



GOVERNMENT OF ODISHA
Department of Water Resources

HYDROLOGY PROJECT - II

(IBRD Loan No. 4947-IN)



ODISHA SURFACE WATER

PROJECT COMPLETION REPORT

Bhubaneswar

August 2014

PROJECT COMPLETION REPORT
Hydrology Project-II (IBRD Credit No. 4749-IN)
Surface Water Component, Odisha

1. Overall Report since Hydrology Project –I

i. HYDROLOGY PROJECT-I :

In 1995, the Govt. of India and participating States entered into a development credit agreement with the World Bank to implement the Hydrology Project under a joint financing arrangement accommodated through the Government of Netherlands to provide related Technical Assistance in form of a grant. The primary objective of the project was to support major aspects of National Water Policy and State Water Policies through improvement of institutional and technical capacity and physical facilities to measure, process, store and disseminate quantity and quality data on Surface Water and Ground Water along with related climatic data. During the implementation of the project, efforts were made for upgrading and development of appropriate data collection network, procurement and installation of data processing equipment, formulation and introduction of data communication practices and related institutional strengthening covering buildings, furniture, vehicles and staff trainings. With the technical assistance of the Hydrology Project Consultants an integrated HIS was established, which is comprehensive, reliable, easily accessible, user friendly and sustainable. The HIS so developed, envisages long-term development for integrated use of water resources. It comprises of physical infrastructure and developed human resources to collect, compile, validate, analyze, transfer, store and disseminate Hydro-meteorological and water quality data for basic water resources evaluation.

Hydrology Project in the State of Orissa virtually commenced from the financial year 1995-96 and was structured for six years operation with an estimated cost of Rupees 287.390 millions. Accordingly the 1st two years of operation remained under 8th five-year plan and the rest four years spilled over to 9th five-year plan. The proposed external input was 223.708 millions, which comprised of non-recurring expenditure for infrastructure development like procurement of equipment, instruments, inspection vehicles, construction of buildings for various purposes, training of staff and recurring expenditure on incremental staff salary. The proposed State Govt. input of Rupees 63.682 millions was arrived at after accounting for the salary and maintenance components, which are all recurring in nature.

In the draft report of May 1993, 92 RG stations were identified in various river basins of the State. Out of those, 22 stations were under operation by the CWC. Accordingly the rest 70 stations were proposed

to be included in the Hydrology Project (SW wing). This fact was reflected in the SAR (Staff Appraisal Report). But subsequently after careful consideration, it was decided during the MTR to take up 65 stations in total under the Hydrology Project. Eventually the project cost was curtailed and ultimately remained at Rs. 119.42 millions. But the delay in implementation of the project has again raised the cost from Rs. 119.42 millions to Rs. 160.511 millions, which has been concurred by project Co-ordination Secretariat.

As conceived at the beginning, there were three distinct phases in the project, namely development, implementation, Operationalization and consolidation. All the three phases were time bound in order to complete the project activities within the stipulated period. However, due to logistical and institutional weakness, the first two phases were delayed. Subsequently, extension of the project period was granted on three different occasions, ultimately fixing the completion date on 31st December 2003. During the extension period, lot of efforts have been made for consolidation of the project activities implemented so far through development of standardized software and extensive skill building of HIS staff across all levels in improving their technical and managerial capabilities. The other achievements include optimization of the existing network and standardization of uniform and easily accessible data.

ii. HYDROLOGY PROJECT-II

After the completion of Phase-I activity of Hydrology Project, It was decided to optimize the utilization of the network developed under HP-I in formulating Design Aids and other Decision Support Systems to support the objectives of National Water Policy as well as State Water Policy. Accordingly, the project was planned under financial assistance from IBRD & the agreement and other legal documents were executed between the Govt. of India and the participating states on one hand and the World Bank on the other on dated. 19.01.2006.

- **Project Development Objective**

To extend and promote the sustained and effective use of the HIS by all potential users concerned with water resources planning and management, both public and private, thereby contributing to improved productivity and cost effectiveness of water related investments.

HP-II: PROJECT SALIENT FEATURE

| | |
|--|---|
| 1. Project Name : | <i>Hydrology Project Phase –II (Surface Water Component)</i> |
| 2. Loan No: | <i>IBRD Credit No 4749-IN</i> |
| 3. Cost of the Project: (Base Cost) | <i>Rs 132.800 Millions</i> |
| 4. Revised this year 2012 | <i>Rs 134.600 Millions</i> |
| 5. Implementing Agency : | <i>Government of Orissa,</i> |
| 6. Sub-Sector: | <i>Department of Water Resources</i> |
| 7. Nodal Coordinating Agency: | <i>MOWR, GOI.</i> |
| 8. Date of Agreement: | <i>19-01-2006</i> |
| 9. Date of Effectiveness | <i>05-04-2006</i> |
| 10. Project Completion date: | <i>31-12-2011(Extended up to May 2014)</i> |
| 11. Terminal date of disbursement: | <i>30-06-2012 (Extended up to Sep 2014)</i> |
| 12. Retroactive Period (USD 6,000,000): | <i>02-11-2004 to 18-01-2006</i> |

Phase-II encompasses activities like

I. Institutional Strengthening

- Consolidating of HP-I
 - Strengthening capacity to use existing software/IT/Equipment
 - Upgrading IT infrastructure
 - Real Time Data Acquisition System (RTDAS)
- Awareness, Disseminating & Knowledge sharing
 - Formulation of Common Task Group of SW & GW wings.
 - Identifying the potential users and their data needs.
 - Procurement of audio-visual aids and other scientific equipment.
 - Regular publication, media coverage, development of linkages and data accessibility.
 - Interaction between different agencies operating in the same domain.
- Implementation Support.
 - Short-term consultancy.
 - Inter & Intra-agency collaboration.
 - Financial Management (MIS).
 - Capacity building & Human Resource Development.

