Decision Making Procedures in India for Dam Building

Nagarjuna Sagar Dam (Andhra Pradesh)

इनसिड - INCID

INDIAN NATIONAL COMMITTEE ON IRRIGATION AND DRAINAGE

(Constituted by Ministry of Water Resources, Govt. of India)

New Delhi

March - 2003

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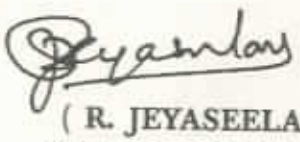
FOREWORD

The Indian National Committee on Irrigation and Drainage (INCID), in pursuance of its objectives and functions, brings out publications of topical interest in the areas of irrigation, drainage and flood control for wide dissemination among professionals and stakeholders in the field. Accordingly INCID is now bringing out the "Report of the Sub-Committee on Decision Making Procedures in India for Dam Building" for information and use of planners, engineers and others engaged in the development of water resources. The publication presents available information on the subject and aims at identifying the gaps in the present decision-making procedures.

The overriding importance of water resources in the overall socio-economic development of the country and the need for augmenting potential and utilizable sources through storage reservoirs/ dams to meet the challenges of emerging water scarcity needs no emphasis. India is still to create by the year 2050 an additional 180 billion cubic metres of live storage to meet the various needs of drinking water, irrigation, hydel power, etc. and the decision making procedures for dam building will continue to be relevant and require updating also.

I am grateful to Shri A.D. Mohile, Former Chairman, Central Water Commission and Chairman of the Sub-Committee and all members of the Sub-Committee in compiling this very useful document for the use of our planners and decision makers apart from providing requisite inputs to the Task Force set up by the International Commission on Irrigation and Drainage (ICID). Thanks are also due to Dr. C.D.Thatte, Secretary-General, ICID, for initiating the subject and guiding the Sub-Committee in this endeavour. Special thanks are due to Shri. Z.Hasan, Former Secretary, Ministry of Water Resources (MOWR) for his inputs in finalizing the Report. The efforts put in by INCID Secretariat and the support and facilities provided to INCID by Shri P.L.Diwan, Chairman and Managing Director, WAPCOS for publishing this document are appreciated and gratefully acknowledged.



(R. JEYASEELAN)
Chairman, INCID &
Central Water Commission

PREFACE

International Commission on Irrigation and Drainage (ICID) has constituted a Taskforce for "Promoting Appropriate Decision-Making procedures for new Dams, particularly for Irrigation, Drainage and Flood Management" in pursuance of the decisions taken in the 52nd International Executive Council (IEC) meeting in Seoul, Korea (November 2001). The Taskforce is chaired by Mr. Z. Hasan, former Secretary, Ministry of Water Resources (MOWR), and has representatives of 7 National Committees and Chairmen of 6 Working Groups as members. Dr. C.D. Thatte, Secretary General, ICID is the Member-Secretary. Important terms of reference of the Taskforce are i) to collect information on preparatory work undertaken for decision making procedures and the presently followed procedures, primarily in ICID member countries, where substantial development through dams and reservoirs is expected in near future and ii) to analyse the collected information and attempt general guidelines/proposals where necessary, with the help of related Work Bodies of ICID.

To facilitate inputs to the Taskforce from the Indian National Committee on Irrigation and Drainage INCID, a Sub-Committee on dams was constituted by INCID with representatives from CWC, National Hydro Power Corporation (NHPC), Tehri Hydro Development Corporation (THDC), Water and Power Consultancy Services (India) Ltd. (WAPCOS), Central Board of Irrigation and Power (CBIP) and INCID as members. The composition of the Sub-Committee is as under :

1.	Mr. A. D. Mohile, Former Chairman, CWC,	-	Chairman
2.	Mr. M. Gopalakrishnan, Member (RM), CWC,	-	Member
3.	Mr. R.C. Jha. Chief Engineer (PAO), CWC,	-	Member
4.	Mr. A. K. Gautam, Director (Economics), CWC	-	Member
5.	Mr. R.K. Khanna, Director (EIA), CWC	-	Member
6.	Mr. R. K. Sharma, Director (Technical), NHPC	-	Member
7.	Mr. Kultar S. Sharma, Director (Technical), THDC.	-	Member
8.	Dr. A.S. Chawla, Director, CBIP.	-	Member
9.	Mr. S. Sethurathinam, General Manager (ID), WAPCOS.	-	Member
10.	Mr. M. S. Menon, Member-Secretary, INCID.	-	Member Secretary,

The Sub-Committee held four meetings to finalise the Report in its present form. In the first two meetings, various issues and the available guidelines in this regard were identified. The structure of the proposed report of the Sub-Committee was finalised in the 3rd meeting. Thereafter, INCID prepared the initial draft of the report, which was discussed in the 4th meeting of the Sub-Committee. Mr. Z. Hasan, Chairman and Dr. C.D Thatte, Member-Secretary of the Taskforce of ICID also participated in the meeting. Their guidance is gratefully acknowledged. The report has been finalised as per the suggestions made by the members and invitees in the 4th meeting. The report covers various issues such as the need for dam building, legal issues, project planning features, environmental and social concerns, financial and economic considerations, etc.

I would like to personally thank the members of the Sub-Committee for their active participation in the meetings and providing the inputs required for preparing this report. I would also like to record my appreciation for the help rendered by INCID Sectt, and in particular by Mr. M.S. Menon, Member-Secretary, INCID and Mr. R.V. Godbole, Consultant, for the compilation of the Report.

A. D. MOHILE
Chairman of the Sub-Committee on Dams

Decision Making Procedures in India for Dam Building

Contents

DECISION MAKING PROCEDURES IN INDIA FOR DAM BUILDING

1. NEED FOR DAM BUILDING

The average annual precipitation in India including snowfall has been estimated as 4000 billion cubic meters (BCM). Though the average rainfall is 1170 mm, it varies from 100mm. in the Western deserts to 11000 mm. in the North Eastern region. More than 50% of precipitation takes place in about 15 days and in less than 100 hours altogether in a year. Also more than 90% of the annual runoff in peninsular rivers and more than 80% of the annual run off in the Himalayan rivers occur during the 4 months of June to September. About 12% of the country receives an average rainfall of less than 610 mm. annually and only 8% receives more than 2500mm. The variability of rainfall from month to month and year to year for the same place is also very high. The total annual water resources of the country (including both the surface and ground water) have been estimated as 1953 BCM by the National Commission for on Integrated Water Resources Development Plan (NCIWRDP) in their Report, Sept. 1999. Of this resource only about 1086 BCM (690 BCM from surface water and 396 BCM from ground water), can be utilized by conventional projects, in the ultimate stage.

The Ganga-Brahmaputra-Meghna system contributes more than 60% of the country's water resources. Many of the small rivers in the peninsular region totally dry up during summer. The wide variation of rainfall in time and space causes regions of harmful abundance (as in the North East) and of acute scarcity (as in the South East and Western Regions). The impact of recurring floods and droughts has left a permanent imprint on the economy and morale of the people and has aggravated regional imbalances in economic development of the country. The strategies in conceiving the resource development and dams have therefore to address these issues.

NCIWRDP after examining the latest trends and views expressed by different demographers, adopted the higher and lower limits of India's population in the year 2050 as 1581 million and 1346 million corresponding to those estimated by Visaria & Visaria and United Nation respectively. After looking into the requirements for various scenarios of population, water use efficiency etc. and availability of water from surface and ground water, the Commission had observed that the country's water requirement barely matches the estimated utilizable water resources. In their Report (Sept.1999), they have concluded that we should aim at reducing water requirement to the low demand scenario and utmost efficiency in water use be introduced.

The NCIWRDP has estimated that the total demand of water for various uses, by 2050, would be around 973 BCM per year (low projection) or 1180 BCM per year (high projection). Although additional return flows of about 214 BCM per year (low projection) or 259 BCM (high projection) per year would be available from these uses, in the Commission's estimate, a large surface and ground water use of about 700 BCM per year and 380 BCM per year respectively would become necessary. This surface water use, in the face of the large temporal variability would require a continued dam building activity. An approximate estimate of the live storage required by 2050 would be 450 BCM. A rough estimate of the live storage, which would have to be created to meet this need would be as follows:

Major & Medium Projects (Existing)	-	177 BCM
Major & Medium Projects (under construction)	-	76 BCM
Minor Storages (existing and under construction)	-	70 BCM
Total Live Storages in projects, existing and under construction	-	323 BCM
Likely loss in live storage due to sedimentation, upto 2050 which has to be compensated for	-	53 BCM (say)
Balance available live storage from the above in 2050	-	323-53 = 270 BCM
Therefore, further new live storage to be created to have a live storage of 450 BCM, by 2050	-	180 BCM

Of this new live storage of 180 BCM, which may have to be created by 2050, projects presently identified would be able to provide only about 132 BCM of live storage.

The number of large dams so far constructed for various purposes such as irrigation, hydel power, flood control etc. is around 4000. The State wise distribution of the dams completed at various points of time and under construction is given at **Annexure-1.1**.

