

Task Force (TF 5)
**APPROPRIATE DECISION MAKING
PROCEDURES FOR NEW DAMS**
particularly for Irrigation, Drainage and Flood Management

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**INTERNATIONAL COMMISSION ON
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Procedures for New Dams**
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Background

In pursuance of the decision taken during the 52nd meeting of the International Executive Council of ICID in Seoul, Korea held on 21st September 2001, a “Task Force (TF5) for Promoting Appropriate Decision Making Procedures for New Dams, particularly for Irrigation, Drainage and Flood Management” was constituted on 16th November 2001. The Task Force comprised members essentially from the ICID National Committees of the countries where a number of large dams are yet to be constructed, representatives of the ICID Working Groups, and stakeholder International Organizations concerned with large dams such as ICOLD, IHA and IWRA.

The main Terms of Reference (ToR) of the Task Force 5 (TF5) were -

- 1 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.
- 2 To analyze the collected information and attempt general guidelines/proposals where necessary, with the help of related work bodies of ICID.

The members of the Task Force were requested to send relevant information relating to the decision making procedures followed in their countries along with any other information that could be useful for preparation of the report. They were also requested to consider constituting shadow sub-committees to collect relevant information on lines it was done by the Indian National Committee (INCID). A draft outline of the inputs expected from different countries was also sent to the members for facilitating collection of the requisite information from them. Responses were received from National Committees of Australia, China, India, Iran, Indonesia, Japan, Mexico and Spain.

The first meeting of the Task Force was held in Montreal, Canada on 22nd July 2002. The meeting was attended by the members from Iran, Indonesia, USA, UK, and representatives from Australia, Brazil, Canada, China, Japan, Korea, Spain, and Turkey. During the meeting, the ToR was discussed along with the program of work for completing the report after the responses from other countries were received. Valuable suggestions were offered by the members and participants. Based on the inputs received, an overview of the status of development and procedures followed in different countries was made and an interim draft report on “appropriate procedures to be followed for new dams in future” was prepared. This report was presented at the ICID Session on “Water for Food and Rural Development” during Third World Water Forum at Kyoto, Japan on 19th March 2003. Thereafter the draft report was presented at the second meeting of the TF on 15th September 2003 during the 54th IEC in Montpellier, France. Incorporating certain observations and suggestions received from members, the report was further updated and modified for presentation at Moscow meeting of the TF. It was decided at the meeting that the report be given final shape before the 55th IEC meeting in September 2004 in Moscow where it would be presented at the 3rd meeting of TF on 06 September 2004 and a decision will be taken whether to conclude the TF.

1.0 HISTORY OF DAM BUILDING AND DECISION MAKING PROCEDURES

- 1.1 Dams and embankments across rivers and streams have been built since times immemorial. These primarily created storage facility in the form of ponds or lakes to meet the water requirements of local communities for various purposes. With the growth of population and civilization, the demand for water increased for domestic use, industries and agriculture, requiring dams of larger heights and storage capacities. Remnants of fairly large sized dams built 2000 to 5000 years ago have been found in countries of ancient civilizations, such as China, India, Egypt and Iran. A number of dams constructed 500 to 1000 years back are still giving useful service to the communities in these countries.
- 1.2 With the advancement in science and technology, better knowledge of laws of mechanics and new construction materials like cement, the real impetus to dam building came during nineteenth and twentieth century. Multiple benefits of creating large storages were realized during this period. The increase in productivity due to irrigated agriculture, assured water supply for domestic and industrial use, fisheries, recreation, generation of hydropower, navigation and flood control made dam building a very attractive proposition for economic growth, prosperity and social services. However, since it required intervention in the natural flow of a river, submergence of land, displacement of people and capital investment, the decision to undertake such a venture vested with the ruler of the territory or the Government. The experts, advisers and ministers played a key role in formulating the dam proposals, and recommending these to the Head of State for a final decision. After a decision to build the dam was taken by the competent authority, the implementation was done by the concerned agencies in accordance with the orders and there was little opposition from any quarters. It was well-recognized that the project was taken up for the benefit of society at large.
- 1.3 During pre-1950 period, construction of large dams became an essential part of development in USA, Canada, Europe, former Soviet Union, Japan and Australia to meet the growing demand of energy and water supply to keep pace with the demands of Industrial Revolution and increasing urban population. The Bureau of Reclamation and the Corps of Engineers of the United States developed expertise in design and construction of dams, besides France and erstwhile USSR etc. By 1975, USA, Canada, Australia and Western Europe had completed most of their storage dams for producing hydro-power, providing water supply, flood control and irrigation development. On the other hand, most of the countries in Asia, Africa and South America were under colonial rule during this period and little development took place in these countries by way of construction of dams for energy and irrigated agriculture. It was only around 1950 that many countries in Asia and Africa gained independence and embarked upon the program of economic development to improve their standard of living. Realizing the major contributions made by dams in USA and Europe, the leaders of these newly independent countries gave top priority to the construction of dams which became a symbol of national pride. This triggered industrial growth and green revolution in the areas benefited by dams like Aswan in Egypt and Bhakra-Beas in India. During the sixties and seventies, a number of multipurpose projects were constructed resulting in rapid economic growth and self-reliance in food and fiber in several countries.
- 1.4 It is estimated that there were some 800,000 dams in the world by 1997, of which more than 45,000 were large dams. As per ICOLD (2001), based on number of large dams registered, USA tops the list with 6411 dams followed by India (4079 dams), China (2211 dams), Spain (1187 dams), Japan (1165 dams), Korea (804 dams) and Canada (793 dams). It is believed that the actual number of dams is much larger than the number of dams registered. For example, about 26000 large dams in China, 2738 large dams in Japan, and about 940 dams in Canada are said to be existing (World Atlas and Industry Guide 2004 of International Journal of Hydropower and Dams). The total design storage capacity of world's large dams is about 6000 cu km. Most of these dams have been constructed for irrigation, flood control, hydropower generation, and water supply purposes. Practically, most of the dams are multipurpose, catering to more than one

function. From the number of dams constructed in various countries it is seen that Africa, where most of the water scarce countries are located, only 5% of the dams have been constructed. The dams constructed in some of the developing countries of Asia since 1950 are helping in alleviating water scarcity problem and contributing to socio-economic development. Most of the new dams being constructed are again multipurpose. For example in India the main purpose for construction of dams is irrigation, hydropower generation and water supply, while they meet other necessities also. The Chinese dams under construction are essentially for flood control, irrigation and hydropower generation (including pumped storage), while in Turkey the dams are being constructed for irrigation, hydropower generation and water supply. In Japan mostly the dams are for flood control purposes, whereas in South Korea the purpose of dam construction is irrigation, hydropower generation, flood management and water supply.

- 1.5 In 1970, the National Environmental Protection Act (NEPA) was enacted by the United States making Environmental Impact Assessment (EIA) of river valley projects mandatory. Following the United Nations Stockholm Conference on Human Environment, there has been a greater concern for the adverse impacts on environment due to various development projects including dam building and resulting submergence. Since then most of the developed and developing countries in the third world have also established Environmental Protection Agencies and separate ministries for environment and ecology. Stringent laws for protection of environment and ecology have been enacted. The new dams are now subjected to Environment Impact Assessments in almost all the countries and necessary safeguards are an essential part of decision making processes.
- 1.6 The decision-making procedures for newly proposed dams more or less remain similar in most of the countries even now with Government agencies playing the key role. However considerable attention is now paid to the environmental and ecological considerations. Most of the countries have developed procedures, guidelines and standards in this respect.

2.0 NATIONAL STRATEGIES

- 2.1 The strategy for water resources development (WRD) of a country is influenced by several factors. These include geographical location, climate, population, economic condition, available arable land and status of agriculture, availability of other natural resources, especially oil and gas, available development alternatives, and above all, the availability of water resources, their spatial and temporal distribution and status of development.
- 2.2 For developing countries like India, China, Indonesia, Nepal where abundant water resources potential for irrigation and hydropower is available and the population largely depends on agriculture, the strategy normally provides for a planned development of water resources for hydro-power and irrigation so as to reduce their dependence on import of oil to meet their energy requirements and achieve/sustain food security for the fast growing population. Such countries may have different economic conditions to embark upon large scale water resources infrastructure projects. Depending upon the prevailing situation, the countries mobilize their limited financial resources and accord high priority for early completion of large dams for water resources development including hydro-power generation.
- 2.3 Some countries with abundant water resources as well as oil and gas resources have a different strategy. Countries like Iran, Iraq, Turkey, Mexico, Columbia, Brazil, Argentina would be keen to develop their renewable water resources potential for hydropower, irrigation, water supply and recreation or a combination of them depending upon the demand, financial resources at their disposal and the status of development already attained. Such countries may, however, not face any problem in economic development if the program of their WRD is altered or delayed, since the oil and gas resources can make up for any variation in economic growth due to change in WRD program.

- 2.4 In countries which have abundant oil and gas reserves and have small population with high per capita income, the strategy for WRD, construction of dams and consequent formation of lakes would be primarily for improvement of environment by extension of green cover, gardens, parks, water sports, and recreation, besides water supply and hydropower generation to the extent such potential is available and techno-economically viable. With enough buying capacity available on account of higher economic level, many countries may not need storages for food production, but import food (‘virtual water’). In many cases, the arid and semi arid climate and scarcity of fresh water resources make it necessary to convert saline sea water to sweet water by desalinization. Many of the oil rich countries of Middle East may come under this category.
- 2.5 The strategies for WRD through new dams may not be presently relevant to the advanced countries also, where more than 80% of the hydropower and irrigation potential has already been developed and most of the dam building activity is over. Some of these countries do not need storage for irrigation as they receive intermittent rainfall throughout the year and heavy snowfall in winter, which act as a natural reservoir and compensate for artificial storage. Their strategy will mainly focus on improvement and modernization of existing facilities, improving the efficiency and saving water using modern technology. As of 2004, Italy, Spain, Romania, Macedonia etc. still have quite a few dams under construction and they have adopted an appropriate strategy and decision making mechanism to implement their programs in a regulated manner.

3.0 LEGAL FRAMEWORK AND INSTITUTIONAL SETUP

- 3.1 It may be required to improve the existing legal framework and institutional setup for development and management of water resources and for resolving inter-state, trans-boundary and inter-sectoral problems. Construction of storage dams on an interstate and international river is likely to affect the natural flow regime which may have positive or negative impacts on the interests of the other co-basin states. For example, construction of dam by an upper riparian state may reduce the flow in the river which may affect adversely the existing storages in a lower riparian state while in some other cases a reduction of flows in the flood season may be beneficial due to reduction of damage due to floods. Also, in yet another case, storage in the upper riparian state may prove to be beneficial for the lower riparian state which may receive regulated discharges even in the low-flow season.
- 3.2 The legal and institutional framework should be such that approval of a project could be controlled by the federal agency or basin authority which may regulate the development of the basin according to an approved master plan of the basin, keep water account of the whole basin and take care of the interests of all co-basin states. There should also be agreements amongst co-basin states with regard to sharing of waters and minimum flows in the lean season, to avoid any future conflicts.
- 3.3 For any large basin or sub-basin, a master plan for development giving details of all the projects according to water allocated to various states would greatly help in smooth implementation of schemes and their operation. The federal government or basin authority should have a decisive role in the allocation of water according to reasonable needs of a co-basin state and preparation of an acceptable master plan. For this purpose, the legal power for regulation and development of an inter-state river should preferably be held by federal government/basin authority. Once the share of a co-basin state is decided/allocated, the state can be authorized to develop projects within the allocated share. A monitoring and regulating institutional mechanism would have to ensure that each co-basin state utilizes its allocated share, while ensuring water rights, shares and environmental considerations towards water quality and ecosystem aspects of lower riparians.
- 3.4 Within the state, a multipurpose dam will have its storage allocated to different water use sectors like irrigation, hydropower, and water-supply for municipal, industrial and

environmental purposes. For efficient management, the institution in charge of water resources in the state would have to cater to the needs of all water use sectors and ensure availability of raw water from the storage to various sectors in accordance with the pre-determined plan of operation. Prioritization of national needs is helpful in efficient management of water resources. For example in India, the drinking water supply is accorded top priority in the National Water Policy. Therefore in deficit years when the availability of water is less than normal, the inter-sectoral priority has to be adhered to and reduction in supply should be in the sectors of low priority.

- 3.5 Existing laws relating to Land Acquisition, Rehabilitation & Resettlement, Environmental Protection and Forest Conservation may have to be reviewed and suitably amended to facilitate smooth implementation of a water resources project, after the government has accorded approval. The stakeholder institutions and NGOs should be fully involved in implementation of environmental safeguards, compensatory afforestation and rehabilitation and resettlement of the affected people. NGOs of the affected areas should be involved in these programs along with the implementing agencies to ensure transparency and social justice. Sensitivity to social concerns with particular reference to indigenous people of the affected area needs to be maintained. In Indonesia, water resources and dam development is based on seven core values – harmony, public benefit, sustainability, equity, integration to master plan, transparency and accountability. National policies are comprehensive within an integrated framework of decision-making procedures and cover governance based on democracy and human rights.