II. Vertical Extension

○ Development of Hydrological Design Aids (HDA)

Development of hydrological design aids for SW wing included in the proposals is as follows:-.

- Water Availability/ Yield assessment
 - Probable Maximum Flood
 - Sedimentation
- ### ○ Decision Support System (DSS)
- Drought monitoring and management in Upper Tel
 - Conjunctive use of Surface water & Ground water in Hirakud Command
 - Short-term reservoir Operation
- ### ○ Purpose Driven Studies (PDS)
- Water Quality monitoring and modelling in Taladanda Canal
 - Sediment yield and its distribution in Hirakud reservoir.

Expenditure Status

Cumulative expenditure up to 31.05.2014

| <u>Category</u> | | <u>Rs (Cr.)</u> |
|-------------------------|----------|------------------|
| i. Goods | - | 1.310 |
| ii. Training | - | 0.437 |
| iii. Civil Works | - | 0.816 |
| iv. Consultancy | - | 0.117 |
| v. Recur. Cost | - | 6.238 |
| T O T A L | - | 8.919 Cr. |
| % of Expenditure | - | 66.26 % |

(Less % of expenditure is due to incompleteness of RTDAS under HP-II)

2. Background: Prior to Hydrology Project –I

- Absence of reliable Hydrological Information System (HIS) network in the state.
- Manual recording of data and maintenance in the hard copy. No such facility for data validation.
- Want of skilled manpower for data collection

3. Institutional Reform during Hydrology Project –I & II

Both the national and the State water policies stress on sustainable development of all sectors, which conserve land, water, plant and animal genetic resources in a technically appropriate, economically viable and socially acceptable manner. Integrated water resources management has become inevitable for this purpose. Keeping these aspects in mind, we have tried to assess the impact of present activities. The current shape of HIS has provided the potential for an integrated hydrological data collection system and in the process ultimately we have come to a stage where the gains of Hydrology Project are distinctly visible. A brief account of such gains is listed below:

- (a) HP has helped us in developing a Hydrological Information System that envisages long-term development for integrated use of water resources instead of confining to any particular project or purpose like Irrigation or Hydro- power generation.
- (b) HP has enabled the organization to acquire specifically designed Software and hard ware for achieving uniformity, standardization and easy availability of reliable data.
- (c) HP-I has helped in optimization of the network within the agency and integration of monitoring networks between different agencies operating in the same domain acquiring high frequency and error free data collection mechanism.
- (d) HP-I has helped us in establishment of Data Processing Centres at different levels including State Data Processing Centre for processing, validation, inter agency data exchange, storage and dissemination of data through a single window.
- (e) Extensive skill building of HIS staff across all level for improving their technical and managerial capabilities.
- (f) HP has introduced the concept and practice of systematic and “demand linked” data dissemination through formation of HDUG. The HDUG provides a common platform for the data producers / suppliers and data users involving representation of various organizations and individuals, both government and non-government, engaged in different sectors for Water Management.
- (g) Concept of Real Time Data Acquisition System (RTDAS) introduced in HP-II.

- (h) Decision Support System (DSS) under HP-II for Integrated Water Resources Management in the state.
- (i) Relevant and effective studies under Hydrological Design Aids (HDA) and Purpose driven Study (PDS)

4. HIS design and development during HP-I and any changes in HP-II

For long term sustainability of HIS, it will be necessary to shift attention from data collection and processing to using the data in planning and management of water resources. Integrated water resources management conforming to the provision of State and national water policies has become the biggest challenge of the present time. The objectives of HP, being multi-dimensional, will play a major role to meet these challenges in future. Quantitative and qualitative assessment of fresh water availability combined with proper monitoring and evaluation can re-assure rational distribution among different sectors like irrigation, power generation, drinking, agriculture and industry etc. An integrated and infallible approach through proper planning and implementation can bring about a revolutionary change in the present status of water scarcity. Poverty alleviation through such attempt should be the ultimate goal. In a state like Orissa, where natural calamity like flood or drought is a common phenomenon, real time use of the acquired data will be of immense help for early flood forecasting and drought monitoring. These two aspects along with conjunctive use of surface and ground water will form the basis of future activities relating HP. In addition to the above considerations, HIS will be a significant contributing factor to the establishment of River Basin organizations.

Establishment of Networks under HP-I

- (a) **River Gauge network including DWLR** : **56**
Out of 56 nos. HP sites, 44 nos. are Gauge & Discharge sites and 12 nos. are only Gauge sites. 20 nos. of Shaft Encoder type DWLR have been commissioned in various selected sites.
- (b) **Rain gauge network** : **65**
99 nos of rain gauge stations are working under HP. The details are as follows.

| | |
|-----|----|
| SRG | 44 |
| ARG | 12 |
| FCS | 09 |
- (c) **Climatological stations** : **09**
9 nos. of Full Climatic Stations are operating in the State. The parameters measured under FCS are :- Daily rain fall, Hourly rain fall, Max. temp, Min. temp, Dry Bulb temp, Wet Bulb temp, Humidity, Wind direction, Instantaneous wind speed, Pan temp & Pan evaporation and Sunshine duration.