The proposals under interbasin transfer of water envisage additional utilization of 200-250 BCM, thereby completely harnessing the utilizable surface flows. Considering the large quantum of water still to be harnessed to meet the future requirements, apart from completing the on-going projects, approximately another 2500 large dams would still be required to be constructed in India. Hence the decision-making procedures for dam building will be more relevant now.

Economy of scale, much less evaporation and seepage losses, safety and flood absorption potential are available with large storage projects. Small projects, per se, cannot by themselves adequately intercept the large quantum of rainfall available for exploitation on a sustained basis. They are worthy supplements and not substitutes for large dams. The storages behind large dams in any basin ensure that there is a cushion to assured water supply even in case of a failure of rainfall (monsoon) in a year because of reserve and in-built carry-over storage. Not only this, they assure attenuated flow downstream during floods because of flood control reserve pondage possible in all such cases.

In any case, before a large dam is opted for, alternative options of several smaller dams or cascade development schemes are considered for resource development in the basin and corresponding benefits and costs are also worked out and compared with a big dam option. Only when the large dam and reservoir option passes the test, it is recommended for further consideration and implementation. National water policy (NWP) as revised and adopted by Govt. of India (2002) also have provided for such studies and involvement of stakeholders in the decision-making. NWP has also recommended for private sector participation in water resources projects.

Water is also a source of energy. Hydro electric power is cost effective in the long run among the various sources of power supply. Besides, hydropower is environment friendly. These dams and reservoirs can help in hydropower generation to meet peak loads on a seasonal as well as daily basis. It is estimated that about 84000 MW of hydropotential is available in the country of which about 13000 MW only has been developed.

Many of the existing dams provide multipurpose benefits and it is essential that more such projects are constructed. While harnessing the remaining water resources, apart from irrigation and drinking water supply, energy generation can also be provided for where feasible, thereby facilitating proper hydro/thermal mix for improving operational reliability.

It may thus be seen from the above that more storage reservoirs would still be required to be constructed to utilize the surface flows since neither small storages nor run-of the river development would ensure water availability in case of monsoon failure.

2. EVOLUTION OF DAM CONSTRUCTION

Irrigation in India has been practised from pre-historic times and appears to have been contemporary with agriculture itself. Frequent references are found in the Vedas and other ancient literature of the importance of wells, tanks canals and dams to the community, of their efficient maintenance and operation and of the duties of the state in these matters. A study of ancient literature, epigraphical records and the ruins of old irrigation works indicates clearly the interest taken by the ancient Hindu rulers of India in the provision of irrigation facilities for the benefit of their subjects.

Although irrigation is practised in India from pre-historical times, the middle of the 19th century saw construction of large canal systems such as Upper Bari Doab Canal (UBDC), Sirhind Canal etc. Around the year 1890, two canals, one from Chenab (now Lower Chenab) and the other from Jhelum (now Lower Jhelum) were built and water diverted by construction of head works. In the earlier part of the 20th century, Ranbir and Pratap canals were constructed taking off from the river Chenab. However all these small storages constructed for diverting the water into the canals were manually made based on site conditions, rather than following any specific check list for deciding the various parameters involved in arriving at the decision.

In Southern India, irrigated agriculture was in vogue in the Cauvery delta, more or less in the same period of civilisation as in the Indus valley. This period is documented as the Sangam age which is much earlier to the Christian era and concluded during the middle of the 3rd century AD. By far, the most important structure built sometimes in the 2nd century AD, is the Grand Anicut across the river Cauvery in Tamil Nadu founded on permeable foundation. Judged from the recorded data, flood to an extent of about 5260 cumecs (1.86 lakhs cusecs) has been discharged through this anicut with minimum or no damage. It is possible that much higher floods could have flowed over it in the past when there were no other structures on this river. No recorded information is available as to how the structure was founded during construction. Many such diversion works (Anicuts) were built across the streams etc. for gravity irrigation by the rulers of South India.

History is replete with instances of various rulers constructing water harvesting structures such as the Sudarsan lake in Girnar (300 BC) which was repaired and widened during the Gupta empire (4-5th century AD); the Western Yamuna Canal (14th century AD) which was

renovated in the 16th century AD by the Mughals and repaired in the 19th century by the British rulers; the Burhia Tal at Etmadpur near Agra built by Lodhi dynasty during 1451-1526 AD; the Tanka (first underground reservoir) constructed in Rajasthan by Raja Sivsinghji in 1607 AD; the Keola Deo Jheel (lake) named Ajan dam constructed by Maharaja of Bharatpur in 1765 AD etc. While there are not much recorded details as to how the decisions to erect these structures were taken, sound engineering judgement, based on the topographical conditions of the site appears to have been the ruling criteria in taking these decisions. The need for the projects to be free from territorial disputes and easy enemy intrusion is another consideration, which influenced these decisions.

In the nineteenth century, like the early rulers of the country, the British also interested themselves in irrigation development soon after they established their hold during which period the old Yamuna Canals in the north and the Cauvery Delta System (Originally built in 200 A.D.) in the south, were remodelled. An attempt was made after 1850 to promote irrigation development through private companies with a Government guarantee of five percent return upon the capital invested. But this experiment was unsuccessful.

In 1866, important and radical changes were made in the principles and the policy governing the execution and financing of irrigation projects as the direct result of the poor performance of the private companies. Three major decisions were taken :

(i) Irrigation projects would, in future, be constructed by the State only though its own agency,

(ii) Irrigation projects would be financed from public loans raised specifically for the purpose; and

(iii) Political boundaries would not be allowed to come in the way, when the best possible utilisation of water of a river for irrigation purposes was being considered.

These decisions gave a great fillip to construction programmes all over the country.

In 1901 the Government of India appointed a special Commission known as the "Indian Irrigation Commission" to report on irrigation as protection against famine in India. The Commission presented in 1903 a report which, in addition to recommending definite lines of policy regarding the selection, financing and maintenance of irrigation works, dealt in detail with practically every scheme under consideration at the time. As the result of the Commission's recommendations a large number of new works were undertaken.

A significant change in the policy governing the administration and financing of irrigation projects was brought about with the introduction of the Montagu-Chemsford Reforms in 1921. The Provincial Governments were authorised to raise loans for financing irrigation projects themselves instead of the Government of India doing it for them. This change coupled with the termination of the First World War in 1918 led to an increase in the tempo of construction of new irrigation projects not only in what was known as British India but also in some of the Princely States.

In 1935, the British Parliament passed the Government of India Act, according to which irrigation was a transferred subject transferred from the control of the Centre to that of the respective Provincial or state Governments due to which the concept of irrigation projects

and river valley developments being the responsibility of Central Government was lost. The Government of India was then no longer concerned with the development of irrigation except where disputes arose between neighbouring provinces.

During the British rule also, many structures were constructed to store and supply water for various needs. The policy then was to construct and operate such projects as financially viable ventures except for those specially considered as protective works for drought proofing. Administrative approvals and technical sanctions from competent authorities as per PWD procedures and specifications were followed for taking up any project. Detailed field investigations were carried out for many of the Water Resources Development projects with regard to foundation conditions, topography, soil conditions etc. These could be considered as the preliminary conditions needed to be satisfied before deciding the size of the project.

Prior to independence and also during the earlier part of the post-independence period, irrigation projects were generally planned on the basis of the financial returns they would give to the State. However, since 1966, the concept of the benefit/cost ratio based on the annual benefits and the annual costs to the community has been adopted for assessing the economic feasibility of irrigation projects.

3. LEGAL FRAME WORK RELATED TO DAM BUILDING

More than 4000 large dams have been built in the country since independence and the experience gained and lessons learnt have been tremendous. This has also brought out many important legal issues starting from the provisions in the Constitution to the inadequacies in the Central and State laws and the need for new laws. An appropriate legal framework is a necessary condition to establish institutions and arrangements for development and management and for resolution of disputes.

Under the Constitution of India which came into force in 1950, 'Water' is basically a State subject and the Union comes in only in the case of interstate river waters.

Entry 17, List II, i.e. State List in 7th Schedule of the Constitution states as follows :

"Water, that is to say water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provisions of Entry 56 of List I".

Entry 56 of List I (Union list) referred to above is as follows :

"Regulation and development of inter-state rivers and river valleys to the extent to which such regulation and development under the control of the Union, is declared by Parliament by law to be expedient in the public interest".

Under Article 262 of the Constitution, Parliament may, by law (1) provide for the adjudication on any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any inter-state river or river valley" and (2) "that neither the Supreme Court nor any other Court shall exercise jurisdiction in respect of any such dispute or complaint" as referred to in (1).

The recent 1992 amendments to the Constitution regarding Panchayats and Municipalities introduced the following entries in the schedules listing the subject – areas in which the State

Governments and legislatures may devolve functions to such bodies, so as to make them evolve as local self-governing institutions :

In the Eighth Schedule (Part IX) dealing with Panchayats, the subjects, "Minor Irrigation, water management and watershed development", "Drinking water" and "Maintenance of community assets" are listed.

In the Twelfth Schedule (Part IX A) dealing with municipalities, the subjects "Water supply of domestic, industrial and commercial purposes" is listed.

Functional responsibilities are thus visualised for local governments in respect of several aspects of water use.