4.0 OVERVIEW OF DECISION MAKING PROCEDURES

- 4.1 The elaborate procedures of decision making followed in Japan, India and Iran are given in the flow charts at **Annexes 1, 2 (Japan), 3 (India), 4 & 5 (Iran)**. The decision making procedures in **Spain** and **Indonesia** are outlined in **Annex 6 and 7** respectively.

The procedures for review and approvals for dams in some selected countries are given below -

AUSTRALIA

Most of the available water resources in the populated and productive regions of Australia have been developed. Murray Darling Basin limits water usage to 1994 levels. This effectively prohibits construction of new dams in this region without a compensatory return of water to the river. The current climate, particularly in South East Australia, is more focused on water conservation and environmental flows with considerable funds allocated by State and Federal Govts. to save water from traditional usage and return to the natural river systems. The techno-economic viability of a dam project requires an assessment of project benefits and viability and financing options. The environmental impact assessment is required under State Legislation. Most evaluations are project based, although overarching processes such as COAG (Council of Australian Governments Water Resource Policy), 1994 set out reforms in the allocation, administration and management of water resources in Australia. There are separate guidelines on the environmental management of dams by Australian National Committee on Large Dams (ANCOLD) and also Commonwealth legislation with Environment Protection and Biodiversity Control Act, which deals with any major project including dams. ANCOLD guidelines include recommendations for options assessment, stakeholder involvement, realistic economic assessment, involuntary resettlement and post construction reviews.

AUSTRALIA

- The environmental framework is well developed over last 30 years.
- Rigorous water allocation policies, including allocations of environmental flow, exist.
- Communication is held with local people for new programs and refurbishment schemes.
- State legislation requires EIA studies.
- Guidelines for environmental management of dams are available.

CHINA

History of construction of earth dams to retain water goes back to 5000 years in China. Dujiangyan project constructed in as far back as 251 B.C. is still providing large benefits in flood control and irrigation. According to ICOLD, there were 22 large dams in 1950, however due to rapid progress since 1949, now more than 26,000 large dams (of more than 15 m height) exist. About 95 major dams varying in height from 60 m to 292 m for different purposes are presently (2004) under construction. About 23% of total hydro-power potential has been developed so far, with installed capacity of hydel stations, as of 2003, of more than 82500 MW. It may be mentioned that about 18% of irrigation in China takes place from groundwater, requiring energy.

Safe Management of Dams is ensured by Design and Construction, Operation Departments according to States and Professional standards. Environmental Protection of Water Resources and Hydropower Projects is ensured as per rules and regulations issued since 1979 by various state agencies. Resettlement of people affected because of reservoirs is done as per specific rules and regulations issued by the State Council since 1981 and standards issued by the Ministry of Water and Power with responsibility of implementation entrusted to local governments. Program of Water Resources and Hydropower Projects is formulated by concerned departments and ministries. Comprehensive Benefits of Water Resources Projects have accrued, which include – gigantic social, economic and environmental benefits in flood control, water supply, irrigation, power generation, aquaculture, environmental improvement and tourism development. 80% of the total reservoirs are used for irrigation which is practiced in only 35% of the total area. Out of about 95 large dams under construction in China, 60 dams are for irrigation and flood control purposes.

Project Proposal Report which is based on long-term planning for national economy and social development, comprehensive planning for river basin and comprehensive planning for regions according to relevant national policies is submitted to the competent authority as stipulated by the State for approval and made public after the Government approval. Feasibility Study Report for a project is compiled as per the regulations issued by the Ministry of Electric Power and Ministry of Water Resources and is submitted for examination to the higher level for approval within the limits of authority stipulated by the State. Subsequent stages of design, construction, completion, check, acceptance and post assessment are implemented by the concerned agencies and departments of the State.

CHINA

- Series of laws and policies for Chinese dam construction developed in last 50 years.
- Compliance of laws and regulations to be examined and approved by National People's Congress before implementation.
- Among the main laws are – Water Law, Land Law, Law on Water and Soil Conservation, Law for Flood Control, Law for Water Pollution Control, Electricity Law, and Law for Cultural Relics Preservation.
- Environmental Protection Law and Measures for Management of Environmental Protection of Fundamental Construction issued in 1979 and 1981.
- Regulations for Environmental Impact Assessment of River Basin Planning issued in 1992.
- Several regulations such as Regulations for Land Requisition and Resettlement for Large and Medium Water and Hydropower Project Construction; Regulations on Safety and Management of Dams and Reservoirs; Regulations for Flood Control; Regulations for Resettlement of Three Gorges Project Construction etc. exist.
- EIAs required for all large and medium water resources projects.
- Developers required to be in communication with local governments and local people such as through National People's Congress.

INDIA

Earth dams for storage and diversion works have been built in India since pre-historic times. A few projects constructed during second and third century A.D. in South India are still providing useful service. More than 4000 large dams have been built in India since independence (1947). The total storage capacity of the reservoirs is around 200 BCM out of a total storage potential of about 400 BCM. It is estimated that another 2500 large dams will be required in future to achieve the ultimate storage potential to utilize it for socio-economic development of the country, including food security and flood control. The irrigation potential of about 90 Mha out of a total of 140 Mha has been achieved as of present. Hydropower of about 29,500 MW out of a total potential of 84,044 MW at 60% load factor has been developed. This is 35% of the total potential. Major and Medium Irrigation projects, hydropower projects and multipurpose projects are implemented by the Central Sector Hydropower Corporations and State Governments after investment clearance is accorded by Govt. of India. In India, like in many developing countries, groundwater is used for irrigation requiring energy for pumping. Over 50% of irrigation is practiced with groundwater.

The investment clearance is based on the techno-economic feasibility established after an appraisal by Central Water Commission is made and environmental clearance given by the Ministry of Environment and Forest. Detailed guidelines and standards for preparation of feasibility reports and environmental impact assessments have been made for the guidance of the State agencies. For issues relating to rehabilitation and resettlement of the persons affected from the dams and reservoirs, the States have Rehabilitation & Resettlement packages to ensure that the standard of living of the persons displaced is improved after the project is implemented than it was before the project implementation. Suitable monitoring mechanism has been established to ensure environmental safeguards, stipulated at the time of clearance. To compensate for the submergence of forest areas, it is obligatory to provide compensatory afforestation equivalent to the forest area submerged in addition to the tree plantations in the project command.

INDIA

- Appropriate legal framework is a necessary condition to establish institutions and arrangements for development and management/resolution of disputes of water resources/projects.
- Adequate provision for protection of environment and forest in-built in the Constitution of India (Article 47, Article 48 (a), Article 51 (a) etc.)
- For sustainable WR development, several Acts and legislations enacted. They include environment (protection) Act 1986; Water (Prevention and Control of Pollution) Act 1974 (amended in 1988); Forest Conservation Act; 1980; Environmental Impact Assessment Notification of 1994 (amended in 1997); etc.
- Strict requirements and procedures for seeking environmental clearance for projects in place.
- Mechanism for post clearance monitoring available.
- Resettlement and Rehabilitation (R&R) Policies and Acts of various State Governments as well as Government of India formulated.
- Special consideration for R&R of ethnic groups.
- Dams safety procedures are available, although no dam safety legislation.
- Large number of Guidelines and Standards for River Valley Development, project structures and materials, available.

INDONESIA

About 200 large and small dams have been constructed to support food production and clean water supply. Benefits have accrued to the people and revenue has been generated at regional and national level. The adverse effects are strictly evaluated and where such factors are dominant, the projects cannot be sanctioned. For example, some negative impacts were observed in construction of Kedung Ombo Dam and

proposed Nipah and Jatigede dams. Jipang Dam was shelved. Only 0.8 Mha area is irrigated through dams out of 7Mha potential rice fields. Only 5% hydropower has been developed out of 78,000 MW potentially identified power. To harness existing water potential, improve socio-economic conditions and for better social welfare, new dam construction is acknowledged as necessary in Indonesia. To make the dam construction more sustainable and well accepted by the community, decision making process should have least negative impacts and maximum benefits to the community. Holistic, comprehensive and multi-disciplinary approach is needed to handle the problems. More dams are required for food, energy, and for mitigating droughts and floods. Ministry of Settlement and Regional Infrastructure (MSRI, Govt. agency) is in charge of water resources development, while Ministry of Environment deals with environmental protection. In Indonesia, the Commission on Dam Safety recommends to MSRI and local governments regarding dam design, impoundment and operation license.

INDONESIA

- National Board of Water Resources and other Local Boards advised the Government on Water Resources Development.
- Local Board of environment details with an environmental protection at provincial and district level.
- The Commission on Dams Safety recommends to MSRI and Local Government on dam design, impounding of reservoir and operation licencing.
- Dam development procedure has seven stages :
 - Needs assessment.
 - Selecting alternatives.
 - Project operation.
 - Project implementation.
 - Establishment of dam operation and maintenance body.
 - Operation and maintenance.

IRAN

Iran is a country with Arid & Semi Arid Climate. Annual precipitation in the country ranges from 50mm to 1000mm. Rainy season does not correspond to irrigation requirements, with the result that it has become necessary to devise ways and means for storing drinking and irrigation water since 2000 years. The system of underground channels (Qanats) goes back to 2500 years. About 200 large dams are presently in operation in Iran. Installed capacity of hydel power is about 3030 MW. About 50% of irrigation in Iran is done with groundwater which necessitates energy for pumping. Darin dam built in 1500 BC has been replaced by a new dam. Growth of population from 11 million to 65 million in past 60 years has given a new impetus to dam construction using modern techniques. Renewable water resource of the country is 130 BCM, of which utilizable is 110 BCM, while the presently used water is 85 BCM. Annual per capita consumption of 1200m³ is planned by utilizing all obtainable resources optimally with storage dams including recycle and reuse. Large National Dams under operation are 57, while large National Dams under construction are 59 and large National Dams under study are 151. Atleast 51 large dams under construction will be for irrigation alone or multipurpose (with irrigation and flood control as a purpose).

Ministry of Energy is responsible for reservoirs, dams and main, primary and secondary irrigation canals. Ministry of Jihad-e-Agriculture is responsible for tertiary and fourth degree irrigation canals and design/implementation of small water supply projects with the approval of Ministry of Energy. Integrated water resources plan including studies of

all catchment areas, supply and demand, and water balance are compiled by Ministry of Energy, which also provides general strategies for dam construction. Management & Planning Organization acts as a coordinator between different sectors and undertakes required credit allocations. Members of the Parliament provide related regulations to reach out the goals of demand and supply in long-term civil projects. Different stages of a major dam project comprising reconnaissance, feasibility studies, detailed design, construction, operation and maintenance and performance evaluation are governed by National and International standards and guidelines. The feasibility studies include environmental considerations, environmental impact and evaluation of changes. The procedure for review and approval of new dam projects is given in the flow charts (**Annex 4 and 5**). The process primarily involves approval of proposals submitted by Regional Water Authority to the Water Affairs of the Ministry of Energy in coordination with planning and management organization

IRAN

- Environmental Impact Assessment necessary for all large projects.
- Participation of local people and awareness campaigns through newspapers, television and regional water authorities.
- Twenty four standards brought out by Water Engineering Standardization Bureau in the form of Bulletins. These relate to reconnaissance studies, design studies, construction services, geotechnical and seismic studies, earthquake engineering studies, rock mechanics, inspection, etc.
- Forty-nine standards under preparation for submission to Iran's Planning and Management Organization for approval. These relate to operation and maintenance, geotechnical studies, concrete structures, tunnels, rocks, etc.
- Several guidelines are in use based on International Standardization Regulations such as by ISRM, US Army Corps of Engineers, ICOLD etc.
- National standards from other countries are also used in dam design and construction. These are - ASTM, ASCE, USBR, BSI, AWWA, AFNOR.
- Additional standards from other countries such as India, former Yugoslavia, Norway and Japan are also used by dam engineers.

JAPAN

The total number of large dams in operation in Japan is 2738 (World Atlas & Industry Guide, 2004 Journal of Hydropower & Dams). The total water storage capacity of all dams is 20.4 km³. Presently, there are 45 large dams under construction which are more than 60 m high. Out of these, 42 dams will be catering to the irrigation and flood control needs. The highest is the Tokuyama (161 m high) rockfill dam which is expected to be completed by 2007. While planning the storage facilities for development, various alternative arrangements are studied thoroughly. The dams/storage facilities are developed for irrigation, flood control and water supply, besides integrated river basin development. Procedures are in place for planning a development schemes for the above purposes. The Land Improvement Act stipulates that any project to be implemented for agricultural land improvement in Japan shall be evaluated to ensure that the expected total benefits exceed of the costs to be incurred by the project. The results of evaluation are required to be made public. The techno-economic viability of the project is studied by conducting economic evaluation for irrigation and/or drainage projects, affordability evaluation for determining rate of recovery from beneficiaries, and for economic evaluation of land improvement projects. The flood control plans for important rivers are designed for floods of 100-200 years recurrence period depending upon the level of protection. The social and environmental impacts are evaluated as per the Environmental Assessment Act (EAA) which was enacted in June 1997 and enforced in June 1999. EAA provides for the procedure for, and matters related with, environmental assessment of large scale projects in which the Government is involved either directly in implementation or in directly by

according approval or permission for implementation. While implementing integrated and holistic plans for sustainability of development involving dams, adequate measures for rehabilitation and compensation of affected people are taken. These include compensation by the project owner, upgrading living conditions and economic infrastructure provided for by the Special Act on the Measures for Reservoir Area Development (SAR), and supporting measures for the foundation of livelihood with the proceeds from the Fund for Measures for Reservoir Area Development (FRD). SAR was enacted in 1973. The compensation standards to the land holders were first determined by the Cabinet in 1962 and later in 1996. The sediments (silts, sands and gravel) in the rivers are considered as part of natural environment. The reservoir capacities are designed for a life of 100 years. Stakeholder participation is encouraged in the interest of equity, efficiency, economy, efficacy and transparency in the decision making procedures. The Ministry of Construction in 1995 reconsidered the decision making processes for large projects to improve transparency and objectivity. Based on this, proper instructions are issued to Directors of all regional construction bureaus who actually handle the planning and implementation of water projects. The Ministry of Agriculture, Forestry and Fisheries (MAFF) implements land improvement projects, including irrigation projects involving dams and barrages.