Data Processing

- (a) **Data entry using SWDES** : **11**
Data entry is done in SDDPC. Out of 9 SDDPCs, 7 are functioning independently and 2 are jointly functioning in one building.
- | | |
|-------|---|
| SDDPC | 8 |
| DDPC | 3 |
- (b) **Primary processing using HYMOS** : **03**
Primary validation using HYMOS are carried in Divisional level in DDPC
- | | |
|------|---|
| DDPC | 3 |
|------|---|
- (c) **Secondary processing using HYMOS** : **04**
Secondary validation is carried in state level in SDPC. Trained official in rank of Asst. Director are engaged for the job

Networks under HP-II

During HP-II, the focus is shifted from HP-I to a more model based study involved in HP-II like Hydrological Design Aids, Decision Support System and Purpose-driven studies. As a result HIS network built under HP-I somehow paralyzed as follows:-

- Data entry in SWDES in SDDPC are not carried out, done in DDPC & SDPC
- HYMOS is not functioning in the SDPC due to absence of AMC
- Absence of trained staff due to promotion /transfer

But, few stations are upgraded to Real Time Data Acquisition System (RTDAS) and are helping to get real time data on finger tips. During monsoon/ Flood season these data are more helpful for accessing discharges and levels in important places, helping in taking decision.

5. Support from Central agencies, TAMC etc.

The trainings and technical support from Central Agencies like NIH and NWA were very commendable. The refresher courses/trainings should be carried by the agencies. NIH should conduct training particularly related to DSS instead of separate course in the state during AMC period.

6. Procurement during Phase 1 and Phase 2

Procurement List under Phase-1

The following major procurement done under HP-I and HP-II

- | | |
|-------------------------------------|----|
| 1. Standard Rain Gauge (SRG) - | 70 |
| 2. Autographic Rain Gauge (ARG) - | 14 |
| 3. Full Climatic station (FCS)Pkg - | 09 |
| 4. Bridge Outfit - | 40 |
| 5. Current Metre - | 50 |

6. Sediment sampling package - 20
7. Bathymetry System - 01
8. Computer Package

Procurement List under Phase-2

| Year | Name of procurement | Unit | Quantity | Amount (Rs.) |
|---------|---|------|----------|----------------|
| 2007-08 | Deskto Computer | No | 2 | 72700 |
| | Colour Laser Printer | No | 2 | 37918 |
| | Laptop | No | 2 | 99400 |
| | UPS APC | No | 5 | 27560 |
| | DLP Multimedia Projector | No | 1 | 99233 |
| | Total | | | 336811 |
| 2008-09 | Laser Printer Cum-Degital Photocopier & Fax Machine | No | 1 | 52473 |
| | EVDO BSNL | No | 1 | 4752 |
| | Repair and upgradation of Computers | No | 1 | 107462 |
| | Supply of TFT Monitor | No | 1 | 43792 |
| | Total | | | 208479 |
| 2009-10 | 22" TFT Monitor | No | 3 | 38400 |
| | Cannon iPF Plotter | No | 1 | 333525 |
| | Arc info GIS | No | 1 | 1268800 |
| | Desktop computer 3 Nos | Pkg | 1 | 212099 |
| | Auto Level SOKKIA with stand | No | 1 | 27900 |
| | Total | | | 1880724 |
| 2010-11 | Digital Printer | No | 1 | 94848 |
| | Multimedia Projector | No | 1 | 94773 |
| | Audio visual Training equipment | Pkg | 1 | 196582 |
| | Desktop computer preloaded operating system | No | 1 | 191743 |
| | Server Intel Zeon two processor 2 Nos | Pkg | 1 | 285062 |
| | Construction of 3rd floor Part | Pkg | 1 | 4765000 |
| | Server software | no | 1 | 136298 |
| | Desk top computer & Peripherals | Pkg | 1 | 54547 |
| | HP Laser Printer Duplex Net work A3 | No | 1 | 164023 |

| | | | | |
|---------|--|-----|----------------|--------------------|
| | HP Laser Printer Duplex Net work A4 | No | 1 | 35450 |
| | Data Backup & Addl Data Backup software san system | Pkg | 1 | 1406396 |
| | Server intel zeon four processoe quard core 2 Nos | Pkg | 1 | 428354 |
| | Online UPS | No | 1 | 147000 |
| | Arc info GIS | No | 1 | 1257000 |
| | 55.80 cm Monitor | No | 1 | 10000 |
| | Rack 19" 42U | No | 1 | 27132 |
| | UnliUPS for Work station | PKG | 1 | 265448 |
| | Server Network device | No | 1 | 44980 |
| | | | Total | 9907079 |
| 2011-12 | | | | |
| | Aqua cooler cum Purifier | No | 1 | 32000 |
| | Supreme Urnet chair | No | 20 | 48748 |
| | Konica Photocopier | No | 1 | 41060 |
| | Intercum system | No | 1 | 84260 |
| | | | Total | 206068 |
| 2012-13 | | | | |
| | Lenovo Dualcore computer | No | 1 | 21850 |
| | Executive Table | No | 1 | 25500 |
| | Desktop compuer | No | 3 | 81107 |
| | Supreme urnet chair | No | 10 | 22360 |
| | | | Total | 150817 |
| 2013-14 | | | | |
| | Steel Almirah | No | 1 | 9988 |
| | HP Laserjet Printer | No | 1 | 7800 |
| | Wooden Bed | No | 2 | 20000 |
| | Geo Max Autolevel Machine | No | 2 | 39700 |
| | HP Scanjet Scanner | No | 1 | 4200 |
| | Supreme Urnet Chair | No | 20 | 48010 |
| | Split Air conditioner | No | 12 | 478381 |
| | Executive High Back Chair | No | 1 | 6585 |
| | Voltas stabiliser Wall mounted | No | 6 | 45000 |
| | Desktop computer with pre-loaded operating system | No | 3 | 123000 |
| | Fire extinguisher | No | 4 | 15571 |
| | Steel office table | Pkg | 1 | 13340 |
| | | | Total | 811575 |
| | | | G Total | 1,35,015,53 |