The two laws enacted by the Union under Article 262 and Entry 56 of List I are the River Boards Act, 1956 and the Inter-state Water Disputes Act, 1956.

River Boards Act, 1956

Under Chapter I, para 2: "It is hereby declared that it is expedient in the public interest that the Central Government should take under its control the regulation and development of interstate rivers and river valleys to the extent hereinafter provided".

Under Chapter II, para 4(1) : "Provided that no such notification shall be issued except after consultation with the Governments interested with respect to the proposal to establish the Board, the persons to be appointed as members thereof and the functions which the Board may be empowered to perform".

Para 4(3) : "Every Board so established shall be a body corporate having perpetual succession and a common seal and shall by the said name sue and be sued."

Para 4(4) : "Every Board shall exercise its jurisdiction within such limits of the river (including its tributaries, if any) or river valley as may specified in the notification under sub section 1 and the area so specified shall be called the area of operation of the Board.

Para 5 (1) : defines the composition of the Board as follows –
"The Board shall consist of a Chairman and such other members as the Central Government thinks fit to appoint."

Para 10 : "Empowers the Board to appoint one or more advisory committee or committees for the purpose of enabling to carryout its functions under this Act."

Interstate Water Disputes Act. 1956

Interstate Water Disputes Act specifies a limited function covering only the adjudication of the disputes relating to the interstate rivers and river valleys and apportioning the waters. It is stated therein, that if it appears to the Government of any State that a water dispute with the Government of another State has arisen or is likely to arise by reason of the fact that the interests of the State or of any of the inhabitants thereof, in the waters of interstate river or river valley, have been or are likely to be, affected prejudicially by –

(a) any executive action or legislation taken or passed or proposed to be taken or passed by the other State; or

(b) the failure of the other State or any authority therein to exercise any of their powers with respect to the use, distribution or control of such waters ; or

(c) the failure of the other State to implement the terms of any agreement relating to the use, distribution or control of such waters,

the State Government may, in such form and manner as may be prescribed, request the Central Government to refer the water dispute to a Tribunal for adjudication.

When any request under section 3 is received from any State Government in respect of any water dispute and the Central Government is of opinion that the water dispute cannot be settled by negotiations, the Central Government shall, by notification in the Official Gazette constitute a Water Disputes Tribunal for the adjudication of the water dispute.

In recent years, since the constitution does not have an entry relating to 'Environment', using the residual powers, the Union has enacted laws on environment and control of pollution, which have effect on water use, including ground water and its exploitation. The Water Prevention and Control of Pollution Act 1974 is the first enactment by the parliament for prevention and control of water pollution and maintaining and restoring the wholesomeness of water. The Forest Conservation Act, 1980 provides for compensatory afforestation for the forest lands diverted for non forest use. Thereafter many Acts/Rules have come into force to protect the environment and to safeguard the interest of project affected families. These issues are further discussed under the relevant para 6.

India shares some of her river systems with her neighbours. In the international context emphasis is placed on bi-lateral co-operation on the basis of mutuality of interests and resolution of differences by negotiations. The guiding objective is the optimum development of the available resources on the basis of equitable sharing of their beneficial uses.

4. PROJECT PLANNING FEATURES

The development of river valley project, though capital intensive in nature has been considered as a vital component in national Five-Year Plans. In the beginning, several project proposals were considered, appraised and implemented in isolation without detailed consideration of long term overall development of water resources of the concerned river valley. However, the need for overall planning and development of river basins was soon realised and necessary checks were introduced in the Guidelines for preparation of Detailed Project Reports of Irrigation and Multipurpose Projects, published by Ministry of Water Resources (erstwhile Ministry of Irrigation), Government of India, in 1980:

Subsequently, separate reference on Guidelines for Preparation of River Basin Master Plans was published by Central Water Commission (CWC), Ministry of Water Resources, Government of India in 1990. Further Guidelines for Overall Planning of River Basins was also printed by Bureau of Indian Standards (IS:13028:1991) (BIS). Since every river basin has its own characteristics and its own developmental requirements, neither step-by-step approach for general planning is possible nor the same is desirable. Most development decisions are multi-objective in nature, involving physical, economic, social and environmental

inputs. The planner has to coordinate existing water resource developments, future requirements, aspiration of various stakeholders, items requiring immediate attention, meeting the long-term developmental plans, etc. Hence before implementing an individual project or proceeding for dam construction, the following aspects are reconsidered in detail after project specific detailed surveys, investigations and studies:

- The Project as an Integral Part of the Basin Plan
- Objectives and Priorities
- Alternative Options for Project Concepts, Size, Needs and Benefits
- Technical, Financial, Environmental Sustainability and Reliability
- Special Considerations for Geographical and Social Factors

In early fifties, Central Water and Power Commission (CW&PC), present CWC, framed its own checklist for appraisal of major and medium projects referred to Central Government for investment clearance. Planning Commission, based on the recommendations of its Technical Advisory Committee for Appraisal of river valley projects (TAC), also used to issue instructions to States from time to time during the latter part of the fifties to facilitate proper formulation of project reports. Thereafter, in the seventies, CWPC prepared the first set of guidelines for the formulation of project reports taking into account various. Standards brought out by then. These have been modified from time to time and have helped in adopting uniform standards and procedures for preparing project reports based on prescribed detailed investigations. The very fact that there has been no major failure reported when more than 4000 major dams were constructed in the last century and still operating successfully shows the soundness of the decision making procedures on dams evolved in the past.

It may, therefore, be seen that various guidelines have been issued and necessary parameters have been taken into account from time to time while deciding and thereafter, constructing the water resource projects. Master Plans have been prepared for most of the river basins in the country as per the guidelines. Water allocation/sharing among co-sharers of interstate basins has also been decided for some of the basins by Tribunal Decisions/Agreements etc.

5. PRESENT APPROACH TO PROJECT PREPARATION

Ministry of Water Resources (MOWR), Government of India has issued "Guidelines for preparation of Detailed Project Reports of Irrigation and Multipurpose Projects". As per the procedure prescribed, the concerned state Government, in the initial stage, will submit preliminary report covering survey and investigation, international/interstate aspects, hydrology, irrigation planning, environmental aspect, intended benefits, etc. which are required to establish soundness of the project proposal. The Detailed Project Report (DPR) will be prepared with up-to-date cost as per the procedure given in the relevant Standards and the Schedule of Rates as approved by the concerned States. The estimates thus prepared would also be checked and vetted in the Cost Appraisal Directorate of CWC. The surveys and investigations required for the purpose have been detailed in the "Guidelines" indicating the extent of surveys required for various purposes, the contour interval needed etc. based on the relevant standards prescribed by BIS. BIS have also prescribed the Standards for fluid flow measurement, Geological investigations and sub-surface explorations etc., which are to be

followed for the collection of data to prepare the requisite project reports. The designs for the various structures would be as per prescribed standards of BIS and procedures given by International Commission on Large Dams (ICOLD). Design floods, safety against earthquakes etc. would also be worked out as per these documents. In view of possible subjectivity in the assumptions regarding earthquake parameters for large dams, these are also reviewed by the National Committee set up for the purpose under the Chairmanship of Member (Designs & Research), CWC.

The project authority would also process and obtain clearances of the Ministry of Environment and Forests (MOEF) in respect of environmental impact assessment and forest areas being diverted. The steps to be taken in this regard are elaborated in para 6. If Scheduled Tribe population is diverted, the clearances of Resettlement and Rehabilitation (R&R) plans would be obtained from Ministry of Tribal Affairs. The DPR thus prepared would be examined in CWC. The CWC would finalise the cost, Benefit Cost Ratio (BC Ratio), Internal Rate of Return (IRR) etc. and State Government would obtain concurrence of State Finance Department for the finalised cost. The project proposal would be put up to the Advisory Committee with all needed clearances and concurrence of the State Government including confirmation regarding inclusion of the project in the current Five Year Plan. Once cleared by the Advisory Committee, investment clearance of Planning Commission would follow and work can be started without further delay.

The procedures followed are given in the chart at **Annex 5.1**. However, presently clearance from Central Agencies is not sought by the State Governments in regard to projects taken up for construction under their Non-Plan Funds.

6. ENVIRONMENTAL AND SOCIAL CONCERNS

Adequate provisions for protection of environment and forests are made in the Constitution of India. Article 47 provides for protection and improvement of health. Article 48A is directed towards protection and improvement of environment and protection of forest and wildlife. Article 51 (A) says it is the duty of every citizen to protect and improve natural environment. Following the UN Conference on Human Environment (Stockholm, 1972), a constitutional amendment (42, 1976) inserted relevant provisions for environment protection in Constitution in Part IV-Directive Principles and Part IV A- Fundamental Duties.

Environmental Acts

In order to ensure sustainable development from water resources angle the Government of India have enacted various Acts and Legislations. Prominent among these is the Environment (Protection) Act, 1986 through which the Government has acquired wide powers for protecting the environment. Some other Acts related to Water and Environment are Water (Prevention and Control of Pollution) Act, 1974 (amended in 1988), Water (Prevention and Control of Pollution) (Cess) Act. 1977 (amended in 1991), Forest Conservation Act, 1980, Environmental Impact Assessment (EIA) Notification of 1994 (amended in 1997) and the Ministry of Environment & Forest's Notification of Jan. 1997, constituting the Central Ground Water Authority (CGWA).