JAPAN

- Land Improvement Act ensures positive benefit-cost ratio.
- Participating farmers bear a part of project costs.
- Flood control plans for rivers of first order of importance are designed for floods of 1:100-200 years.
- Environmental Assessment Act was enacted in June 1997 and put in force in June 1999.
- For reservoir area development, the measures adopted are -
 - Compensation by project owner.
 - Special Act on measures for Reservoir Area Development – (SAR).
 - Fund for Reservoir Area Development (FRD).
- Equity, efficiency economy, efficacy and transparency of decision making procedures ensured.
- Stakeholder participation is encouraged.
- Ministry of Agriculture, Forestry and Fisheries (MAFF) implements land improvement projects.

MEXICO

River Basin Commissions were created during 1940-60 as one of the main strategies to launch regional development programs sustained by multipurpose water-related projects.

Dams play an essential role to achieve the objectives of national development. Annual Runoff for the country is 410 BCM and Groundwater recharge of 63 BCM. Storage capacity in early 40s was 12 BCM and Hydropower 400 MW, however, at the end of 1960, storage capacity increased to 125 BCM and Hydropower to 5000 MW. Presently the storage capacity is 150 BCM with 840 Large dams (18% of the total dams), while the hydro-power installed capacity in operation is 76000 MW. Registered large dams are 575 as per World Atlas and Industry Guide 2004 of Journal of Hydropower and Dams. Total utilization of water resources is 198 BCM, of which, 86% is from surface sources. Main users of water are - Hydropower (119 BCM) and Agriculture (44.4 BCM).

General Law of Ecological Balance and Environmental Protection (LGEEPA) and its Regulations were enacted in 1988 and subsequently modified in December 1996 and May 2000 making preparation of EIA mandatory for major development projects. Through EIA, Ministry of Environment and Natural Resources of Mexico decides whether a project can be cleared after reviewing its overall environmental impacts.

MEXICO

- Mexico has over 80 years of experience in development of dams.
- Due to absence of adequate procedures, negative impacts were witnessed earlier.
- Environmental Legal Framework in the form of LGEEPA, 1988 exists. Regulations were modified in 1996 and 2000.
- Ministry of Environmental and Natural Resources of Mexico (SENARNAT) is the overall reviewing and sanctioning authority in Mexico.
- Several regional parameters, social parameters for human settlement, and economic parameters are considered for socio-economic analysis in EIS.

SPAIN

Spain has a total of 1202 large dams in operation which store a total volume of 56.5 km³. There are 326 embankment dams. Nine new high dams of 60 m or more height are currently under construction. The Ministerio de Medio Ambiente (Ministry of the Environment) is in charge of water resources, and as part of its organization there are also basin authorities for each major river basin. The Government has adopted national regulations concerning Environmental Impact Assessment (EIA) in order to comply with EEC Directive 85/337/EEC. Construction of dams in Spain is regulated through a three-phased administrative procedure which guarantees (i) social needs; (ii) technical viability of the dam; and (iii) environmental sustainability. A water resources development plan in a basin is developed through a document called 'Drainage Basin Hydrological Plan' (Plan Hidrológico de Cuenca) in which all studies carried out on the basis of present and future resource demands are compiled. Various alternative demand scenarios are considered by the executive and consulting bodies of 'Drainage Basin Authority' (Confederación Hidrográfica) and the recommendations are submitted for approval for the Drainage Basin Hydrological Plan. All such hydrological plans are submitted for consideration of the Ministry of Environment in a large document 'National Hydrological Plan' (Plan Hidrológico Nacional) which is to be put up to the National Parliament and subsequently approved by law. A multidisciplinary team studies various processes in the development of a dam-related project under 'Dams and Reservoir Safety Rules' (Reglamento de Seguridad de Presas y Embalses). The technical approval by the General Directorate of Hydraulic Works and Water Quality is published through the State Official Journal for 'Public Acknowledgement'. If the Public Acknowledgement and the Environmental Impact Studies are available, then the 'Jurisdictional Report' is ratified for obtaining 'Final Approval'. According to the Spanish Law, all large dams are necessarily required to prepare Environmental Impact Study Reports which involve an elaborate process.

SPAIN

- National regulations concerning environmental impact assessments to comply with EEC Directive 85/337/EEC have been adopted.
- Legislative Royal Decree 1302/1986 on EIA and Royal Decree 1131/1988 are in place.
- Fourteen regions have specified legislations for EIA.
- Procedures are available for dam-related projects from conception to realization.
- Environmental Impact Study is compulsory for large dams.

TURKEY

Turkey receives a runoff of 186.05 km³ from a total mean annual precipitation volume of 501 km³. The General Directorate of State Hydraulic Works (DSI) is in charge of water resources which has 26 regional Directorates, roughly corresponding to the number of country's river basins. The total number of large dams in operation is 543, comprising 525 embankment dams, 14 concrete dams and 4 composite dams. The total storage volume from all dams is about 139.5 km³. Presently (2003), 54 large dams are under construction varying in height from 63 m to 247 m. At least 43 of these dams are being constructed for irrigation and flood control purposes. In June 2002, the EIA Regulations were revised and some new criteria regarding water resources development projects were added. The new criteria mainly relate to water transfer between basins, groundwater withdrawal activities and rehabilitation of riverbeds for the purpose of flood protection.

Apart from mandatory EIAs, public meetings are also held to involve the local people in new schemes, which is compulsory by legislation. A monthly periodical called *Water World (Su Dunyasi)* is published and television programs targeting children are prepared, ensuring that public awareness about the role and benefit of dams is increased.

TURKEY

- Comprehensive EIAs are required for storage facilities with reservoir surface area more than 15 sq. km and volume more than 100 million cubic metre, as well as power projects of more than 50 MW.
- New criteria on water resources development projects added in EIA regulations in June 2002.
- Local people are involved in the project planning through public meetings.
- Legislation requires participation of all involved parties.
- Affected people collaborate to identify ways to alleviate negative impacts of projects.

- 4.2 The summarized reflection of decision-making procedures in respect of several ICID network countries indicates that many countries have set up appropriate institutional mechanisms to examine the environmental impacts of projects and it is only after they are convinced about the safeguard measures that environmental clearance is given for a dam project. There is also a process of Public Hearing in several countries to ascertain the views of the people before the project is taken up for implementation. In most of the democratically elected governments, the representatives of people are involved in the decision making process. The decision for a new dam is to be taken by involving the representatives of the majority of the people. The prime responsibility of a welfare state is to ensure proper justice, fair play, and extension of benefits from the project to all affected people to the extent feasible.
- 4.3 Normally, a new dam in a river basin is an integral component of an overall master-plan of Water Resources Development (WRD). The principles of the plan are generally laid down in a feasibility study, which increasingly include a technical, socio-economic and environmental analysis, based on various potential options. It may be of importance that the plans be examined by a National Agency concerned with Water Resources or Basin Authority for techno-economic viability, as well as inter-state and international issues.
- 4.4 The Agency responsible to conceive and construct a new dam generally prepares first a feasibility report and then a Detailed Project Report (DPR), as known in many parts of the world and in India, as per the standards and guidelines after carrying out necessary field investigation, surveys and studies, as well as institutional and public presentations and hearings. A summary report of the project proposal is generally submitted to the concerned government bodies to obtain an 'in principle' acceptance. After 'in principle' acceptance of the proposal, the DPR is prepared and the statutory clearances from the concerned

ministries/departments are obtained. If the project is found to be viable, it is placed before a high level multidisciplinary committee with representatives from all the concerned ministries for consideration and recommendation for investment clearances and then a Planning Commission or any Competent Authority accords its approval. The project is taken up for implementation by the Agency and funds are allocated and placed at their disposal. This process for decision making could be different in different countries depending on the government/institutional setup for examining various aspects of a large water resources project. Various agencies responsible for project clearance in selected countries are mentioned in the preceding paragraphs and boxes.

- 4.5 The survey indicates that the procedures being currently followed address almost all identifiable and necessary aspects relating to techno-economic viability, socio-economic needs and environmental sustainability. These are normally given adequate consideration by the concerned agencies before the project is finally approved by a National Government for implementation.
- 4.6 A brief appraisal of the status and procedures adopted in different countries with regard to environmental safeguards is given in **Annex 8**. It is apparent that this aspect has received particular attention in all countries globally.

Country reports from Australia, China, India, Indonesia, Iran, Japan, Mexico and Spain and other relevant articles related to dams in Spain and Turkey are attached in **Annex 9**.

5.0 COMMON PROBLEMS IN DECISION MAKING

- 5.1 Any WRD project involving construction of a new dam has to fulfill the requirements of techno-economic viability, environmental safeguards and social acceptability. The detailed project reports are prepared according to the guidelines and standards which are progressively revisited to account for technological advancements, new issues and safety concerns. While an extensive knowledge database and literature is available on technical and economic aspects, the same is not always true in respect of the environmental and social aspects on which greater focus is being directed globally. This may result in a project report remaining deficient in respect of environmental and social issues. The guidelines and checklists issued by Environmental Protection Agencies or the concerned ministries for impact analysis, generally highlight the adverse effects of development projects, but do not discuss the ways and means to minimize the adverse impacts or how to convert the issues into opportunities for improving the environment. These guidelines generally tend to ignore evaluation of positive impacts of a dam and reservoir on the environment and ecology of the area served. While it may not be possible to quantify all the socio-economic benefits generated by a project, many tangible and intangible effects can be perceived, such as infrastructural development (roads, railways etc.), improvement of health, education, employment generation, alleviation of poverty, reduction in time and effort of travel etc. which can or cannot be quantified in economic terms. The reports of impact assessments on environment and social aspects are expected to give a complete picture of the overall positive tangible and intangible effects due to the project. It is therefore necessary that a National Policy on Environment and Development is formulated giving separate guidelines in respect of WRD projects in the countries where such policy is not yet formulated. The projects having potential of improving the quality of environment should be distinctly separated from the projects which are liable to pollute land, water and/or air.
- 5.2 The policy for Rehabilitation and Resettlement of displaced persons requires a comprehensive approach to ensure that the affected people are provided a better standard of living after displacement as compared to 'pre-project' stage. A comprehensive survey of the affected area should be carried out at the time of initial planning itself, to estimate the number of affected people for rehabilitation, extent of compensation required for the property likely to be affected etc., for the policy makers to have a better appreciation of the extent of rehabilitation and resettlement works to be carried out during implementation of the project. Preparation of an appropriate Rehabilitation & Resettlement action plan is greatly facilitated if there is a National Policy and Guidelines specifically for the persons

displaced due to construction of a dam and reservoir project. To minimize the hardships to the displaced persons it should be ensured that all promised compensation packages are made available and where necessary, new townships and new villages are completed in all respects and suitable arrangements for relocation are made before the inundation takes place.