7. Decision Support System (DSS-Planning)

Under Hydrology Project-II, Odisha has opted for two studies, namely

- i. **Drought monitoring and management in Upper Tel**
- ii. **Conjunctive use of SW & GW in Hirakud Reservoir and**
- later iii. **Short-term operation of Hirakud reservoir** is taken-up with connection to study-ii

The summary of activities under DSS (P) for the state is as follows:-

- Installation of DSS Software
 - Set up of Static IP address
 - Installation of DSS 3.2 (latest version) and dashboard in server and workstations
 - DSS v. 4.0 is available but not yet customized in the system
 - Commissioning of webserver
 - Setting up of MIKE BASIN network license
- Drought Management
 - Development of Drought Dashboard
- Model Development
 - Conjunctive use of surface and ground water to improve the efficiency of water utilization
 - Changing cropping patterns to increase benefits for the farmers

Only one officer is dedicated to DSS activity from the beginning from SW wing, but no one from GW wing is attached to DSS. There is further technical / scenario development under the study due to technical and trained staff. The last training on “MIKE HYDRO” was not attended by Odisha due to last moment communication.

8. PDS: Key applications

Study: Water Quality monitoring & modelling in Taladanda Canal.

Consultant:- Dr. RAMAKAR JHA, Professor, Department of Civil Engineering, National Institute of Technology, Rourkela, India

Purpose: It is intended that the consultant will assist the surface water wing of Hydrology Project, Orissa to develop mathematical models related to water quality in Taladanda Canal basin on the data available and to be acquired during the process of implementation. Such models must be developed in a manner so as to arrive at standardized methodologies.

Findings: The canal is commanding an ayacut of 72611 Ha with design discharge of 88.42 cum. The total length of the canal is 83.2 km. The area enjoys a subtropical monsoon climate with an average annual rainfall of 1,370 mm and average annual humidity is 76%. The temperature varies from 11.9_C to 44.4_C. There are two major geological formations covering the study area, i.e., Eastern ghat group of crystalline rocks, and Gondwana group of sedimentary rocks. Presently the canal is in a dilapidated condition (Figure 2). The deficiency in carrying capacity in the canal is mainly due to discharge of pollutants from municipal sources, hospitals, industries for which its carrying capacity is not achieved and has become unsuitable for human consumption. Realising the importance of this problem this study aims to determine the present pollution level of the canal and based on the findings suitable models for prediction of the pollutant behaviour at different locations of Taldanda canal.

In Taldanda canal water quality survey was carried out at different sampling locations during the year 2011-2012 by the water resources department and provided to NIT Rourkela for its analysis. In addition, water quality data collected earlier by different research in Taldanada canal has also been studied in the present work.

Das and Acharya,(2003) collected a total of 120 water and sewage samples from 20 stations over six consecutive seasons in two years in order to study the possible impact of domestic sewage on the lotic water in and around Cuttack, India.

Samantray et al.2009 carried out water quality analysis, and the results are shown in Table 1.

Table 1: Water quality during different season in Taldanda Canal Samantray et al. (2009)

| <i>Location</i> | <i>Season</i> | <i>pH</i> | <i>Turbidity</i> <i>NTU</i> | <i>[TDS]</i> <i>mg/l</i> | <i>[TH]</i> <i>mg/l</i> | <i>[NO₃]</i> <i>mg/l</i> | <i>[F]</i> <i>mg/l</i> | <i>[BOD]</i> <i>mg/l</i> | <i>[DO]</i> <i>mg/l</i> |
|-----------------|---------------|-----------|--------------------------------|-----------------------------|----------------------------|--|---------------------------|-----------------------------|----------------------------|
| T1 | Postmonsoon | 7.38 | 5 | 76 | 24 | 8.8 | 0.32 | 2.7 | 6.4 |
| | Winter | 7.31 | 4 | 81 | 33 | 9.9 | 0.36 | 2.8 | 6.2 |
| | Summer | 7.16 | 5 | 101 | 48 | 11.0 | 0.40 | 3.0 | 6.0 |
| T2 | Postmonsoon | 7.27 | 3 | 66 | 20 | 4.0 | 0.22 | 3.6 | 6.0 |
| | Winter | 7.00 | 5 | 85 | 32 | 4.5 | 0.25 | 3.7 | 5.8 |
| | Summer | 6.85 | 5 | 109 | 46 | 5.0 | 0.28 | 4.0 | 5.7 |
| T3 | Postmonsoon | 7.18 | 4 | 158 | 43 | 3.2 | 0.32 | 4.8 | 5.8 |
| | Winter | 7.06 | 5 | 167 | 60 | 3.6 | 0.36 | 4.9 | 5.6 |
| | Summer | 6.92 | 12 | 209 | 87 | 4.0 | 0.40 | 5.0 | 5.5 |
| T4 | Postmonsoon | 7.53 | 4 | 184 | 63 | 5.6 | 0.24 | 3.7 | 6.0 |
| | Winter | 7.46 | 5 | 194 | 98 | 6.3 | 0.27 | 3.8 | 5.8 |
| | Summer | 7.31 | 4 | 242 | 140 | 7.0 | 0.30 | 4.0 | 5.6 |
| T5 | Postmonsoon | 7.32 | 4 | 67 | 33 | 12.8 | 0.33 | 3.6 | 5.9 |
| | Winter | 7.24 | 3 | 88 | 46 | 14.4 | 0.37 | 3.7 | 5.7 |
| | Summer | 7.09 | 6 | 113 | 67 | 16.0 | 0.42 | 4.0 | 5.6 |