The Water (Prevention and Control of Pollution) Act, 1974 seeks to maintain or restore "wholesomeness of water" and the Central and state Pollution Control Boards have been

established under this Act. According to the Water Cess Act, 1997, both Central and State Governments have to provide funds to the Boards for implementing this act. The Forest Conservation Act, 1980 provides for compensatory afforestation to make up for the diversion of forestland to non-forest use. The Environment (Protection) Act, 1986 was enacted in 1986 for the protection and improvement of human environment. The EIA Notification of 1994 has made the environmental clearance mandatory for all new projects and expansion/ modernisation of existing projects covering 29 disciplines, which include hydropower, major irrigation and flood control projects. Its amendment in 1997 has made it mandatory to hold environmental public hearing before according environmental clearance.

Environmental Clearance of Projects

Before January, 1994, it was an administrative requirement for the mega projects to obtain environmental clearance from the MOEF, Govt. of India. However, in order to assess the impacts of the developmental projects/activities on the environment, MOEF issued a gazette notification on the EIA on January 27, 1994 (as amended on May 4, 1994) and made environmental clearance statutory for all the projects located in ecologically sensitive/fragile areas as notified by the Govt. of India from time to time, besides 29 categories of the projects as specified in the Schedule 1 of the notification. These also include water resources development (WRD) projects.

Requirements for environmental clearance

All the WRD projects viz. hydroelectric and irrigation projects including flood control have to obtain separate site as well as environmental clearance from the Govt. of India where the investment is Rs.50 crore or above (MOEF, 1994). This limit was later revised to Rs.100 crores (MOEF, 2002). All kinds of projects located in ecologically sensitive/fragile areas e.g. Doon Valley in Uttaranchal and Aravalli range in Rajasthan etc. as notified by the Govt. of India from time to time have to obtain environmental clearance compulsorily irrespective of the cost and whether they are listed in the schedule-I of the EIA notification or not. All the projects located in/near forests, wildlife sanctuaries, national parks, wetlands, mangroves, biosphere reserves, hill and mountain areas etc. also need environmental clearance.

Documents required with the project proposal

It is mandatory to submit the following documents along with project proposal before starting any activity at the project site :

(a) Environmental Appraisal Questionnaire as prescribed in the Schedule II of EIA notification

(b) Feasibility/Project Report

(c) EIA/Environmental Management Plan

(d) Site clearance

(e) Rehabilitation Plans, where large-scale displacement of people is anticipated.

Procedure for seeking environmental clearance

Any person who desires to establish a project of any category mentioned in Schedule-I shall submit an application to the Department of Environment/State Government dealing with the environment. The application shall be made in the proforma in Schedule-II.

All the 29 category of projects as mentioned in schedule-I of EIA Notification, 1994 including all the WRD projects have to go through the process of public hearing since April 10, 1997 (MOEF, 1997). Twenty sets of executive summary containing the salient features are to be submitted to the State Pollution Control Board (SPCB) both in English as well as local language. A notice for environmental public hearing is issued by the State Pollution Control Board in atleast two newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned. Date, time and place of public hearing shall be mentioned clearly by the State Pollution Control Board. Public can submit its suggestions, views, comments and objections within 30 days from the date of publication of the notification.

The participation in public hearing is open to the bonafide residents, environmental groups and others located at the project site/sites of displacement/sites likely to be affected. Written suggestions/representations can also be made by the public to the concerned State Pollution Control Board.

The composition of Public Hearing Panel consists of the following :

(i) District Collector or his nominee – Chairman.

(ii) Representative of the State Pollution Control Board.

(iii) Representative of the State Government dealing with the subject.

(iv) Representative of the Department of the State Government dealing with the environment.

(v) Not more than three representatives of the local bodies such as Municipalities or Panchayats.

(vi) Not more than three senior citizens of the area nominated by the District Collector.

The concerned person(s) are provided access to the Executive Summary of the project at the following places :

(i) District Collector's Office.

(ii) District Industry Centre.

(iii) Office of the Chief Executive Officers of the Zila Parishad or Commissioner of the Municipal Corporation/Local body as the case may be.

(iv) Head office of the concerned State Pollution Control Board and its concerned Regional Office.

(v) Department of the State Government dealing with the Environment.

Since WRD projects also require site-clearance, they have to apply for the site clearance also.

A decision regarding suitability of the proposed site is conveyed within 30 days. The said site clearance is granted for a sanctioned capacity and is valid for a period of five years for commencing the construction or operation.

The report submitted with the application is evaluated and assessed by the Impact Assessment Agency (IAA) and if deemed necessary it may consult a Committee of Experts (EC) having a composition as specified in Schedule-III. This Committee of Experts has full right of entry and inspection of the site at any time prior to, during or after the commencement of the operations relating to the project.

Based on the technical assessment of the documents and data furnished by the applicant supplemented by the data collected during site visits after interaction with affected population and environmental group, State Government prepares a set of recommendations. If necessary, summary of the reports, recommendations and conditions subject to which environmental clearance is given, is also made available to the concerned parties or environmental groups on request in public interest. Comments of the public may be solicited, if so decided by the Impact Assessment Agency within 30 days of the receipt of the proposal.

Environmental Safeguards/Conditions Stipulated for WRD Projects

Following are the general environmental safeguards /conditions stipulated by the Govt. of India for implementation by the project proponents for maintaining the environmental and ecological balance in the concerned area:

(i) Proper resettlement and rehabilitation of the project affected persons.

(ii) Free fuel supply to be provided to the labour force at the project cost.

(iii) Restoration of construction area to be ensured by levelling, filling of borrow pits and landscaping. Necessary soil conservation measures during construction of roads.

(iv) Afforestation/compensatory afforestation.

(v) Catchment area treatment as per the scheduled plan and completed before filling up the reservoir.

(vi) Adequate arrangement to prevent incidence of any endemic health problems due to water/soil-borne diseases.

(vii) A multidisciplinary Environmental Management Cell to be constituted by the State Govt. in consultation with the MOEF with inclusion of experts from the disciplines such as forestry, ecology, wildlife, social science, etc. to oversee the effective implementation of suggested environmental measures.

(viii) Adequate and separate budget for the environmental management.

Post-clearance monitoring

Six Regional Offices of the MOEF located at Lucknow, Chandigarh, Bhopal, Bhubaneshwar, Shillong and Bangalore have been assigned the job of post-clearance monitoring of all the cleared projects. All the recommendations/conditions stipulated by the Expert Committee (EC) have to be complied with by the project proponents. Submission of six monthly reports is mandatory after commissioning the project. Subject to the public interest, IAA can make "compliance report" available to the public. Cases of the non-compliance of the stipulated environmental conditions/recommendations of the cleared projects are brought to the notice

of Ministry of Environment & Forests and Central/State Pollution Control Boards, which initiate action against the project proponents under various legislations promulgated by the Govt. of India.

A National Level Environmental Monitoring Committee has also been constituted by the Union Ministry of Water Resources to oversee the implementation of the environmental safeguards. It is headed by the Member (Water Planning & Projects), CWC and comprises of members from the Ministries of Environment & Forests, Agriculture, Welfare and Water Resources, besides Planning Commission. It is assisted by State Level Environmental Monitoring Committees and Project Level Environmental Management Committees.

The following draft standards are under preparation by the Bureau of Indian Standards for assisting the concerned agencies and project proponents in preparation of Environmental Impact Assessment and Environmental Management Plans for Water Resources Projects.

i) Environment Impact Assessment of Water Resources Projects – Standardization of Parameters, Doc: WRD 24(329)

ii) Glossary of Technical Terms related to Environmental Impact. Doc: WRD 24(331)

iii) Environmental Management Plan for Water Resources Projects – Standardization of Parameters, Doc: WRD 24(330)

iv) Guidelines for Environmental Impact Assessment of Hydropower / River Valley Projects, Doc: WRD (332)

Further Studies

Of late, concerns have been expressed regarding green house gas (GHG) emissions from the reservoirs for want of proper clearance of the trees etc. in the submerged areas, as also the loss in absorption of CO_2 gases from the environment due to felling of trees in the project areas. It is argued that though compensatory afforestation is provided for, during the transition time before new forests come up, the CO_2 emissions would not be controlled. However, this contention ignores the fact that the irrigation area added due to the project and the greenery arising thereof, would certainly add substantially to the capacity of converting CO_2 into oxygen. Since in general, the irrigated area would be five to ten times larger than submerged area, this improvement would be substantial. In the case of hydroelectric projects, the alternative of fossil based thermal stations would have more GHG emissions than created by reservoir emissions. Hence such apprehensions may be unwarranted. However, studies need to be taken up to find out the extent of GHG emissions from reservoirs. Similarly studies are also required to be taken-up for assessing environmental impacts with and without the dams. Studies are also required to decide the minimum flow requirements to maintain the eco-system of the river channel.