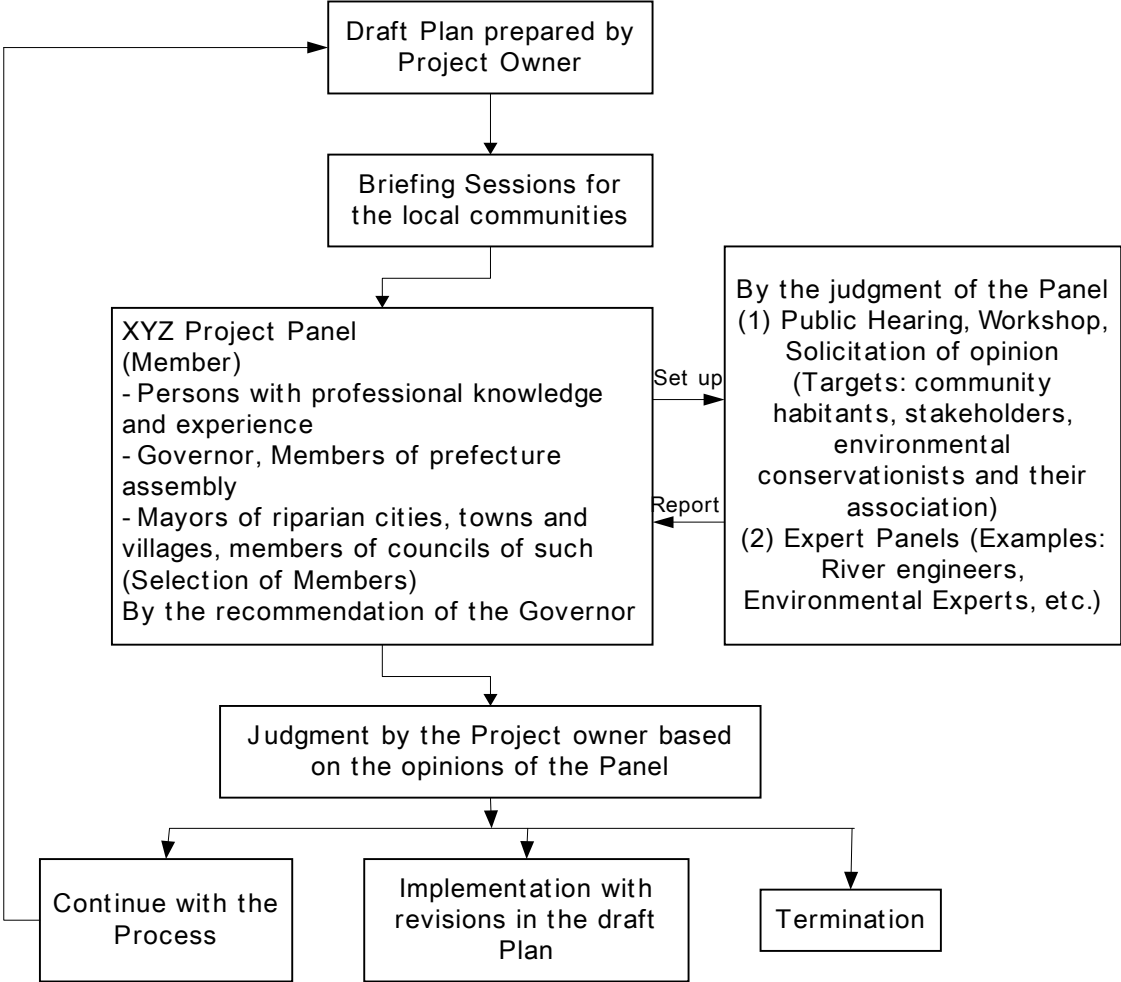
- 5.3 Water Resources Projects are primarily for the benefit of common people to meet their requirements of water supply, irrigation, navigation, energy, and flood management. In addition, generally many other benefits may play a role, like recreation, nature conservation and enhancement of ecology. WRD projects, especially in developing countries, are mostly undertaken in the public sector. However, it is seen that in case of a few countries, there was a lack of coordination and cooperation between the various agencies involved in Environmental Protection, Forest Conservation, Social Issues, Energy, Agriculture and Water Supply. A water resources development project needs to be treated as a joint welfare project. Close cooperation and coordination between all concerned agencies would facilitate a smooth implementation.

6.0 ROAD MAP FOR PROCEDURES TO BE FOLLOWED FOR NEW DAMS

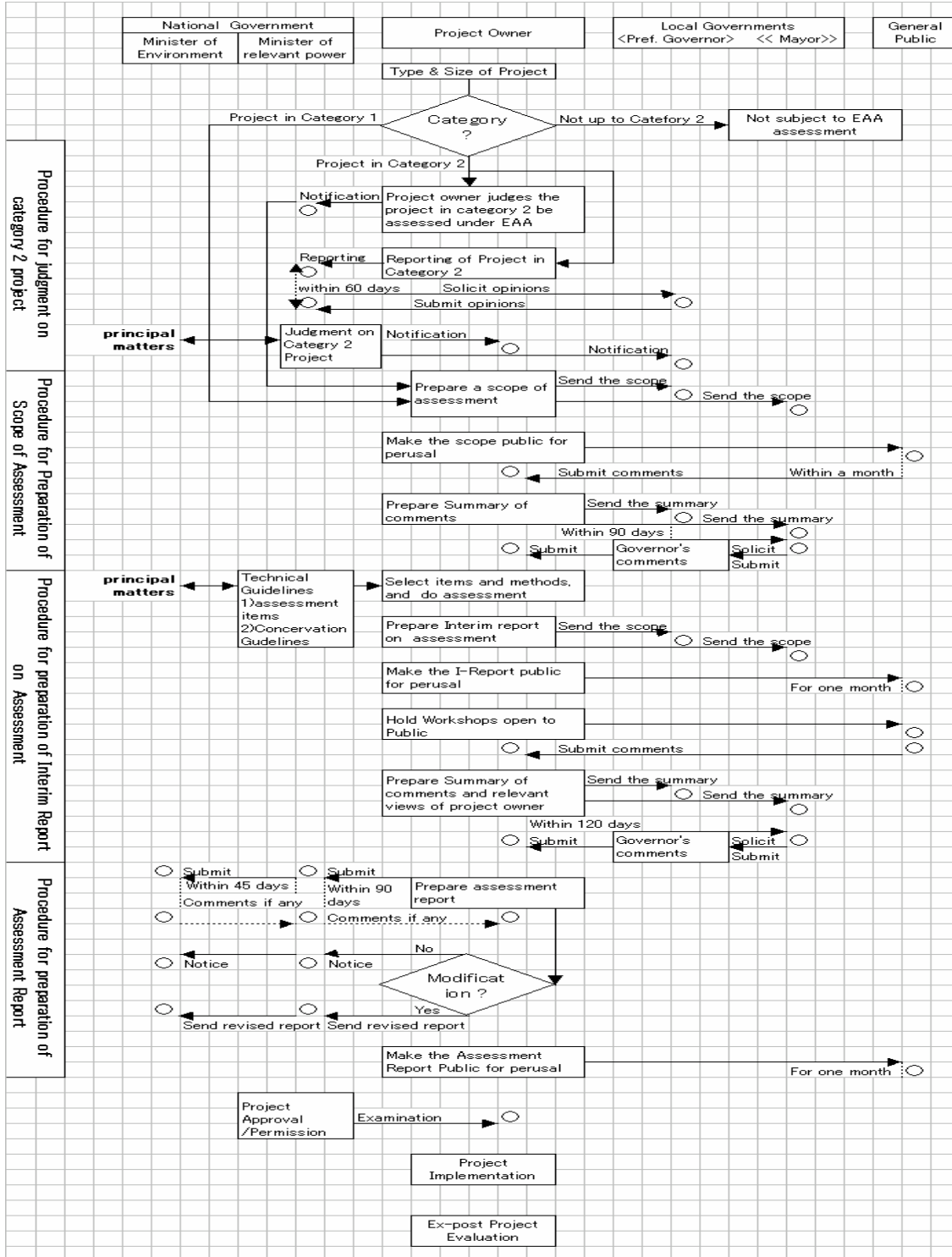
- 6.1 Most of the countries have established institutional mechanisms for examining techno-economic feasibility, social acceptability and environmental safeguards to ensure that adverse effects are minimized and benefits enhanced from the water resources projects involving dams. Where such mechanisms are not there, a scope for improvement exists and should be developed.
- 6.2 There is a need to treat water resources projects as environment friendly projects since they have great potential to improve the quality of air, land and water as a result of developed green cover due to agriculture and plantations, hydropower generation (replacing fossil fuel based energy), improvement of health due to provision of freshwater resources, and availability of lakes for development of fisheries, and recreation. On the other hand, a clear prescription on how negative environmental impacts will be compensated would have to be an integral part of the decision to construct a dam.
- 6.3 The environmental impact analysis (EIA) should include both the positive and negative impacts in a balanced way. Suitable weightages should be given to various environmental and social benefits derived from the project.
- 6.4 A national policy on environment and development should be formulated to define the ultimate goals and objectives of developing water resources potential of the country for the economic growth and well being of the civil society and the responsibilities of the concerned departments to take care of the environmental and social aspects.
- 6.5 The Rehabilitation and Resettlement of the displaced persons should be guided by a national policy which should provide for the improvement of living standard of the people affected. There should be adequate provision for better land, better home, better community life and better employment for all project affected persons. The affected people should be used as a resource for the project, if necessary by imparting them training in required skills. The implementation of Rehabilitation & Resettlement should be carried out as an integral part of the project in association with the representatives of the affected communities and NGOs belonging to the affected area, since the needs of the affected persons can be best met by involving them or communicating with them or their representatives directly.
- 6.6 Basin-wise consideration of projects is important to ensure that a balanced development which does not adversely affect other interests guaranteed by existing developmental activities and projects, is finally achieved. The procedure for techno-economic appraisal should have in-built mechanism to ensure an approach that integrates the multiple objectives of development and management of land and water resources. The riparian countries should agree on an institutional and legal framework that aims at supporting the sustainable development of water and river basins.

- 6.7 The decision-making procedures presently adopted in some of the leading countries may be taken as a model with suitable modifications to ensure smooth processing and approval by the Government. Once the project is approved by the competent authority, all concerned departments should take the responsibility to implement the project with full cooperation and assistance keeping in mind that it is a project for the prosperity of the nation and its people.
- 6.8 NGOs and voluntary organizations should preferably be involved in a constructive manner to see that the environmental and social issues are properly addressed during the implementation of the project. They may help the Government in the process of nation building and improving the quality of life of the people. This is necessary particularly in those countries, which have been left behind economically and are facing the problems of poverty, hunger, malnutrition and unemployment.
- 6.9 A time-bound action plan to develop the water resources potential for irrigated agriculture, flood management and other relevant issues would have to be envisaged by those countries which are lagging behind, so that the water, food and energy security as well as sustainability is achieved by most of the developing world.

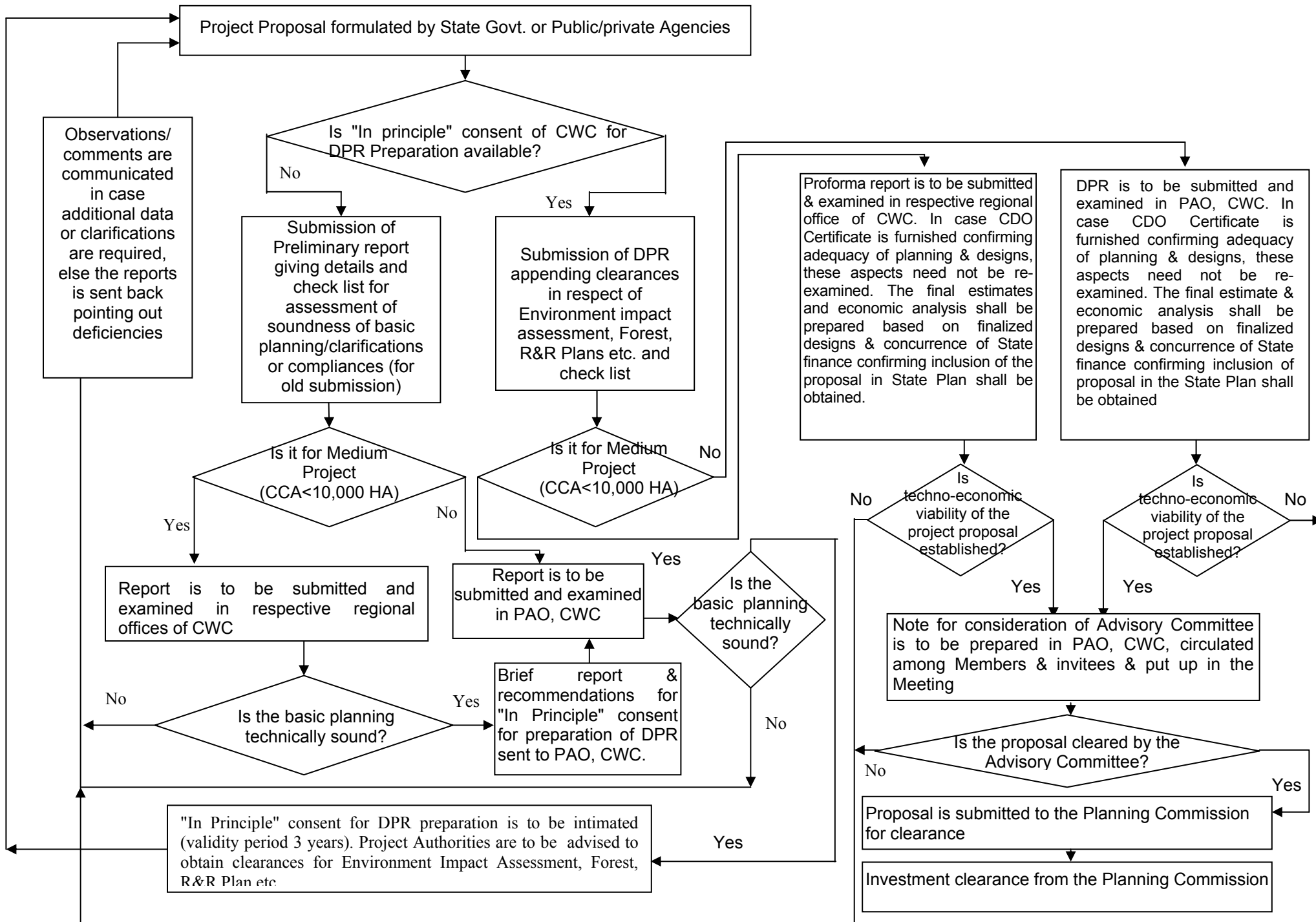
Diagram : Project Evaluation by a Panel in Japan



Environmental Impact Assessment Procedure in Japan Annex 2



**SUBMISSION, APPRAISAL & CLEARANCE OF MAJOR, MEDUM IRRIGATION
AND MULTIPURPOSE PROJECT PROPOSALS ON INTER STATE RIVERS (INDIA)**