Recommendations

1. BOD and COD values are very high. This can be removed by using hydrogen peroxide or oxidation using aerators or coagulants. For BOD and DO simulation at different location, proper water quality modeling approach needs to be applied to find the assimilative capacity and most suitable site for waste disposal with their appropriate quantity.
2. Iron and Copper are present in high amount, which needs to be controlled by effluent management and suitable removal techniques including oxidation, activated carbon, ion exchange, chemical treatment, membrane or adsorption techniques. Some trace metals such as Zinc, lead, Chromium, Cadmium, Cobalt, and Boron have been detected, which may be a alarming signal for future water management. Chemical treatment, activated carbon, coagulation, ion exchange, and membrane techniques should be applied.
3. Biological variables (Total coliform, Fecal coliform and E-coli are available significantly), which may cause serious health problem to the people drinking the canal water and using it for drinking purposes. Chlorination, UV technique, membrane techniques are mainly required for pathogen removal. However, total organic carbon should be checked before injecting chlorine to avoid formation of disinfection by products which causes cancer.
4. Turbidity is high, which needs to be reduced to improve the water quality ionic components by chemical treatment, and ion exchange techniques.
5. Non-point source pollution is entering in Hanusa nala as return flow. Nitrate is increasing in the downstream. It needs to be removed by chemical treatment to avoid diseases like “blue baby”.
6. Regular monitoring of highly toxic variables needs to be done and water quality management should be applied properly.
7. Water quality models developed in the present work are very useful to estimate chemicals, heavy metals, coliform, physical parameters, nutrients, organic matter, etc. at downstream station with high accuracy and correlation statistics.

9. HDUG

Role of HDUG

- ✓ HDUGS have key role for promoting HIS use
- ✓ The objective of HDUG is to promote the effective use of the HIS by all potential users.
- ✓ Advisory and co-ordination support to make the data users more proactive.
- ✓ To discuss issue on HIS dissemination such as quantitative & qualitative aspects of supplied data to users
- ✓ To co-ordinate with State level HDUG and HP authorities.
- ✓ To promote use of data bank and suggest improvements to make it more user friendly
- ✓ To identify priority areas where data collection/ processing/ dissemination is highly essential.
- ✓ Provide feedbacks on the difficulties/ success encountered while using data & its quality.

Status of HDUG

| | |
|-------------------------|------------------------|
| HDUG Date (DD/MM/YYYY) | 22/01/96 |
| Number of HDUG in State | |
| Central HDUG | 1 |
| Regional HDUG | 30 |
| Meetings held in HDUG | |
| Central HDUG (Date) | 1 (15/09/2006) |
| Regional HDUG (Date) | 12 (21/02/2007) |

10. Awareness and Dissemination

| | |
|---|----------------------|
| Awareness Workshops/Seminars | |
| Number of Workshops held | 11 |
| Number of persons attending workshops | 736 |
| Date of latest workshop (DD/MM/YYYY) | 21/02/2014 |
| Number of persons attending latest workshop | 70 |
| Data dissemination | In data years |
| Meteorological data | 861 |
| Hydrological data | 610 |
| Revenue Collection | Rs. 2.38 lacs |
| Government/ Research fellow/ Students | 24 |
| Private agency | 38 |

11. Capacity building and trainings

Total no of personnel trained:-2372

Total no of Trainings held:- 122 during span of 8 years under HP-II.

| SI No. | Name of the training | No. of participant | Place | Date |
|----------------------------|--|--------------------|--------------------------|-----------------------|
| DURING YEAR 2006-07 | | | | |
| 1 | In-house training on Basic Computer & MS office | 20 | SDPC, Bhubaneswar | Aug 24-31, 2006 |
| 2 | Application of modern technique in practicing Hydrology | 2 | NIH, Roorkee | Oct 9-13, 2007 |
| 3 | Interactive workshop for prioritization of structure, inputs & outputs of DSS (Planning) | 2 | NIH, Roorkee | Nov 22-24, 2006 |
| 4 | Repair & refresher training course on Integrated Bathymetric System | 21 | Hirakud | Jan 16-29, 2007 |
| 5 | Workshop on Financial Management and procurement related key issues | 3 | New Delhi | Jan 24-25, 2007 |
| 6 | Training on "Water Information system Data Online Management" (WISDOM) | 1 | NWA, Pune | Feb 28 - Mar 02, 2007 |
| 7 | Training course on " Hydrological Modelling" | 2 | NWA, Pune | Mar 07-09, 2007 |
| 8 | Refresher training course on HYMOS | 3 | CWC, Bhubaneswar | Mar 26-30, 2007 |
| DURING YEAR 2007-08 | | | | |
| 1 | TOT Programme on Hydrometry including use of SWDES software | 3 | NWA, Pune | May 08-18, 2007 |
| 2 | In-house training course on SWDES | 19 | HP Building, Bhubaneswar | May 23-26, 2007 |
| 3 | Workshop on Financial Reporting under HP-II | 2 | NWA, Pune | May 24-25, 2007 |
| 4 | 1 st State Level Interactive Workshop on DSS (Planning) | 150 | Bhubaneswar | June 06, 2007 |
| 5 | In-house training programme on Basic Hydrology | 35 | Rayagada | Jul 19-20, 2007 |
| 6 | Orientation Course on GIS | 1 | ORSAC, Bhubaneswar | Jul 19-30, 2007 |
| 7 | One day workshop on Procurement & Financial issues | 3 | New Delhi | Jul 30, 2007 |
| 8 | In-house training programme on Water Quality | 20 | Bolangir | Jul 31, 2007 |
| 9 | TOT programme in Surface Water Data Processing & its validation using HYMOS | 2 | NWA, Pune | Aug 20-31, 2007 |
| 10 | One day In-house training Programme in FMR | 25 | HP Building, Bhubaneswar | Sep 28, 2007 |
| 11 | In-house training programme in Water Quality | 25 | CWC, MERO, Bhubaneswar | Sep 29, 2007 |
| 12 | Application of RS& GIS in WRM under Hp-II | 1 | NIH, Roorkee | Oct 08-12, 2007 |
| 13 | GIS layer application for DSS (planning) – HP-II. | 1 | NRSA, Hyderabad | Oct 13-17, 2007 |
| DURING YEAR 2008-09 | | | | |
| 1 | In-house training course on Basic Hydrology | 38 | HP Building, Bhubaneswar | Jun 10-11, 2008 |
| 2 | Workshop on " Procurement & Financial Management" under HP-II | 2 | WB Office, New Delhi | Jun 16-18, 2008 |
| 3 | In-house training course on Financial | 40 | HP Building, | Aug 19-20, 2008 |