Social concerns

For ensuring equity in water supply and for protecting the interests of the stakeholders, formation of Water Users' Association (WUA) is a must in the project command. Adequate representation of women, farm labourers and sharecroppers are being ensured in WUAs for this purpose. Many States have issued enabling laws in this regard.

Resettlement and rehabilitation procedures and their evolution

The construction of dams involves resettlement of project affected people (PAP) warranting their resettlement at some other sites. Early planners of India were well aware of the problems. Epigraphical report number 397 of 1909 mentions that whenever private lands were acquired for the construction of irrigation works, the owners were provided with other lands in compensation. The problem of resettling and safeguarding the interests of displaced persons continue to be considered even today. In fact most of the criticism that is being levelled against Government policies is not due to the faulty provisions in the policies but due to bad implementation of these policies. A perusal of the various rehabilitation problems that are encountered in different water resources projects prove the point. One of the first major resettlement operations is related to the evacuation of the Bilaspur town in Himachal Pradesh, which was submerged by the Bhakra dam reservoir. Seven thousand people of the town, who had modern amenities like college, hospital, markets and playgrounds were displaced. A new township was created on nearby high ground and displaced persons were given cash to build new houses. Today, the new Bilaspur is a flourishing town. For the displaced people at Ukai (Gujarat), new village sites have been provided with approach, internal roads, schools, wells, drainage, etc. Facilities have been given for seasonal cultivation and priorities were accorded in the jobs. Lift irrigation schemes and cooperative fishing were also introduced to help them.

Government of Andhra Pradesh formulated its resettlement policy in 1959, which was implemented at the time of construction of Nagarjuna Sagar project. About 5100 families were resettled in 34 newly established villages. The people were provided with free housing sites and the families who had been dependant on cultivation of land for their livelihood for at least 3 years were given 5 acres (2 ha.) of land free of cost. Liberal compensation, ex-gratia payment and various facilities were provided at the new sites. After the enactment of the Forest Conservation Act, 1980, by Government of India, the rehabilitation policy was further modified to include cash compensation along with civic amenities at new sites. This newly formulated policy was implemented at Lower Maneru and Srisailam Projects in A.P.

Maharashtra Resettlement Act, 1976, provides for many amenities to oustees which include providing free residential plots of size 370 sq.mt. to agriculturist families having less than 5 family members. Additional area of 185 sq.mt. for every three additional members subject to the ceiling of 740 sq.mt. is provided. To non agriculturist families with less than 5 family members a plot of 185 sq.m. is given. Additional 92.5 sq.m. for every three additional family members subject to a maximum of 370 sq.mts. is also given. Provision also exists for acquisition and reservation of 15% of command area for resettlement purposes. In the Bhima Project, assistance was given to more than 50% of the project affected people by providing lift irrigation facilities on the periphery of the newly created reservoir. The project authorities have started earmarking sufficient funds in the project proposals for rehabilitation programmes, which include providing cash grants, reservations in employment, training facilities, agricultural land, residential plots, colonies with schools, drinking water facilities, good roads, hospitals, etc. The matter of having a uniform rehabilitation policy applicable throughout the country is engaging the attention of Government of India.

Government of Karnataka have laid down detailed guidelines for the project affected persons. Each project had a Rehabilitation Committee to take care of the interests of the oustees. The Committee selected the sites for the rehabilitation centers and land in those areas were acquired under the Land Acquisition Act. Oustees were compensated for their houses and land lost in

submersion. All the infrastructure like schools, temples, mosques, community halls, wells etc. were provided. The oustees of Malaprabha project lost their fertile lands under submersion. Almost all of them were rehabilitated on the higher contour areas where eight number of lift irrigation schemes were provided.

For Sardar Sarovar Project, under construction in Narmada river basin, Narmada Water Disputes Tribunal has laid down very liberal guidelines for rehabilitation of project affected persons. These include provision of free residential sites in the rehabilitation colonies having modern civic and community facilities like hospitals, panchayat ghars, schools etc. Every displaced family from whom more than 25% of their land holdings is acquired would be offered irrigable land equivalent in area to the land acquired subject to prescribed ceiling in the State concerned and to a minimum of 2 hectares. Other measures proposed are cash grants, training facilities, employment opportunities, etc. Landless persons would be rehabilitated in agricultural or non- agricultural sector, as the case may be and would be entitled to a stable means of livelihood in accordance with the objective set forth.

National and provincial policies in regard to resettlement and rehabilitation

As indicated above, some of the State (Provincial) Governments in India have formulated their R&R (Resettlement and Rehabilitation) policies. Such policies have also been formulated for some individual water resources projects. Some organizations like power corporations have also formulated their own policies. However, the policies vary widely from State to State, from project to project and from authority to authority. No single, comprehensive, uniform common national policy has been adopted. In order to bring into existence a uniform policy, package and guidelines to provide the minimum basic resettlement and rehabilitation benefits to such vulnerable groups of citizens/ families, the Government of India has prepared a draft National Policy on Resettlement and Rehabilitation. The objectives of R & R measures as brought out in the draft document are as under:

a) To minimize displacement and to prevent state induced impoverishment of people on account of compulsory acquisition of land for the State, semi government or private interests.

b) To start at the earliest a regime of planned rehabilitation and resettlement for the displaced and adversely affected families:

c) To specify the categories of affected families who should be covered under the specific packages for resettlement and rehabilitation, to specify the benefits available under the packages for universal application throughout the country, to provide such minimum assistance, some of them being mandatory, to ensure that the most vulnerable group of citizens of our society get reasonable protection to their loss of productive assets and livelihood.

d) To enable affected communities to assess and react in an informed way about the stated public policy, and all other aspects of any project including ecological impact and the rehabilitation package.

e) To ensure specific attention to address the special needs of the displaced or adversely affected tribal families in the rehabilitation and resettlement measures.

f) To minimize the trauma of displacement on account of compulsory acquisition of land.

g) To provide for a standing organizational set up which provides for significant participation of community representatives selected by the affected people and in particular ensures the full participation of economically and socially disadvantaged people.

h) To provide for minimum basic amenities in the villages and colonies where the displaced families are resettled in large numbers; and

i) To get peaceful and quick physical possession of the acquired land for speedy implementation of public purpose schemes, developmental projects, setting up of essential industries, avoiding price escalation and enhancing the pace of economic development and growth process.

Special considerations for R&R related preferences of ethnic groups

Special attention has been paid to the resettlement and rehabilitation of ethnic groups such as tribal families in the above draft National Policy. Various measures suggested in this respect are as follows:

Prior to the acquisition of land for any project in any tribal area, an enquiry must be made by the competent Revenue authorities to determine whether any tribal lands have been transferred in violation of the Law on the subject. Social activists and prominent NGOs of the area should be associated with such enquiry. Urgent measures should be taken to cancel such transfers and restore the rights and title of the tribals on their alienated land, before acquisition proceedings are started so that the tribal families are not deprived of their legal rights for compensation, and thus benefits allotment of fresh land and such other related packages.

Measures should also be taken to record the rights of tribals in land previously allotted to them or under their possession. All forest lands under occupation of the tribal families since 24th October, 1980 or before this date shall be deemed to have been allotted or owned by the concerned tribal families, and while dispossessing them from such land such families shall be paid full compensation under Land Acquisition Acts. This will ensure that the compensation and rehabilitation package is made available to the tribals.

In the event of absence of reliable other data for evaluation of the land value in the tribal areas, the minimum land value to be provided for acquisition per acre of tribal land shall be not less than Rs.15,000/-.

In respect of a tribal landowner, provision of land for land is mandatory.

The resettlement site for displaced tribal families should be selected with great care and in consultation with their traditional/elected leaders or representatives of the displaced families and also with the project authorities as well as reputed voluntary organizations to ensure peaceful resettlement and harmonious living with the host communities. While selecting resettlement site it should also be seen that the tribal families are rehabilitated as close to their natural habitat as possible; they should also be provided with their traditional rights on minor forest produce and common property resources, if available, near to the new place of settlement; and in case any such family can continue their access or entry to such forest or common property in the area near to the place of eviction, they may continue to enjoy their earlier rights to the aforesaid sources of livelihood.

Efforts should be taken to ensure that all tribal families of the ousted villages are resettled together in a particular area, to the extent possible. In no case such tribal families be so segregated in providing settlement with house-sites, that they lose the contact within their linguistic group and ethnic group, unless any of such family had expressed his willingness/no objection in writing, to such segregated rehabilitation. For settlement of tribal families in a new locality, common property land for religious and community gathering should be allotted free of cost.

The displaced tribal families shall be compensated for loss of their customary rights/usage on forest produce in case the new site does not provide for such gathering of such forest produce. Such compensation should be calculated @ 10 times the minimum wages which a tribal family would have earned at the rates fixed by the respective State Governments during one single working season of 45 days i.e. equivalent to 450 days minimum agricultural wages.

In the case of Sardar Sarovar Project mentioned earlier and in some other projects, many tribal families have been affected and due care has been taken in their resettlement and rehabilitation.