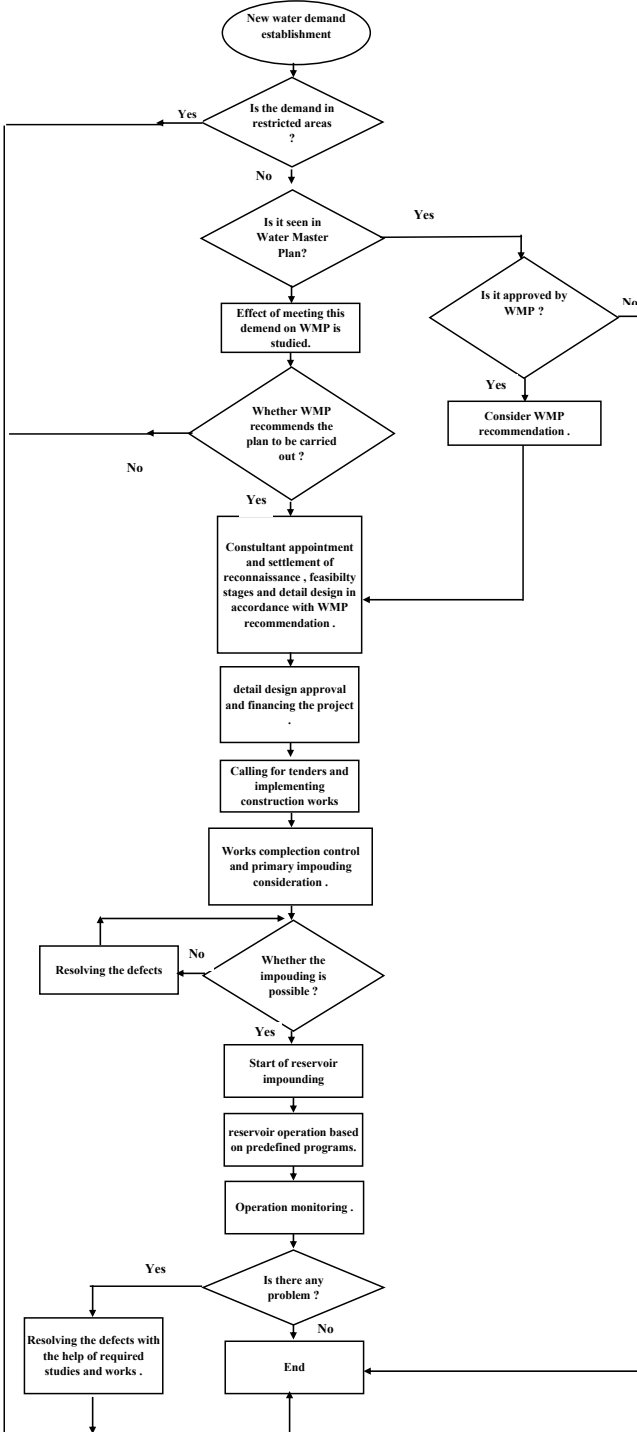


Flowchart 1

IRAN

Annex4

Water Master Plan
(WMP)



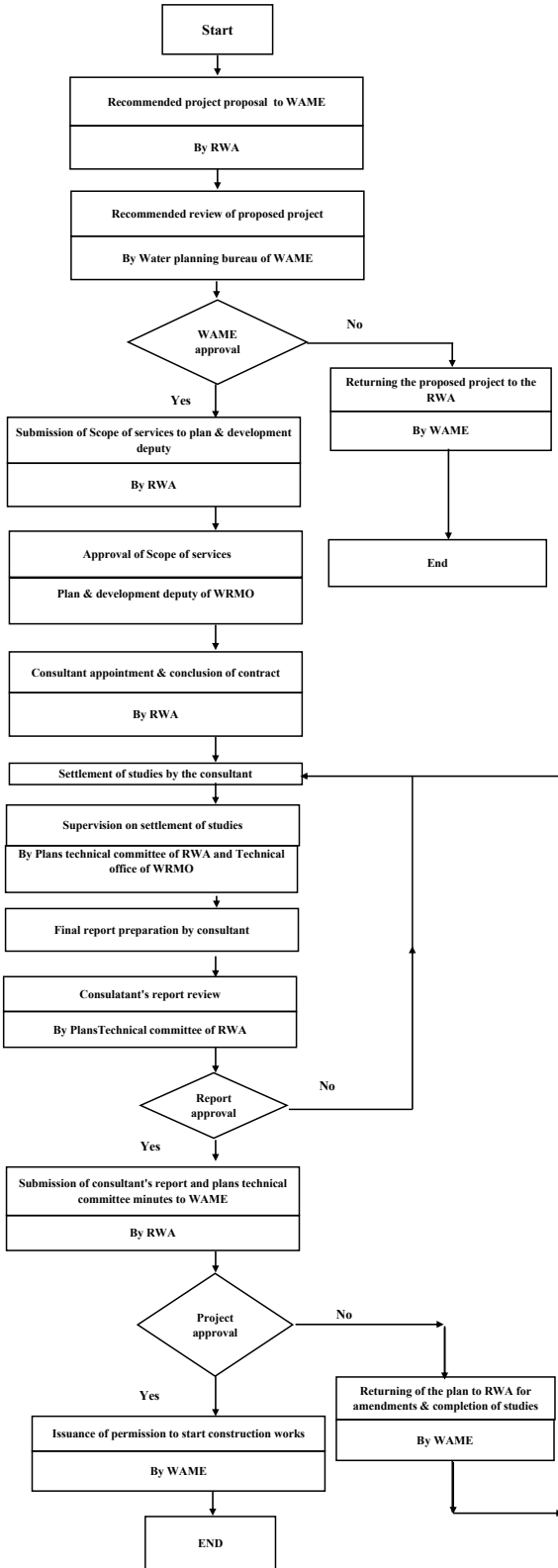
Flowchart 2

IRAN

Annex5

Water affairs of ministry of energy (W A M E)
Regional water authority (R W A)
Water resources mangement organization (W R M O)

Diagram for " Procedure of review & Approval of new dam project studies "



Annex 6

DECISION-MAKING PROCEDURES FOR NEW DAMS IN SPAIN

Dam building in Spain is regulated through a three-phased administrative procedure which guaranties: a) a social need, b) the technical viability of the dam, c) environmental observance, all of these being part of a complex democratic decision-taking process.

These processes can be summarized as follows:

A) Social need

Spain hydraulic regulation system is divided into water basins (Cuenca Hidrográfica), each one possessing its own and independent administrative organization where water users are represented and which is coordinated and directed by the General Directorate for Hydraulic Works and Water Quality of the Environment Ministry.

The hydraulic management scheme of a water basin is contained in a document called "**Drainage Basin Hydrological Plan**" (Plan Hidrológico de Cuenca) in which all studies carried out on present and future resources and demands, as well as work requirements, are compounded.

From this analysis, all the different alternatives to attend demands are deduced. These alternatives are in their turn analysed, discussed and informed by the executive and consulting bodies of the Drainage Basin Authority (Confederación Hidrográfica) itself. The conclusions drawn are submitted to approval and then come to constitute the "**Drainage Basin Hydrological Plan**" ("Plan Hidrológico de Cuenca").

All the drainage basin hydrological plans, complemented with the considerations of the Ministry of Environment, through its consulting bodies, form the "**National Hydrological Plan**" (Plan Hidrológico Nacional), which is submitted to the national Parliament and approved by law.

Henceforth, any Spanish dam project must follow this consensus process which in the end has to be approved by law. The "**National Hydrological Plan**" includes a catalogue of dams considered to be of general interest.

B) Technical viability

The project of a dam is elaborated by a multidisciplinary team under the direction of an engineer of renown prestige in the field of hydraulics and dams and is bound to a "**Dams and Reservoirs Safety Rules**" (Reglamento de Seguridad de Presas y Embalses) that set the points to follow in the design, building, first filling and out of service of dams.

Once the written project has been elaborated, it must be granted a "**Technical Approval**" which belongs to the corresponding service of the General Directorate of Hydraulic Works and Water Quality in charge of ensuring that the "**Dams and Reservoir Safety Rules**" have been properly complied with.

The "**Technical Approval**" is then submitted to "**Public Acknowledgement**" through the State Official Journal, with the object of receiving all eventual allegations on the project.

The result of the "**Public Acknowledgement**", together with the "**Environmental Impact Study**" (point C) are informed. If these are favourable, the "**Jurisdictional Report**" is then produced with the resolution of the allegations and the "**Declaration of Impact**" ratifies the environmental study to

give way to the **"Final Approval"** of the project which only then will be provided with financial resources for the work to be contracted and carried out.

C) Environmental Control

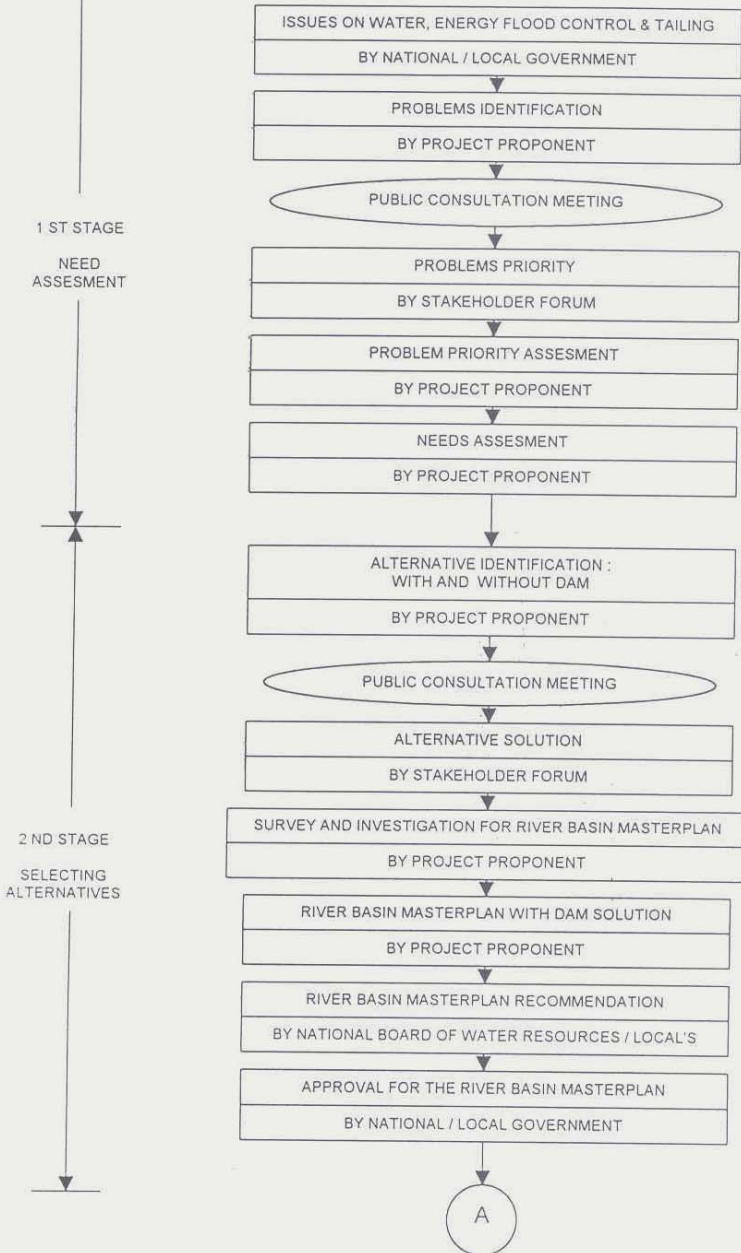
The Spanish Law establishes a compulsory **"Environmental Impact Study"** for the building of a Great Dam.