| | | | | |
|----|--|----|--------------------------|-----------------|
| | Management Reporting (FMR) | | Bhubaneswar | |
| 4 | In-house training on Basic Hydrology | 48 | Hotel Triveni, Bolangir | Sep 30, 2008 |
| 6 | In-house training programme on SWDES | 25 | HP Building, Bhubaneswar | Oct 22-25, 2008 |
| 7 | In-house training on Basic Hydrology & Meteorology | 47 | Divn. Office, Koraput | Nov 17-18, 2008 |
| 8 | Appreciation course on Emerging Issue of Water Resources | 2 | WALMI, Cuttack | Dec 11-12, 2008 |
| 9 | One day training programme on Water Quality | 40 | Bolangir | Jan 16, 2009 |
| 10 | Introductory Workshop on "Awareness Raising on HIS" | 35 | HP Building, Bhubaneswar | Feb 6, 2009 |
| 11 | Inception Workshop on DSS (Planning) for IWRDM | 3 | New Delhi | Feb 9-10, 2009 |

DURING YEAR 2009-10

| | | | | |
|----|--|----|--------------------------|-----------------------|
| 1 | Surface Water Data Processing & its validation using HYMOS | 2 | NWA, Pune | Apr 28 - May 08, 2009 |
| 2 | In-house training on Surface Water Data Processing & its validation using HYMOS | 25 | HP Building, Bhubaneswar | May 26-27, 2009 |
| 3 | Two days workshop on "Procurement & preparation for Mid Term Review" | 1 | New Delhi | June 4-5, 2009 |
| 5 | One-day training workshop on "Online Updating of MTR cost Table" | 2 | New Delhi | Aug 28, 2009 |
| 6 | Mid Term Review Mission (MTR), October 5-14, 2009 | 3 | New Delhi | Oct 11-14, 2009 |
| 7 | In-house training programme in Basic Computer at Koraput | 20 | Koraput | Oct 26-31, 2009 |
| 8 | Two weeks training programme on " Rainfall-runoff modeling and River Basin modeling" | 3 | NIH, Roorkee | Nov 9-20, 2009 |
| 9 | Workshop on DSS(P) for decision makers | 1 | New Delhi | Nov 11, 2009 |
| 10 | Workshop on Purpose Driven Studies (PDS) by PCS, MOWR | 2 | New Delhi | Nov 23-24, 2009 |
| 11 | In-house training programme on Basic Hydrology | 35 | Rayagada | Nov 24-25, 2009 |
| 12 | Workshop on "HIS Awareness" for Departmental Engineers | 71 | Cuttack (Eastern Circle) | Dec 12, 2009 |
| 13 | In-house training programme in Basic Computer & MS Office | 39 | HP Building, Bhubaneswar | Dec 14-19, 2009 |
| 14 | Workshop on Conceptualization of DSS(P) | 1 | New Delhi | Jan 7, 2009 |
| 15 | Workshop on "HIS Awareness" for Departmental Engineers | 60 | Kamakshyanagar | Jan 8, 2010 |
| 16 | Two weeks training programme on model development under DSS(P) | 3 | NIH, Roorkee | Feb 8-19, 2010 |
| 17 | In-house training programme in "WQ & Sediment Analysis" at Berhampur | 49 | Berhampur | Feb 16-17, 2010 |
| 18 | In-house training programme in "Basic Hydrology" at Bhubaneswar | 52 | HP Building, Bhubaneswar | Feb 25-26, 2010 |
| 19 | In-house training programme in "SWDES" at Bhubaneswar | 20 | HP Building, Bhubaneswar | Mar 15-16, 2010 |
| 20 | In-house training programme in "FMR" at Bhubaneswar | 42 | HP Building, Bhubaneswar | Mar 17-18, 2010 |
| 21 | Training on use of "ArcGIS 9.31" by ESRI, India | 7 | Bhubaneswar | Mar 17-19, 2010 |