Other Required Actions

While compensating land for land in the command area, two options are available for acquisition of land. The normal procedure is to acquire the land under the "Land Acquisition Act". However, though the land cost could be less, this is a time consuming procedure in view of the frequent litigations and subsequent intervention by Courts thereby delaying the whole exercise and hence the project itself. The other alternative is to acquire the land through negotiations with the owners. This is a faster, though costlier, procedure and there is also the possibility of complaints arising out of corrupt practices. Although this aspect will have to be specially taken care of and checked, the negotiations route would be both much faster and more satisfactory to the landholders and need to be followed as a routine, acquisition being used mainly as a deterrent.

In the implementation stage of R&R packages, small modifications may be required to meet the local situations. Some discretionary powers permitting small deviations from the packages may be allowed to the Site-in-Charge so as to better the R&R efforts. Grievance Redressal machinery chaired by a retired Judge of the High Court is also to be set up to ensure proper implementation. Appeals if any against their decision could be entertained by the State High Court. These provisions would ensure justice to the PAP.

Preservation of Historical, Archaeological & Cultural Monuments & Preservation of Heritage

There are no specific guidelines for preservation of historical and cultural monuments etc. However, specific guidelines in this regard would be included in draft Standards under preparation. Presently, due care is invariably taken for protection or restoration of such heritage while taking up a project. A few instances are given below.

Due to the construction of Nagarjunasagar dam in the state of Andhra Pradesh valuable historical monuments were to come under submergence. These were excavated well before impoundment and shifted to a museum on the top of a hill within the reservoir. Similarly a Dargah (place of worship for muslims) at Galiakot which would have come under submergence of Kadana reservoir on river Mahi in the state of Gujarat was protected from submergence

by construction of a ring bund (embankment). In the case of Sardar Sarovar Project, the Shool Paneshwar temple was relocated to a safer place. There are many other examples like Srisailam and Narayanpur reservoirs where historical monuments have been rehabilitated successfully. Thus the sites of historical and archaeological importance are protected by proper planning at the initial stages of a project.

7. FINANCIAL AND ECONOMIC CONSIDERATIONS

Before independence, the financial productivity test was the criterion for sanctioning of irrigation projects. The test of financial productivity being that the project should be able to show a certain percentage return on the sum-at-charge in the 10th year after its opening, the sum-at-charge being the capital cost plus the arrears of interest up to that year. The financial productivity test (to ensure 6% return) was rigidly applied to all irrigation projects upto 1949.

After independence, as irrigation was to be stepped up considerably, the return in the productivity test was reduced from 6 percent to 3.75 percent. Consequently, a large number of projects could be accepted for construction.

In 1958, the Planning Commission initiated studies of some of the major completed projects to assess the overall benefits and to find a better criterion for deciding whether various irrigation projects should be undertaken. These studies which were completed in 1961 showed that large benefits accrued from irrigation in terms of double cropping, diversification and better quality crops, higher yields, larger income and greater opportunities of employment. Indirect benefits that accrued were the establishment of processing industries, the expansion of consumer industries, retail trade, transport and communications. The total benefits from irrigation were far larger than the direct financial returns accruing to Government from irrigation rates. The Committee, therefore, recommended that in future, the benefit cost ratio should be used for assessing the feasibility of new projects instead of the traditional criterion of the direct financial return to Government. For simplicity, it was also considered that the indirect or secondary benefits need not be taken into account. The benefit was to be worked out as the difference between the value of the total annual agricultural production and the cost of cultivation before and after the introduction of irrigation. The cost should be taken to comprise the annual interest on capital, depreciation and expenditure on maintenance and operation.

In 1964, the "Committee to suggest Ways and Means of Improving the Financial Returns from Irrigation Projects" recommended that the economic benefit criterion should be adopted for sanctioning irrigation projects instead of the financial criterion. The Government accepted this recommendation and since then, the benefit cost ratio criterion has been adopted. The Irrigation Commission (1972) also observed that the economic benefit criterion is more suitable than the financial criterion. The application of the benefit-cost-ratio criterion has, however, undesirable effects. It minimizes the importance of securing adequate return from investments on irrigation projects. The Irrigation Commission, therefore, recommended that at the time of considering a project for acceptance, the financial return of the project should also be carefully examined. If the return does not cover working expenses and interest charges on capital, the impact of the project on the irrigation revenues of the state should be examined to see if an upward revision of the water rates in the states, would be necessary.

On the recommendation of the Working Group set up in 1977 to consider the issues covering returns from irrigation projects, a Committee under the Chairmanship of Shri. Nitin Desai

was constituted in December, 1981. In its report submitted in 1983, the Committee suggested a methodology consisting of opportunity cost, shadow pricing of inputs and outputs, foreign exchange etc. It also recommended for improvement of data base and method of cost benefit analysis of project and introduction of sensitivity analysis etc. The recommendations of Nitin Desai Committee Report were considered in a meeting of the Secretaries of State Irrigation Departments, representatives of the Planning Commission and CWC held under the Chairmanship of Secretary, MOWR, at New Delhi on 18.9.1986. It was suggested therein that in addition to B.C.Ratio on a single year basis, the project reports should also give Internal Rate of Return on a Discounted Cash Flow (DCF) basis spread over the life of the project without converting market prices into economic prices. Further, steps should be taken to proceed in stages towards a full scale social cost benefit analysis. The socio-economic cost benefits appraisal should take into account as many of the quantifiable costs and benefits as possible and should make an appraisal leading to internal rate of return calculated on a discounted cash flow basis without adjusting for economic efficiency prices of inputs and outputs.

At present, Internal Rate of Return is calculated on the basis of market prices without any adjustment for economic prices. This is because of non availability of national parameters for selection of economic prices. Calculation of IRR is undertaken to reflect the further cost involved in long gestation that takes place during the construction when only investments are made. Similarly irrigation development over large area is a slow process and projections of progress to assess flow of benefits and the stream of realizable benefits find place in the IRR analysis. The methodology used at present for calculation of the Benefit Cost Ratio is given at Annexure 7.1 and for calculation of IRR is given at Annexure 7.2

Economic analysis of power component of multi-purpose projects including pumped storage schemes are to be carried out as per guidelines of the Ministry of Energy/Central Electricity Authority.

A review of the Guidelines for the preparation of Detailed Project Reports of irrigation projects was taken up by a Working Group set up in CWC in 1999. This Working Group while updating the other details of the report also reviewed the existing practice for ascertaining economic viability of the projects and made further suggestions for incorporation in the Guidelines for working out the Benefit Cost Ratio and Internal Rate of Return.

The improvements necessary in the present procedure for economic analysis are given below:

1) Techno-Economic Analysis :
The techno-economic analysis needs to cover all technical options available for meeting the broad objectives envisaged. Presently, at best, only sizing options in regard to the project proposal are considered.

2) Costs and Benefits :
Presently, the annual cost at a given interest rate is compared with the annual benefit to ensure that the BC Ratio is more than the prescribed minimum. Complete stream of annual costs and annual benefits needs to be considered, both brought to the present value and then BC Ratio and IRR need to be calculated. The recommendations of the Nitin Desai Committee and the subsequent decisions of MOWR (1986) are in this direction and have to be acted upon.

3) Use of Opportunity Costs :
The goods and services, which are part of the project must be valued in terms of real costs incurred in supplying them or their value in other uses. Use of administered prices does not appear appropriate. Similarly, labour costs for unskilled labour, as dictated by minimum wages, are often much higher than the economic costs.

4) Cropping Pattern and Crop Yield :
The assumed cropping pattern needs to be justified with reference to not only technical factors but also the actual experience in a comparable area. Arbitrary provisions for high value crops need not be accepted unless they are fully justified.

A more systematic attempt to asses the impact of irrigation in different agro climatic zones in the country is also essential. The data on crop yield from agricultural research farms, farm –level demonstrations and field trials need to be used cautiously since they represent what could be attained under nearly ideal conditions. Assessment of crop yields in a realistic manner is absolutely necessary if the benefit cost analysis is to serve the desired purpose.

5) Indirect Benefits :
Indirect benefits accruing to the national economy as a result of the project, should be taken into account only when the benefits are suitably projected

6) Flood Control Benefits :
Presently the procedure adopted for working out BCR in the case of Flood Control Projects, has certain deficiencies since these are worked out only on the basis of past flood damages. An area with an endemic flood problem may have remained comparatively undeveloped, and consequently the past damages may have been low, although there may be a large scope for development if flood control is provided. "With and without" rather than "Before and After" needs to be the basis of assessment. Similarly, land erosion involves a perpetual loss of benefits and needs to be evaluated as such.

Allocation of cost

The allocated cost for each component of the Multipurpose Project is worked out as per IS 7560-1974. The cost of other components like water supply, road/railway bridge over the head-works shall be shared by the concerned Department on mutually agreed basis.