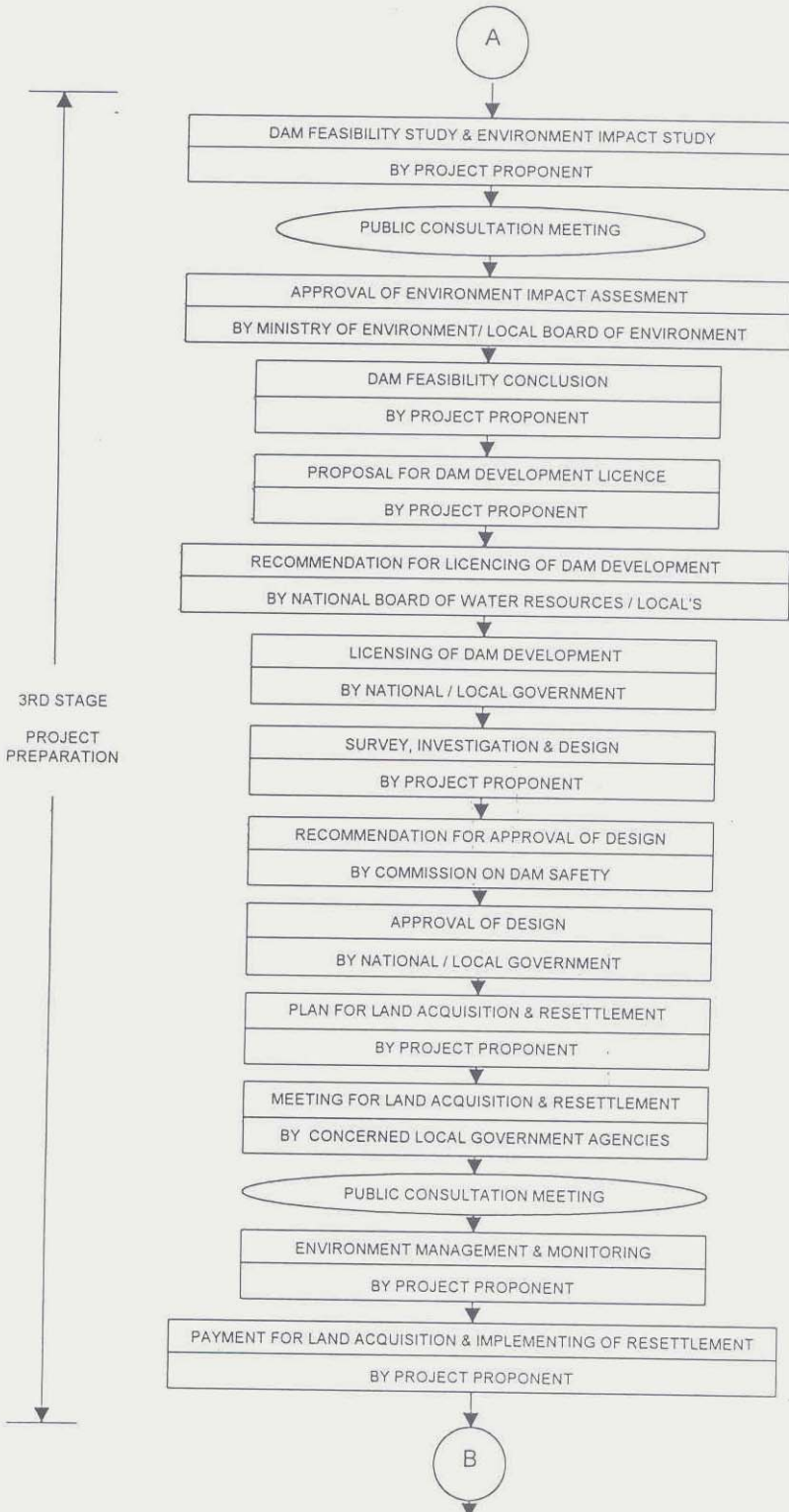
The process which is stipulated in the corresponding law can be summarized as follows:

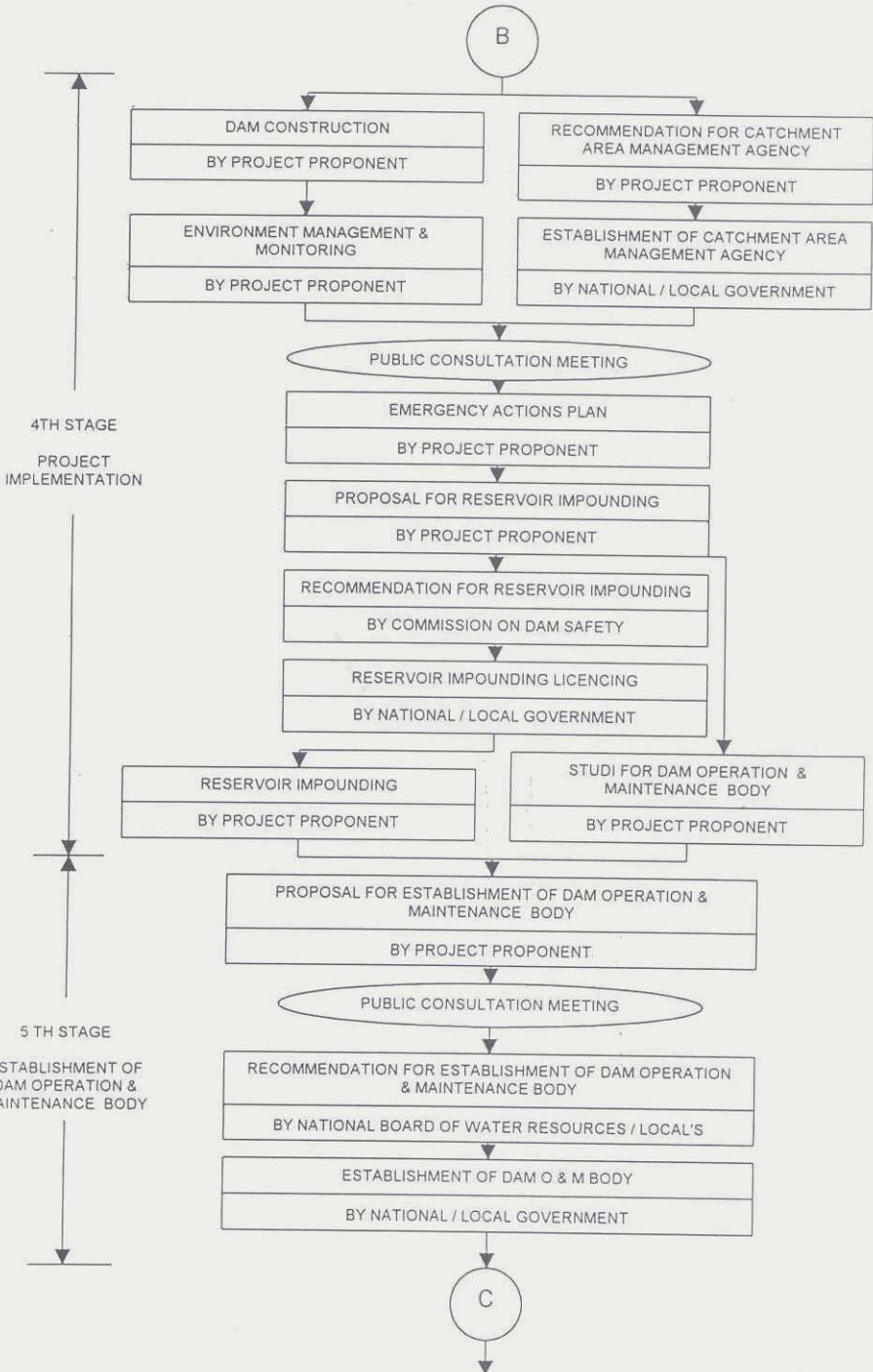
- The first step, before initiating the project, consists in deciding whether the work is or not projected in an area under **Special Environmental Protection** for any circumstance.
- Simultaneously to this process, a **"Summary Report"** describing the main aspects of the project is elaborated and sent to all institutions and organisms concerned for these to express their allegations which will be taken into account in the final elaboration of the project.
- Both actions are undertaken by the General Directorate of Quality and Environmental Evaluation of the Ministry of Environment.
- Once the allegations and the **"Summary Report"** have been acknowledged and the importance of the emplacement of the projected work assessed, the **"Environmental Impact Study"** is written simultaneously to the design project, analysing all legal aspects of the latter which may in some or other way affect the environment, and evaluating at all time the environmental impacts.
- The **"Environmental Impact Study"** document is then submitted to the General Directorate of Quality and Environmental Evaluation who will analyse it and point out any possible problem arisen in the study. The General Directorate will thereof produce a **"Declaration of Impact"** which will determine whether the project is environmentally viable or not, and under which conditions.
- This **"Declaration of Impact"**, together with the **"Jurisdictional Report"** and the **"Public Acknowledgement"** will, as we said in point B, give way to the **"Final Approval"**.

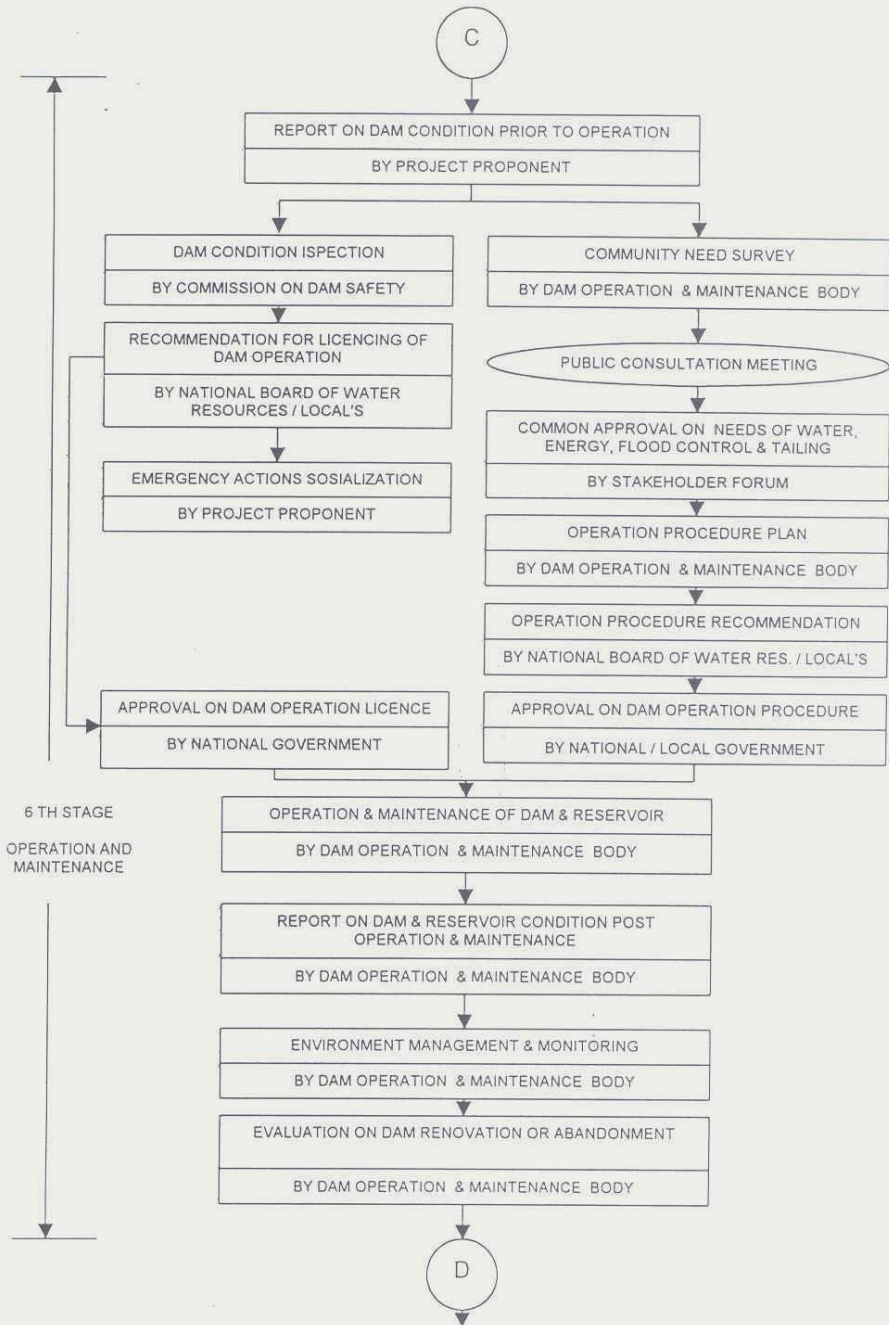
Throughout the building process of the dam, there will be an **"Environmental Follow-up"** to ensure all terms stipulated in the **"Declaration of Impact"** are being respected. The process ends with a report to the attention of the Directorate General of Quality and Environmental Evaluation that certifies the works have been carried out respectfully to the environmental norms.

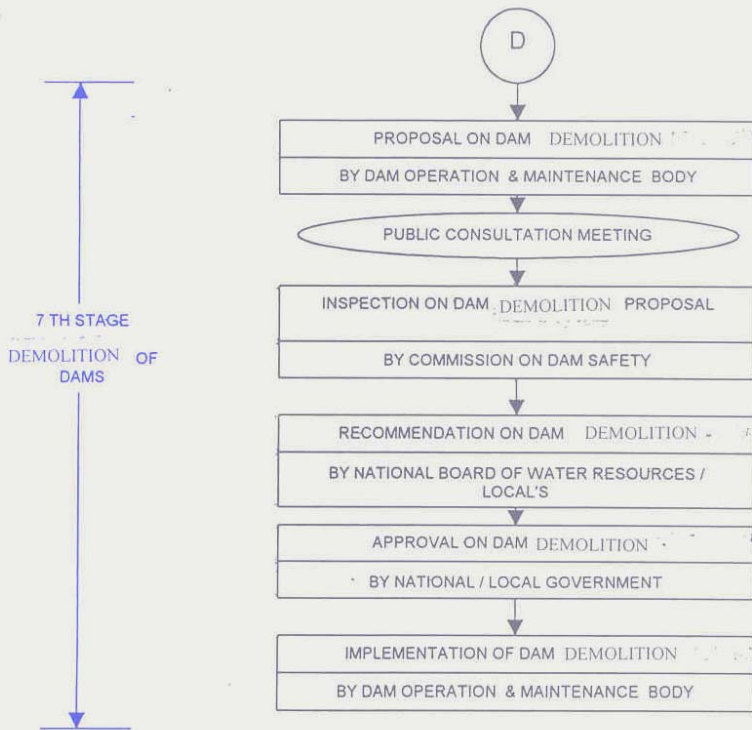
FLOW CHART OF DECISION MAKING PROCEDURES FOR NEW DAMS DEVELOPMENT IN INDONESIA











Annex 8

Status of Environmental Considerations related to Dams in ICID Network Countries

(Source : World Atlas & Industry Guide 2003, The International Journal on Hydropower and Dams, UK)

AFRICA

1. **Egypt** : The Environmental Affairs Agency in the Ministry of Environment Affairs is responsible for environmental impact assessment. According to Law No 4/1994 on Environment Protection, all new projects are required to have an environmental impact assessment to obtain the Ministry's approval.