DURING YEAR 2010-11

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|----|--|----|--------------------------|----------------------|
| 1 | State visit by DHI Consultants for support training on "Model development on DSS(P)" | 6 | Bhubaneswar | May 10-14, 2010 |
| 2 | Workshop on development of "Hydrological Design Aides (SW)" | 1 | New Delhi | June 4, 2010 |
| 3 | Workshop on Database Development under DSS(P) | 2 | New Delhi | June 11, 2010 |
| 4 | In-house one-day workshop on "The World Bank Procurement Procedures" | 25 | Bhubaneswar | July 2, 2010 |
| 5 | Training on "Predictions on Ungauged Basins" at NIH, Roorkee | 3 | NIH, Roorkee | July 26-30, 2010 |
| 6 | Training course on "Decision Support System (P) for IWR Planning & Management" | 1 | DHI, Denmark | Aug 2 - Sep 10, 2010 |
| 7 | In-house training programme in "Basic Hydrology" at Rayagada | 40 | Rayagada | Aug 5-6, 2010 |
| 8 | In-house training programme in "Basic Hydrology" at Bolangir | 49 | Hotel Triveni, Bolangir | Aug 25, 2010 |
| 9 | In-house training programme in "Basic Hydrology" at Koraput | 48 | Koraput | Sep 28-29, 2010 |
| 10 | In-house training programme in "WQ & Sediment Analysis" at Bolangir | 45 | Hotel Triveni, Bolangir | Oct 25, 2010 |
| 11 | In-house training programme in "WQ & Sediment Analysis" at Berhampur | 46 | Berhampur | Oct 27-28, 2010 |
| 12 | In-house training programme in "SWDES" at Bhubaneswar | 15 | HP Building, Bhubaneswar | Nov 22-23, 2010 |
| 13 | Training on "Financial Monitoring & Reporting (FMR)" at NWA Pune | 2 | NWA, Pune | Nov 23-24, 2010 |
| 14 | In-house training programme in "FMR" at Bhubaneswar | 50 | HP Building, Bhubaneswar | Nov 24-25, 2010 |
| 15 | Training on "DSS Introduction & Case Study Support" at NIH, Roorkee | 1 | NIH, Roorkee | Jan 10-21, 2011 |
| 16 | In-house training programme in "SWDES" at Bhubaneswar | 12 | SDPC, Bhubaneswar | Jan 27-28, 2011 |
| 17 | In-house training programme in "WQ & Sediment Analysis" at Berhampur | 45 | Berhampur | Jan 28-29, 2011 |
| 18 | Training on "DSS Introduction & Case Study Support" at NIH, Roorkee | 1 | NIH, Roorkee | Feb 7-18, 2011 |
| 19 | In-house training programme in "Basic Hydrology" at Bhubaneswar | 52 | HP Building, Bhubaneswar | Feb 17-18, 2011 |
| 20 | In-house training programme in "Basic Computer" at Koraput | 9 | Koraput | Feb 23-26, 2011 |
| 21 | Workshop on "HIS Awareness" at Bolangir | 48 | Hotel Triveni, Bolangir | Mar 9, 2011 |
| 22 | In-house training programme in "WQ & Sediment Analysis" at Bolangir | 45 | Hotel Triveni, Bolangir | Mar 10, 2011 |
| 23 | In-house training programme in "FMR" at Bhubaneswar | 42 | HP Building, Bhubaneswar | Mar 23-24, 2011 |
| 24 | In-house training programme in "SWDES" at Bhubaneswar | 20 | HP Building, Bhubaneswar | Mar 25-26, 2011 |

DURING YEAR 2011-12

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|---|--|---|--------------|-----------------|
| 1 | Training course on "Project hydrology" | 2 | NIH, Belgaum | Sep 16-20, 2011 |
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| 2 | Workshop on Environmental issues on WRD&M (Climatic changes, Rainfall etc.) | 3 | WALMI, Cuttack | Sep 19-20, 2011 |
| 3 | Training Course on "Storm water Management in Urban Areas" | 2 | NIH, Kakinada | Sep 21-23, 2011 |
| 4 | In-house training programme in "Basic Hydrology" at Koraput | 47 | Koraput | Sep 28-29, 2011 |
| 5 | In-house training programme in "Basic Hydrology" at Bolangir | 49 | Hotel Triveni, Bolangir | Oct 16, 2010 |
| 6 | Training Workshop on "Drought Mitigation & Management" | 2 | NIH, Roorkee | Oct 31-Nov 4, 2011 |
| 7 | Training programme in "Basic Computer" at Baripada | 30 | Baripada | Nov 14-19, 2011 |
| 8 | In-house training programme in "SWDES" at Bhubaneswar | 12 | SDPC, Bhubaneswar | Nov 29-30, 2011 |
| 9 | In-house training programme in "SWDES" at Bhubaneswar | 15 | SDPC, Bhubaneswar | Dec 01-02, 2011 |
| 10 | In-house training programme in "WQ & Sediment Analysis" at Bolangir | 40 | Berhampur | Dec 16-17, 2011 |
| 11 | Training Programme on "DSS Application" | 2 | NIH, Roorkee | Jan 9-13, 2012 |
| 12 | Development of Hydrological Design Aids (HDA) | 1 | New Delhi | Feb 7-9, 2012 |
| 13 | In-house training programme in "Basic Computer" at Bolangir | 42 | Hotel Triveni, Bolangir | Feb 22-25, 2012 |
| 14 | Workshop on Financial Management Reporting System under HP-II | 2 | NWA, Pune | Mar 1-2, 2012 |
| 15 | In-house training programme in "SWDES" at Bhubaneswar | 14 | SDPC, Bhubaneswar | Mar 12-13, 2012 |
| 16 | In-house training programme in "FMR" at Bhubaneswar | 45 | SDPC, Bhubaneswar | Mar 14-15, 2012 |
| 17 | Training on GIS Application & WQ management | 2 | IIPA, New Delhi | Mar 15-17, 2012 |
| 18 | In-house training programme in "Basic Hydrology & Meteorology" at Rayagada | 39 | Rayagada | Mar 28-29, 2012 |