Water Pricing

The construction of major/medium irrigation projects is capital intensive. The projects give benefits to farmers in the form of supplying water for raising crops. In return, the farmers are charged for the water supplied to them. The water charges vary from State to State, project to project, and crop to crop. The rates vary widely for the same crop in the same state depending on irrigation season, type of system etc. There are no uniform set principles in fixing the water rates and a multiplicity of principles are followed such as recovery of cost of water, capacity of irrigators to pay based on gross irrigated area or net benefit of irrigation, type of crops, sources of water supply and its assurance, classification of land linked with land

revenue system and combination of various elements. Prior to independence, the irrigation projects were treated like any other commercial venture and irrigation rates charged were generally adequate to meet the working expenses and the interest on the capital invested. However, after independence, the irrigation projects were considered as a necessity for net addition of agricultural output to the economy and the methodology for deciding economic viability was shifted from Financial rate of return criteria to Benefit - Cost Ratio criteria. This, however had undesirable effect. The State Governments failed to enhance the water rates periodically, commensurate with the rising capital cost of the project and O&M needs. As a consequence there has been progressive deterioration in the return of irrigation projects imposing a growing burden on the general revenue of the States.

Keeping in view the deteriorating returns from irrigation project, it is felt that there is an urgent need for upward revision of the existing water rates. In case water rates are not revised upward, state will not be in a position to provide adequate allocation for maintenance and repairs of the project, which will be responsible for low, possibly deteriorating quality of services. Therefore, a revision in the level and structure of water rates is necessary in the interest of both efficiency and equity.

Accelerated Irrigation Benefit Programme (AIBP)

Some ameliorative measures have been taken up since 1996 to try to complete projects in advanced stages of construction by making additional funds available to them. The Accelerated Irrigation Benefit Programme (AIBP) was launched by the Government of India in 1996-97 as a central loan scheme on matching basis. Selected major and medium projects are financed under the programme since then.

Since 1999-2000, two major modifications have been made in the scheme. One is that the Central Loan Assistance should not be used to meet establishment costs and the other is that assistance would be given in the ratio of 2:1 (Centre : State) in the case of major states and 3:1 in the case of special category States and the KBK districts of Orissa. While this terminal project financing method has helped a few languishing projects towards completion, it makes only a modest addition in terms of the funds that are required by these projects.

Private Sector Participation

Under the planned regime, the expenditure on water resources projects from investigation stage to distribution stage is being incurred by the Government. Private sector and farmers' participation has been negligible.

In order to examine the feasibility of private sector participation in irrigation and multi-purpose projects a High Level Committee was constituted in the Ministry of Water Resources, under the Chairmanship of Union Minister of State for Water Resources in the year 1995. The Committee recommended introducing the concept on a pilot basis in respect of certain projects which did not have problems of inter-state issues, security etc. in specific regions. The concept could be extended to more and more projects on gaining experience. Such an investment could be thought of particularly in the case of ongoing projects, which were in advance stage of construction but were incomplete due to lack of funds. New projects could also be considered for private sector participation after due investigations and obtaining techno-economic, environmental including resettlement and rehabilitation and investment clearance.

It would be appropriate for the State Governments to examine in detail legal aspects contained in the Irrigation Acts before going for private sector participation. The Committee also recommended competitive bidding to ensure transparency and cost effectiveness. Other recommendations were as below :

- Cost recovery methods, water rates allowed and guarantees, if any, should be specified.
- Considerable improvements in the procedures for clearance of projects is called for and the procedures should be simplified as much as possible to promote private sector participation.
- Obligation of the government and the private sector should be clearly spelt out in the agreement. Provision should also be made for settlement of disputes and arbitration.
- Some incentives will have to be offered to the private sector including avenues to augment revenues. These could be in the form of tax holidays, floating tax free revenue bonds, loans at concessional rates including moratorium on repayment etc.
- Framing of a definite policy and its adoption by the National Water Resources Council may be essential for implementing this concept. A well prepared publicity campaign will be required for wider participation and its eventual success
- Various combinations of building, owning (of structures etc), operating, leasing and transferring may have to be considered. The exact type may be decided by the States as considered appropriate by them. The main objective should be oriented towards finding ways and means that are more efficient, responsible and environment friendly for development and optimum utilization of country's available water resources.

Some initiatives in respect of private sector participation have already been taken in the States of Andhra Pradesh, Karnataka. Madhya Pradesh, Maharashtra & Orissa, but the results are yet to be evaluated. Private sector participation would be forthcoming only if private sector is confident of getting adequate returns from its investment in irrigation. This, in turn, would require realization of adequate revenue from users of irrigation water, which is not the case now. As of now, private sector participation could be significant in projects mainly intended for supply to the industrial use and urban water supply (in some cases) and for these components in other projects.

8. FINDINGS & SUGGESTIONS

Findings about decision-making process

The Indian decision making processes have evolved over time, as the water related concerns grew and as the institutional and legal frame work evolved into the present complex structure.

At present, various decision making process are already in place.

The planning and designing of dams is guided by a large number of national and agency standards to ensure that the investigations are fairly detailed and all reasonable contingencies of loadings, hydrological events, seismic events etc are considered, For, seismic factors, in particular, a National Committee is in place to guide the decisions.

The planning, appraisal and approval process involves the State Government Departments and other implementing agencies, the Central Ministries as also the Planning Commission. Guidelines regarding preparation of projects are already in place. The technical aspects of major projects are looked into by experts in the appraisal agencies like the Central Water Commission. The standards for techno-economic viability are laid down, and such a viability is ensured by an inter disciplinary team.

The environment related concerns are addressed through public hearings in the project area, as also through the State Pollution Control Board and the State Forest Department. The Ministry of Environment & Forests at the Centre is required to consider the Environment Impact Assessment (EIA) study, and is advised by an External Committee of Experts. Only after their satisfaction about the environmental impacts and the mitigative measures, the clearance, as required under the law, is issued.

The likely displacement which the tribal population may be subjected to, are especially addressed by the Ministry of Tribal Affairs (MOTA).

The Technical Advisory Committee (TAC) under the Ministry of Water Resources gives the final clearance after a review of the techno economic appraisals, the EIA study, the views of the Ministry of Tribal Affairs etc. Even after their being satisfied about these, and after their clearance, a separate investment clearance from the Planning Commission is required.

The Planning Commission ensures that the projects as cleared by all the agencies and finally by the Technical Advisory Committee, can be implemented within the available development finance. It also reviews the priority of the project in the national context and issues the investment clearance.

Suggestions for Improvement

Although various procedures for decision making are well laid down, the present study has brought out the need and desirability of some improvements. These have been discussed in the text and are abstracted below.

1) The complex process of techno economic approval after examination by Central Agencies and Planning Commission applies only to plan projects. Even here, it is a procedural requirement for obtaining the plan finance and not a legal requirement. Non plan projects, it appears, can be implemented without going through this process although such instances are very rare. There seems to be need to bring all water projects under this process of TAC clearance possibly through legislative measures.

2) Although Dam Safety procedures are in place, there is no dam safety legislation. Since, in future, dam ownership may be diversified, such legislation may become necessary.

3) At present, detailed documentation of examination of options is not given in the feasibility report /DPR. A detailed chapter analysing the available options, not involving large dams, to meet the overall objectives and aspirations , could preferably be included in the DPR of future dam projects.

4) Faster land acquisition procedures based more largely on negotiated settlements for increased satisfaction may have to be practiced.

5) R&R polices need to be documented in broad national guidelines and more detailed state guidelines. These guidelines, inter-alia, need to provide for a machinery for continuous monitoring of R&R and for quick quasi judicial settlement of grievances, by making small adjustments in the package to suit local conditions.

6) The productivity (yields) of irrigated crop as assumed in the economic analysis often seem to be optimistic and are not based on the experience of nearby irrigation projects. It appears necessary to lay down guidelines or standardised procedures to project the yield from the available experience, even while allowing projections of managerial improvements in the "with project" situation.

7) The projects need to consider conjunctive use as an integral part of the irrigation plan, even though the actual implementation of the ground water component including investments could be by the farmers. The economic analysis needs to consider all such investments in public and private domains, and all benefits.

8) As stated, costs to all and benefits to all, need to be considered in the economic analysis. The benefit cost procedures need to consider the complete stream of annual costs and benefits. The recommendations of the Desai Committee need to be acted upon.

9) All goods and services which are part of the project need to be valued in terms of real economic costs, rather than at costs dictated by administered prices. Evaluation of labour costs also at the real economic costs, rather than the higher administered wages, is necessary.

10) Cropping patterns projected in the project need to consider the experience in the comparable neighboring areas

11) Indirect benefits accruing to the economy need to be evaluated and considered.

12) The benefit cost analysis procedures for flood control and erosion control projects need considerable improvements. The present procedures seem to be based on the "before and after" principle, where as the "with and without" principle needs to be followed. The loss of an opportunity of development to an are a affected due to floods is not reflected in the present procedures. Similarly the perpetual loss of land and its productivity needs to be reflected in the procedure for analysing erosion control projects.

13) A review of decision-making processes may become necessary if the private sector investments in water development projects become routine.

14) Various further studies in regard to environmental impacts are necessary and have been indicated in the text.