A new development will usually involve direct dialogue as well as written communication between the concerned communities and the responsible authorities.

2. **Ethiopia** : All projects are requested to have an environmental impact assessment conducted, covering all potential damage to the environment, mitigation and restoration, as well as a reclamation plan including a resettlement program for displaced residents, and the estimated implementation costs.
3. **Mozambique** : There is a legal framework in the country covering environmental impact studies for water resources development projects, and local people are informed about plans for new or refurbishment schemes through newspapers, radio and television.
4. **Nigeria** : There is a legal framework for environmental impact assessment and management, which is a policy of the Federal Environmental Protection Agency. It is in accordance with the World Bank's new policy on water resources management, with special reference to EIAs.
5. **South Africa** : The Environment Conservation Act (No 73) of 1989 covers the identification and prevention of activities which are likely to have a detrimental effect on the environment. It also covers the EIA process necessary to obtain authorization for carrying out identified activity.

The National Environmental Act (No 107) of 1988 promotes the application of appropriate environment management (such as the EIA) to ensure integrated environmental management. It also covers the identification of activities, which may not go ahead without prior authorization.

Some guidelines for environmental impact studies for water resources developments projects are also included in the National Water Act (No36) for 1998 and the National Heritage Resources Act (No 25) of 1999.

Media, broadcasting on local radio stations, local newspapers, posters, information sessions, and public participation meetings (that is, public participation in accordance with legal requirements) are some of the methods used to communicate with local people when a new development is planned.

The local community structures are often used to convey information and to report back to the project via the community leaders. Job creation is encouraged locally during the lifecycle of a project. Awareness programs are also being developed, as well as capacity building and communication programs.

6. **Tanzania** : The power projects are subject to an environmental impact assessment. The National Environmental Management Council is the main regulation body.

The methods generally used to communicate with local people when a new or refurbishment scheme is planned include conducting public meetings and workshops involving all stakeholders as well as conducting an EIA. New publications aim to increase public awareness about the role and benefits of hydro plants.

AMERICAS

1. **Argentina** : The legal framework for EIA and/or management was established by the Secretariat of State for Energy in 1987 by Resolution 718. It passed a guidebook for hydroelectric environmental water works management, applicable to new reservoir projects. In addition, all 13 concession contracts relating to hydro plants (after 1993) contain clause about environmental duties, environmental tasks and obligations for hydro-biological and water quality measurements. The law applies to all sizes of projects.

No fixed method has been established for communicating with local people about new projects. However, the public hearing method will probably be the method adopted, based on the experience of applying the public hearing method to other subjects, such as electricity market regulation.

2. **Brazil** : There has been a general legal framework covering environmental impact studies since 1981; this covers all types of projects and activities which could affect the environment. A licensing procedure is required for all types of water resources projects and has been detailed at various levels of Federal and State administration, to take into consideration the various stages of project implementation.

Recently, there has been some revision of the requirements applicable to small hydro projects, to facilitate the approval and financing of projects under 30MW.

The licensing procedure requires publicity at all stages of project implementation, mainly before any of the three required licences (preliminary, implementation and operation licences) are issued by the environmental agencies. A public hearing is required before the implementation licence is issued for every major project.

No specific steps are being taken to increase public awareness of the role and benefits of hydro. In Brazil, the public is generally aware that reliable water and energy supply is important for development, health and well being, and that this can only be achieved in the country through the development of dams and hydropower plants.

3. **Canada** : the Canadian Environmental Assessment Act (CEAA), passed into law in 1995, and is at present being reviewed by Parliament. This ensures that all development projects that require a Federal decision receive careful review. Environmental assessment (EA) is a comprehensive and systematic process designed to identify, analyze and evaluate the environmental effects of proposed projects. EA involves the public in an open and participatory manner and allows for the effective integration of environmental considerations and public concerns into decision-making. All energy projects are covered by the legislation.

When a new or refurbishment scheme is planned, various methods are used to communicate with local people, depending on the scope and context of the project. These include public hearings, roundtable discussions, formal and informal meetings, information sessions and the creation of committees.

In Canada, all hydropower projects are subject to a comprehensive environmental assessment, which covers planning, construction and operation. Legislation also requires the participation of all parties involved, including the local population that might be affected by the development of the project. Local communities are invited to collaborate in identifying ways to alleviate some of the negative impacts of a project, for example, by reforestation, wetland establishment and fish reclamation; and, to ensure that they benefit from the project through improved quality of life, employment and business opportunities, and long-term revenues. In Canada today, a project can only be developed when it is deemed to be socially and environmentally acceptable.

4. **Chile** : CONAMA is responsible for the environmental management of dams more than 5 m high or with at least 50 000 m³ of storage capacity.

CNE announced in August 2001 that it plans to increase its environmental scrutiny during the early stages of all energy projects. The aim is to ensure that energy production will be sustainable.

When a project is planned, a meeting is usually held with people who might be affected, according to CONAMA's procedures.

Hydro plant staff have begun participating in the Chilean national Committee of ICOLD.

5. **USA** : The USA, with the world's largest economy, is also the world's largest single source of anthropogenic greenhouse gas emissions. Current projections indicate that US emissions of carbon, mainly in the form of carbon dioxide, will reach 1690×10^6 tonnes since 1990. At the Kyoto Summit in 1997, the US delegation agreed to reduce carbon emissions by 7 per cent from 1990 levels by 2008-2012. It is unlikely that this goal will be met. In 2001, the Bush administration said that the USA had "no interest" in implementing or ratifying the Kyoto Treaty, saying it would be harmful to the US economy.

Meanwhile, non-carbon emitting renewables such as wind, solar, biomass and geothermal power continue to supply only a very small fraction of US energy needs, and there is strong environmental opposition to hydropower.

ASIA AND OCEANIA

1. **Australia** : Australia's environmental framework has been reasonably well developed over the last 30 years and is now maturing in most areas. Changes to the administration are taking place, but these generally do not significantly affect the process of gaining environmental approvals. One of the main changes that has taken place in recent years has been the development of more rigorous water allocation policies, including allocations of water of environmental flow requirements.

The methods used to communicate with local people when a new or refurbishment scheme is planned range from specialized communications programs to public meetings, meetings with specific interest groups, local fora, formal reporting to regulatory authorities, to special legal processes such as Land and Environment courts.

2. **China** : There is a series of laws and policies for Chinese dam construction, formulated through 50 years of practice. Compliance with these important laws or regulations has to be examined and approved by the National People's Congress, prior to the implementation of a project.

The main laws include: Water Law, Land Law, the Law on Water and Soil Conservation, the Law for Flood Control, the Law for Water Pollution Control, Electricity Law, and Law for Cultural Relics Preservation.

The Environmental Protection Law and the Measure for Management of Environmental Protection of Fundamental Construction were issued in 1979 and 1981. The Regulation for Environment Assessment and Impact Statement of Water Resources Projects' (trial) was issued in 1988. The Regulation for Environment Impact Assessment of River Basin Planning was issued in 1992.

In addition, there are many regulations which need to be followed, such as the Regulations for Land Requisition and Resettlement for Large and Medium Water and Hydropower Project Construction, the Regulations on Safety and Management of Dams and Reservoirs, Regulations for Flood Control, the Regulations for Resettlement of Three Gorges Project Construction, and so on.

EIAs are required for all large and medium water resources projects, the joint systems of medium and small projects, and the planning (development and control) of river basins. Projects are controlled by various organizations depending on their reservoir size or installed capacity. For instance, reservoir projects with capacities larger than $100 \times 10^6 \text{ m}^3$ to $100 \times 10^5 \text{ m}^3$ need to be approved by the provinces; projects with a medium-sized reservoir ($10 \times 10^6 \text{ m}^3$ to $100 \times 10^6 \text{ m}^3$) need to be approved by the provinces; projects with less than $10 \times 10^6 \text{ m}^3$ reservoirs need to be approved by counties, and so on.

The organization related to dam construction will be further improved with the development of the social and national economy. Efforts are continuously being made with regard to the social and environmental aspects of water resources development.

When planning a scheme, developers are required to obtain the opinion of the local government, which in turn obtains the developments of the local people. Every county, city and province has a local people's congress. For very large water projects, such as Three Gorges, there is the National People's Congress.

3. **India** : The Indian Constitution is one of a few in the world which includes environmental safeguards. It is compulsory to carry out an impact study, and to submit an impact statement before any project can be cleared for investment.
4. **Iran** : An environmental impact assessment has to be carried out for all of Iran's large projects which are under construction or planned.

Newspapers, television and regional water authorities provide information to be local people on new water resources development projects.

Because Iran is a region which experiences frequent droughts, people are well aware of the value of water.

5. **Israel** : The Ministry of Environment is responsible for environmental impact assessment of projects.

Local people are informed about planned schemes by local regional and national planning committees.

6. **Japan** : There is a law covering Environmental Impact Assessment for new developments.
7. **Korea** : There is a law which covers impact and appraisal concerning environmental aspects. Large dams (with heights greater than 15 m) and reservoirs with a storage capacity of more than $20 \times 10^6 \text{ m}^3$ are covered by the legislation.

Permission from the Ministry of Environment is necessary prior to the construction of any powerplant.

Local people are informed of a new scheme through visits and public hearings.

8. **Malaysia** :The Environmental Quality Act of 1974 covers environmental impact studies for water resources development projects. It includes dams and hydropower schemes. EIA studies must be carried out a condition for project approval for: dams more than 15 m high, ancillary structures covering a total area of more than 40 ha, and reservoirs with a surface area of more than 400 ha.

Publications and electronic media as well as direct explanations to affected people are methods used to communicate when a new development is planned.

9. **Nepal** : The National Environment Impact Assessment guidelines (1993) provide a framework for EIA and/or management. Projects requiring an EIA include: generation projects with a capacity of more than 5 MW; medium - and large-scale irrigation projects; and, resettlement programs. The Ministry of Population and Environment is responsible for this.
10. **Pakistan** : There is a large framework for environmental impact assessment, applicable to all projects.
11. **Philippines** : The Philippines Environmental Impact Statement (EIS) system requires all Government agencies, Government-owned or controlled corporations and private companies to prepare an environmental impact assessment for any project or activity that affects the environment. These assessments, which are essential in obtaining an Environmental Compliance Certificate (ECC) are issued by the Department of Environment and Natural Resources. The ECC is needed to obtain project-related permits and approvals, and in many cases, bank loans.

Project of 10 MW or more require an EIS, while projects of less than 10 MW need an Initial Environmental Examination.

12. **Sri Lanka** : Environmental impact assessments are required for all projects.

Local people receive news on new schemes through media as well as through the local government bodies and agents in the respective areas. Furthermore, public meetings, seminars and programs on radio and television and held with the participation of the various groups concerned.

13. **Turkey** : Comprehensive EIAs are required for storage facilities having reservoir surface areas of more than 15 km² and reservoir volumes of more than $100 \times 10^6 \text{ m}^3$, as well as powerplants having installed capacities of more than 50 MW. For powerplants with smaller capacities, a preliminary EIA is necessary

In June 2002, the EIA regulation was revised again and some new criteria about water resources development projects were added. The new criteria are mainly related to water transfer between basins, groundwater withdrawal activities and rehabilitation of riverbeds for the purpose of flood protection.

Apart from EIAs, public meetings are also carried out to involve the local people in new schemes. Legislation also requires the participation of all parties involved, including the local population which might be affected by the development of the project. Local communities are invited to collaborate in identifying ways to alleviate some of the negative impacts of a project and to ensure that they benefit from the project.

14. **Uzbekistan** : The legal basis used to assess a project's influence on the environment is the Law on Nature Conservation enacted in 1992. Environmental control is carried out by the State Committee of Nature Conservation, which comprises a number of scientific and research institutes and organizations. Projects for new schemes are required to be examined by State experts to ensure that they comply with the legislation.

One of the provisions of the legislation on conservation of wildlife and environment involves informing the affected population at the early design stage through the mass media. In cases where the construction of a project envisages resettlement or a change in living conditions, it is obligatory to organize meetings where designers and representatives of the local people discuss design solutions, taking into account the wishes of the local population.

EUROPE

1. **Austria** : There is a legal framework for environmental impact assessment. It is applicable to all projects larger than 15 MW.

When a new or refurbishment scheme is planned, information days are held to communicate with local people, and information is also printed in local newspapers.

Public awareness about the role and benefits of hydropower is being increased by showing the benefits for saving fossil fuel and reducing greenhouse gas emissions. Also, the advantages of not needing nuclear energy for domestic purposes are stressed.

2. **Bulgaria** : The Ministry of Environment and Water is responsible for environmental impact assessment and management. There is a water law and a law for conservation of the environment as well as other environmental guidelines. All projects require an EIA, and local communicators also take part in the council which approves new projects.