DURING YEAR 2012-13

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|----|--|----|----------------------------|----------------------|
| 1 | Workshop on Realtime Hydrological Information System Network in India | 2 | NWA, Pune | Jul 23-27, 2012 |
| 2 | Workshop on " DSS (P) Application" | 1 | New Delhi | Oct 4, 2012 |
| 3 | Training on "Regionlization of Watershed response in Ungauged Basins" | 3 | NIH, Roorkee | Oct 15-19, 2012 |
| 4 | In-house training programme in "Basic Computer" at Bhubaneswar | 45 | SDPC, Bhubaneswar | Oct 18-20, 2012 |
| 5 | Workshop on "Flow & Forecast Model" | 50 | Dam Safety Conference Hall | Nov 9, 2012 |
| 6 | In-house training programme in "Basic Hydrology" at Bolangir | 45 | Hotel Triveni, Bolangir | Dec 12, 2012 |
| 7 | In-house training programme in "FMR" at Bhubaneswar | 24 | SDPC, Bhubaneswar | Jan 16-17, 2013 |
| 8 | Training Course on "Environment Hydrology: Special reference to SW & GW quality" | 2 | NIH, Belgaum | Jan 29-31, 2013 |
| 9 | Training on "Basics of Hydro-Electric Projects" | 4 | NWA, Pune | Feb 25 - Mar 1, 2013 |
| 10 | Seminar on "Embedded Electronic System in | 70 | NIT, Rourkela | Feb 27, 2013 |

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| | Water Resources" | | | |
| 11 | Training on " Rainfall-Runoff modelling" | 3 | NIH, Roorkee | Mar 11-15, 2013 |
| 12 | Training programme on "Telemetry" | 2 | NWA, Pune | Mar 19-21, 2013 |

DURING YEAR 2013-14

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|----|--|----|-------------------------------|------------------------|
| 1 | In-house training programme in "Basic Computer" at Bhubaneswar | 45 | SDPC, Bhubaneswar | Jul 31 - Aug 2, 2013 |
| 2 | Final Workshop on " DSS (P) software" | 1 | New Delhi | Aug 8, 2013 |
| 3 | Training on "Advanced Watershed Modelling" | 2 | NWA, Pune | Sep 23-27, 2013 |
| 4 | HIS Awareness Workshop | 40 | Shikhetra Odisha Bhawan, Puri | Sept 25, 2013 |
| 5 | Workshop on Realtime Streamflow forecasting & ROS for Krishna & Bhima Basins | 1 | Yashadha, Pune | Oct 3, 2013 |
| 6 | Training course on "Long lead-time ensemble river & flood forecasting" | 2 | NIH, Pune | Nov 18-23, 2013 |
| 7 | Training workshop on "Groundwater Resources management" | 2 | HRRC, NIH, Belgaum | Dec 3-5, 2013 |
| 8 | Training course on "Storm Analysis & Estimation of Design Flood (HDA-2)" | 1 | NWA, Pune | Dec 16-21, 2013 |
| 9 | Training programme on "Project Monitoring using Open Source GIS" | 2 | NWA, Pune | Dec 30, 13 - Jan 3, 14 |
| 10 | Training program on "Sediment rate estimation and SWAT Application (HDA-3)" | 2 | NWA, Pune | Jan 13-17, 2014 |
| 11 | Training on Scripting & Dashboard in Decision Support System for WRP | 1 | NIH, Roorkee | Jan 20-24, 2014 |
| 12 | Training workshop on "Hydrological Analysis using statistical & stochastic technique." | 2 | NIH, Roorkee | Feb 24-28, 2014 |
| 13 | Training program on "Drought Disaster Risk Assessment & Management" | 2 | NIH, Roorkee | Mar 10-14, 2014 |
| 14 | Training Program on " Flood Inundation Mapping including Use of RS-GIS" | 1 | NWA, Pune | Jun 9-13, 2014 |
| 15 | Training program on "Water Quality Monitoring and Climatic Change" | 1 | NWA, Pune | Jun 16-20, 2014 |

12. Lessons Learnt

- ✓ Induction of research oriented brains to Hydrology Project.
- ✓ Continuance of trained staff of the organization in the relevant area of work for a longer period. The current structure thus has to be improved through induction of already trained personnel from other wings of the WR Department.
- ✓ Procedural delay has to be overcome by amending the provisions to suit the specific needs of HP. For example, travelling by air should be allowed for attending various important trainings/ meetings within short notice.
- ✓ Security and safety for highly sophisticated equipment for real time data transmission has to be thought over immediately.

13. Future Plans & Needs:-

i) Upgradation, Repair & Renovation of HP-I & HP-II.

ii) Provision for infrastructure development for HP-I & HP-II.

- Construction of residential & non-residential buildings.
- Procurement of inspection vehicles for Divisions & Sub-Divisions.
- Procurement of furniture & T&P materials for Divisions, Sub-Divisions & Section etc.
- Provisions for Desktop, Laptop, Projector, generators.
- Provision for development server, software.
- Provision for awareness & training programs.
- Infrastructure for sediment & Water Quality Laboratory.
- Provision for Rest Shed.

iii) Expansion of HP-II

- Installation of additional RTDAS Stations to collect data from inaccessible location / area.
- Installation of RTDAS Stations in Water Resources Department Divisions/ Sub-Divisions/ Sections / Block Head Quarters / Other required places in addition inaccessible areas.

The above stations are essential to avoid manual observations as well as the risk of delay & accuracy. Besides change of committing human error or tampering the data while transmission can be avoided.

iv) Concept of RTDAS

The RTDAS will be an effective non-structural measure for flood forecasting & early working system.

14. Conclusions:-

The activities of HP-I & HP-II will get impaired unless the system is put to a sustainable state. Adequate budgetary provision will be made under the non-plan expenditure to meet the requirements in future. More important, more sustainable trained and research oriented personnel should be inducted to world of HP to think, serve and achieve as a team to take the study to bigger height.