* * * * *

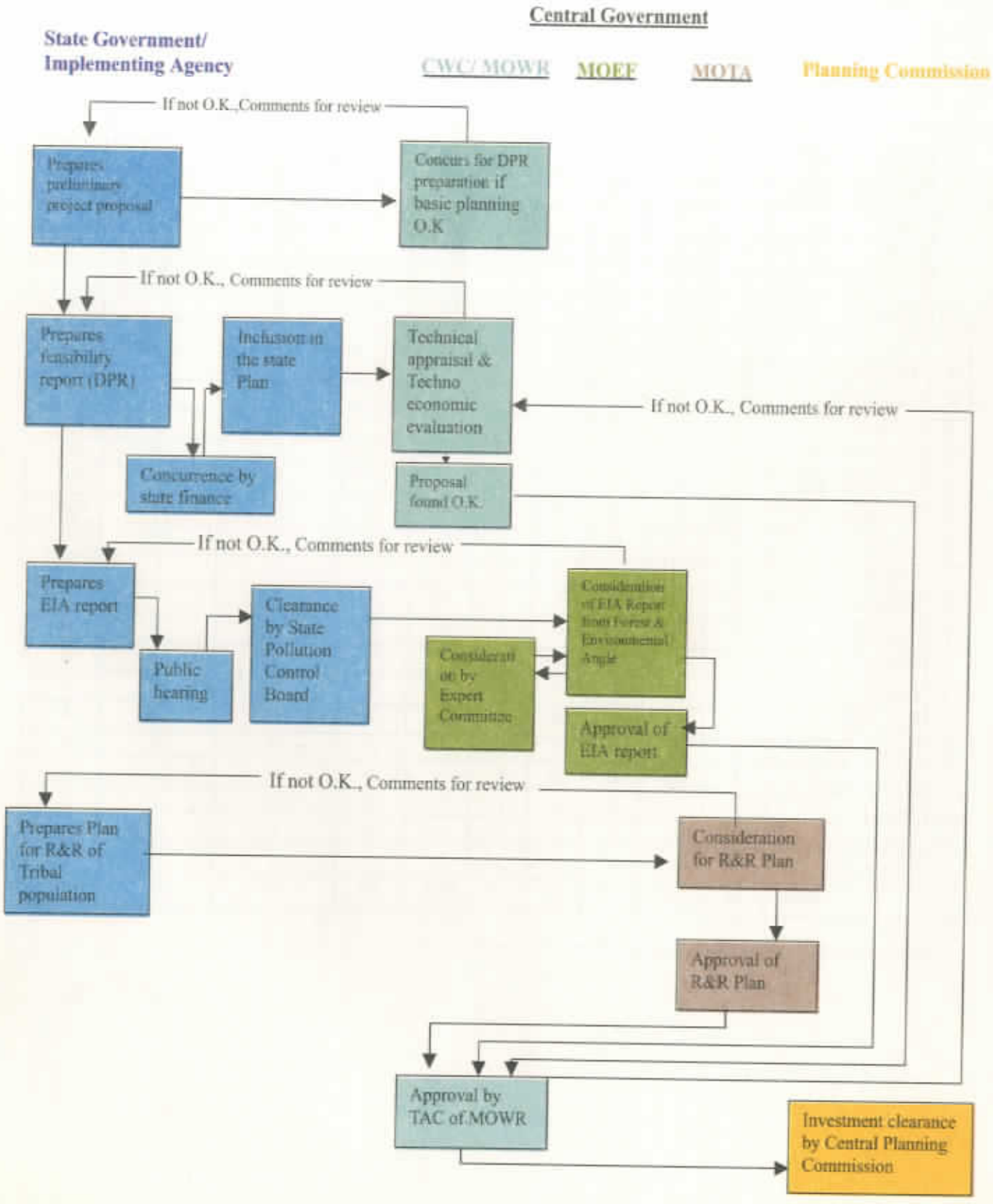
Annexure–1.1

STATEWISE DETAILS OF DAMS EXISTING AND UNDER CONSTRUCTION

Sl. no	State/U.T	Number of Dams Completed During the Period								*Dams* Under Construction	Total
		Upto 1900	1901 to 1950	1951 to 1960	1961 to 1970	1971 to 1980	1981 to 1989	1990 & After	Year of Construction not available		
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	2.
1.	Andhra Pradesh	3	24	16	20	18	18	2	57	26	184
2.	Arunachal Pradesh	0	0	0	0	0	0	0	0	1	1
3.	Assam	0	0	0	0	0	2	0	0	1	3
4.	Bihar	1	0	12	6	14	23	0	5	33	94
5.	Goa	0	0	0	0	1	4	0	0	2	7
6.	Gujarat	5	47	60	76	133	131	8	6	71	537
7.	Haryana	0	0	0	0	0	0	0	0	0	0
8.	Himachal Pradesh	0	0	0	1	2	1	0	0	1	5
9.	Jammu & Kashmir	0	0	0	0	2	2	0	3	2	9
10	Karnataka	6	16	11	35	45	40	0	35	28	216
11	Kerala	0	1	4	16	7	5	0	5	16	54
12	Madhya Pradesh	1	86	39	81	256	397	77	9	147	1093
13	Maharashtra	16	35	25	146	589	324	10	84	300	1529
14	Manipur	0	0	0	0	1	0	0	1	3	5
15	Meghalaya	0	0	1	3	2	0	0	0	1	7
16	Mizoram	0	0	0	0	0	0	0	0	0	0
17	Nagaland	0	0	0	0	0	0	0	0	0	0
18	Orissa	0	2	3	5	48	72	0	1	18	149
19	Punjab	0	0	1	0	0	0	0	0	1	2
20	Rajasthan	5	5	30	19	20	16	0	27	4	126
21	Sikkim	0	0	0	9	0	0	0	0	0	0
22	Tamil Nadu	1	10	10	24	27	9	0	3	13	97
23	Tripura	0	0	0	0	1	0	0	0	0	1
24	Uttar Pradesh	4	25	21	28	19	12	14	0	22	145
25	West Bengal	0	0	1	1	5	10	5	0	5	27
	Total	42	251	234	461	1190	1066	116	236	695	4291

Source :- Dam Safety Directorate, Central Water Commission

Submission, Appraisal & Clearance of Major Irrigation and Multipurpose Project Proposal on Inter State Rivers



Annexure - 7.1
Total cost:
CCA:

PROFORMA FOR THE CALCULATION OF BENEFIT COST RATIO (BCR)
.....Project

(Rs. In lakhs)

				Without project	With project
A.	**GROSS RECEIPTS**				
1.	Gross value of farm produce				
2.	Dung receipts (as 30% of fodder expenditure)				
3.	Total (A) : Gross Receipts (1+2)				
B.	**EXPENSES**				
1.	Expenditure on seeds				
2.	Expenditure on manure etc.				
3.	Expenditure on hired labour (human and bullock)				
		Without Project	With Project		
4.	Fodder expenses	15% of item A.1	10% of item A.1		
5.	Depreciation on implements	2.7% of item A.1	2.7% of item A.1		
6.	Share and Cash Rent	5% of item A.1	3% of item A.1		
7.	Land Revenue	2% of item A.1	2% of item A.1		
8.	Total (B) : Expenses (1to 7)				
C.	**NET VALUE OF PRODUCE**				
1.	Total Gross receipts (Total A3)				
2.	Minus total expenses (Total B6)				
3.	Net value of produce (C) : (1-2)				
D.	**ANNUAL AGRICULTURAL BENEFITS :**				
1.	Net value after irrigation (C.3)				
2.	Net Value before irrigation (C.3)				
3.	Net Annual Benefits (D) : (1-2)				
E.	Other net annual benefits due to aqua-culture including pisciculture, drinking & industrial water supply, hydro-power generation, animal husbandry, catchment area treatment chargeable to project, canal bank plantation, reservoir periphery aforestation etc.				
F.	**TOTAL NET ANNUAL BENEFITS (D3+E)**				
G.	**ANNUAL COSTS :**				
1.	Interest on capital @ 10% (Estimated total cost of the project including cost of land development @ Rs. .....per ha.)				
2.	Depreciation of the project @ 1% of the cost of project for 100 years life of the project and @ 2% for 50 years life of the project.				
3.	Annual operation and maintenance charges @ Rs..... Per ha. of CCA 264310.				
4.	Maintenance of the head works @ 1% of its cost.				
5.	Depreciation of the pumping system @ 8.33% of the estimated cost of the pumping system assuming life of the system as 12 years (Applicable to lift irrigation)				
6.	Depreciation of the rising mains @ 3.33% of the estimated cost of the pumping system assuming life of the system as 30 years.				
7.	Power charges for lift irrigation @ Rs..... per ha. (Applicable to lift irrigation) :				
8.	Total (G) : Annual Costs (1to7)				
	BENEFIT COST RATIO : F: Annual Benefits / G8 : Annual Costs				

PROFORMA FOR CALCULATION OF INTERNAL RATE OF RETURN

.....Project

Total cost of the Project :

CCA :

Annual Benefits :

Rs. In lakhs

Sl. No.	Year	Project Cost Expenditure	CCA Developed		O&M Cost @Rs..... per ha	Total Cost (Col.3+Col.6)	Benefits	Net Cash Flow (Col.8-Col.7)	Net Present Benefits (Discount Factor (12%)
			% age	Area in ha					
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

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