The role and benefits of hydropower is covered by organized discussions, which bring together specialists and other members of the public.

3. **Croatia** : There is a legal obligation to study the environmental impact of all hydropower projects in Croatia. The result must be approved by the State Directorate for Nature Conservation and Environmental Protection, which is responsible for enforcing the law.

Public consultations/hearings (based on the EIA study) are conducted to communicate with local people when a new or refurbishment project is planned. Public campaigns are organized to increase awareness about the role and benefits of dams and hydro plants.

4. **Cyprus** : Environmental impact assessment is carried out in accordance with EU directives. EIA studies are mandatory for dams with a capacity of $5 \times 10^6 \text{ m}^3$, but optional for smaller dams.

When a new or refurbishment scheme is planned, the views of local people are obtained by Government officials and environmental consultants, and carry considerable weight. Public awareness of the benefits of dams is increased through meetings between the local people and WDD engineers.

5. **Estonia** : The Ministry of Environmental Protection is in charge of water resources, and considers possible impacts of projects.

There is a legal framework and specific guidelines covering environmental impact studies, which apply to projects which either modify the coastline or a body of water, or involve a storage reservoir with a capacity of more than $10 \times 10^6 \text{ m}^3$.

A great energy strategy was recently developed, with the aim of increasing the population's knowledge of environmental issues.

The benefits of dams and hydro plants are covered by conferences, seminars, workshops and articles in newspapers.

6. **Greece** : Law Nos. 269/90, 165/86 and 998/79 constitute Greece's legal framework for environmental impact assessment, and they relate to all technical projects regardless of type and size. They are administered by the Ministry of Environment, Planning and Public Works.

The EIA of a future project is presented in a public hearing at a council in the local prefecture.

7. **Ireland** : There is a legal framework relating to EIA and management of powerplants larger than 300 kW, as well as for dams where the storage volume exceeds 106 m³, waste disposal, refineries, metal works and chemical works.

Communication with local people regarding new projects is generally done through public consultation meetings.

8. **Italy** : The national law on environmental impact assessment were introduced in Italy in 1986, with the establishment of the Ministry of Environment. The national legislation covers the protection of water resources, desisting and environmental regional laws. The public are advised of new projects through the national newspapers as well as through public surveys.

Steps being taken to increase public awareness about the role and benefits of hydro plants include providing the correct technical information to the people and offering the possibility to visit dams and hydro plants.

9. **Lithuania** : There is a legal framework for environmental impact assessment, which is applicable to all types of development projects. EIA procedures correspond entirely to those required by the EU Directives and other regulations dealing with the implementation of the EIA.

The Ministry of Environment is responsible for EIAs. There are also eight regional Departments of Environmental Protection.

Depending on the size of a particular project, there are two options: mandatory requirement or screening. The typical guidance is issued to carry out the screening process. Although hydropower is not directly included in the mandatory list for EIA, impounding reservoirs or cross watershed diversions are closely related to hydro projects. Hydropower projects of more than 0.1 MW capacity must be subjected to the screening.

The Law on Public information applies with regard to communicating with the local people when developing any project. It was applied only for developing a very small number of mini hydro plants (when this law was passed no large project was constructed).

The Lithuanian Hydropower Association, a non-governmental organization, is in charge of promoting hydropower in Lithuania. The association advises its members on technical and political matters, represents their interests in energy - and environment-related laws and regulations, and arranges seminars, conferences. A number of studies related to the technical, environmental and legal issues affecting hydropower are produced each year for the relevant ministries and research institutions.

The association cooperates with local governmental and non-governmental organizations on matters, which are likely to contribute to hydropower development. The members maintain contact with the mass media, informing them of their activities.

The media are used extensively by water, hydropower and dam specialists with the aim to increase public awareness about the role and benefits of dams and hydro plants.

10. **Poland** : The Environment Protection Code was recently adapted to the EU guidelines. An EIA is necessary for all new dams, reservoirs and hydropower plants.

Local people are informed of new projects as well as the role and benefits of dams and hydro projects through the national media.

11. **Portugal** : Environmental impact assessments are mandatory for hydro projects which have the following minimum characteristics: an installed capacity of 20 MW; a dam height of 15 m; a reservoir capacity of 100 0000 m³; a reservoir area of 50 000 m²; or, a dam crest length of 500 m.

During 2000, the Decreto-Lei 69/2000 (Government Law) was published, which modifies the country's legal framework according to two European directives (85/337/CEE and 97/11/CE) covering EIA studies.

12. **Romania** : There is a legal framework for environmental impact assessment and management. The Law on Environment Protection, issued after 1990, specifies the obligations of all water users, including hydro plant owners. It is enforced by the Ministry of Environment, which has organizations located in each district.

13. **Russia** : According to the 'Federal Law of Environment Protection', all water resources projects, including hydropower developments, are required to have an EIA conducted.

A new Water Code has just been prepared and will be discussed by the Federal Assembly (Parliament).

The public discussion on hydraulic projects is a relatively new concept in Russia. The forms of dialogue are rather limited: mainly public meetings and newspaper publications.

The construction of the Katun hydro plant (1600 MW) in the Republic of Altay was stopped 12 years ago as a result of a very active and biased discussion.

14. **Slovak Republic** : There is a law (Act 127/1994) which provides a legal framework for environmental impact assessment. Its first application was at the Zilina hydro project between 1993 and 1998. According to this law, hearings are conducted to communicate with local people when a new or refurbishment scheme is planned. Regional authorities

operate an information centre which files documentation on dams and hydro plants (Zilina, Sered and Ipel); it is open to the public.

15. **Slovenia** : The Law on Environmental Protection covers all matters concerning the protection of the natural environment and the general conditions for the use of natural goods, as well as the basic conditions for sustainable development. This law defines when an EIA is necessary prior to a project affecting the environment.

In the hydro sector, an EIA must be carried out for reservoir plants where the reservoir volume exceeds 10 000 m³, or for run-of-river station larger than 500 kW.

16. **Spain** : To comply with EEC Directive 85/337/EEC, the Government has adopted national regulations concerning environmental impact assessments. They are the Legislative Royal Decree 1302/1986 on EIA and the Royal Decree 1131/1988. EIAs are required for large dams and, in addition, 14 regions have more specific legislation for EIAs which include small hydro projects.

17. **Ukraine** : State regulations exist for environmental assessment, applicable at the design and construction stages of projects. The legislation includes a basic law on environments protection, a number of local laws and government regulations (on nature reserves, animal life, protection and usage of historical and cultural heritage and son on).

Studies on the influence of hydro plants on the environment are carried out by: 10 State institutes which belongs to the National Academy of Sciences, a few institutes which belong to the Ministry of Health and the Ministry of Ecology and Natural Resources, several universities, and so on. These scientific research institutes carry out environmental impact evaluations for hydro developments of any capacity. The national organization which regulates and controls issues connected to the environmental impact of hydro projects is the Ministry of Ecology and Natural Resources.

Local people can obtain information from the following sources when a new or refurbishment scheme is planned:

- publication of statements about ecological consequences;
- public availability of project materials;
- project discussion in the mass media;
- public hearings; and,
- If necessary, public ecological expertise.

Scientific articles in popular newspapers and magazines as well as specialist press conferences increase public awareness about the role and benefits of dams and hydro plants.

OTHER NETWORK COUNTRIES

AFRICA

1. **Burkina Faso** : An Environment Code has been in force since 1997, requiring projects of all types and sizes to have an environmental impact assessment and to have a mitigation plan for adverse impacts, prior to implementation. The Ministry of Environment and Water is responsible for this.

The World Bank Guidelines, which apply to a new or refurbishment scheme, are generally communicated to local people.

As Burkina Faso is a less developed country, funding organizations such as the IMF and the World Bank have an important influence and their guidelines are rigorously implemented.

2. **Ivory Coast** : There is a framework for environmental impact assessment, but it is incomplete in terms of directives and laws.
3. **Kenya** : Kenya follows World Bank guidelines for environmental impact assessment and management.

Also, there is an environmental bill, passed by Parliament, according to which environmental impact reports for new or proposed projects are mandatory.

Participatory rural appraisal, public meetings, household surveys and documented information are some of the ways used to communicate with local people when a new or refurbishment scheme is planned.

Stakeholder participation in all power projects is encouraged to increase public awareness about the role and benefits of dams and hydro plants.

4. **Libya** : The General Authority for Environment has recently been created, Generally the implementation of new projects is decided only by the Government.
5. **Madagascar** : All hydro projects require an environmental impact study, which should be submitted to the Office National de l'Environnement.
6. **Mauritius** : Environmental impact studies for all types of projects are governed by the EIA Act of 1991. Local people are informed about plans for new or refurbishment schemes through the press.
7. **Sudan** : The National Council for Environment has been established for the development of a legal framework and policy for environmental protection.

Local people are informed about plans for any new projects, usually through newspapers, radio and television.

8. **Tunisia** : Environmental impact assessment is under the supervision of the Ministère de l'Environnement et de l'Aménagement du Territoire. For each project, depending on its size, environmental impacts have to be studied prior to project implementation.

Local people are generally informed when a new or refurbishment scheme is planned. In general, the public is aware of the role and benefits of hydro plants. Compensation is provided for lands, harvest and other disturbances caused by a project, the value of which is estimated by international experts.

9. **Uganda** : There is a general National Environment Status with guidelines for all projects, with specific regulations for the energy sector. There is also an Electricity Act, which states that a licence is required for developments equal to or more than 0.5 MW. The licensing process requires an EIA.

Methods used to inform the local people of a new scheme include: print and electronic media, local councils and public notices in public places. There are no significant efforts to increase public awareness about the role and benefits of dams and hydro plants yet. There are mainly reactions to concerns raised by stakeholders.

10. **Zimbabwe** : A legal framework essentially covering all projects is being prepared.

Public meetings, Catchment Council meetings, distribute council meetings and ZCOLD meetings are methods used to communicate with local people when a new or refurbishment scheme is planned. In Zimbabwe, the public is well aware of the benefits of dams and hydropower plants as water management strategy has been given a lot of publicity over the years.

AMERICAS

1. **Cuba** : Decree Law No. 130 of Land Waters (surface and underground) passed on 1 July 1993, covers the basic principles established in the Constitution of the Republic of Cuba and the Law of Protection of the Environment.

When a new project is planned, communication with the public is by various Government departments, such as the National Assembly of the Popular Power, as well as national journals, radio stations and television.

2. **Colombia**: The Ministry of Environment is responsible for water resources, and there are 26 regional environmental authorities. The Ministry of Mines and Energy, through its Mining and Energy Planning Unit (UPME), is in charge of nominal planning of hydro projects, while the Ministry of Environment has to approve each project.

There is a legal framework for environmental impact assessment and management.

3. **Dominican Republic** : A new Environmental Government Agency was created in 2000 (Secretaria de Estado de Medio Ambiente y Recursos Naturales), which takes care of environmental aspects of water resources development.
4. **Ecuador** : There is a legal framework in Ecuador covered by a law of 1996, and applying to all projects of 1 MW or more. There have been no recent changes.
5. **Honduras**: There is a general environmental law called 'Ley General del Ambiente' which covers a broad range of project types. The law was issued in 1993 and states that a project must have an environmental licence and a contract for mitigation measures. Also, the 'Ley

Marco del Subsector Eléctrico', issued in 1994, states that generation project must have the approval of SERNA. The legislation covers projects of all types and sizes.

Opinions of local people about a new project are investigated through meetings with local authorities, and all the local organizations involved.

6. **Panama** : The National Environmental Authority (ANAM), established by Law 41, and its rules and regulations, form the necessary framework for EIA. The legislation covers projects of all types and sizes, and becomes progressively more comprehensive with increasing project size.

When a new or refurbishment scheme is planned, the relevant information has to be published in the local newspapers and a public forum has to take place as part of the EIA approval process. This provides all the stakeholders with an opportunity to present their views and receive any information regarding the project and the EIA.

Government and non-governmental organizations are continuing work to increase public awareness about the role and benefits of dams and hydro plants.

7. **Peru** : Efforts are under way to implement a legal framework covering environment impact studies for water resources projects. At present, each sector has its own rules, and Consejo Nacional del Ambiente (CONAN) intervenes in the case of disputes.

In the energy sector, it is necessary to prepare an environmental study for new projects, which needs to be approved. Public discussions are held during the process.

In Peru, the possibility of constructing more large dams is not likely, because near the coast (which is dry and needs irrigation) there is a lot of sediment in the rivers. Moreover, the area tends to be seismically active. For hydropower plants, large heads can usually be developed without large dams, and dams are normally used only for daily regulation.

8. **Surinam** : A new institute, National Institute of Environment and Development of Surinam (NIMOS) has been established to deal with matters relating to the environmental legal framework and impact assessments, including water development projects.

Information is generally spread through radio and telecommunications, but in some cases through workshops and seminars.

9. **Venezuela** : The national legal framework contains a set of judicial norms that are directly related to EIAs of projects in different phases of development. There is also a set of decrees, among which no. 1257 stands out, relating to the evaluation of activities which could degrade the environment.

This legislation covers projects such as: mining, exploration and exploitation of hydrocarbons, forestry, agro-industry, aqua-culture, energy production, industry, transport, waste disposal, tourism, residential infrastructure, transmission lines, water transfers, and so on.

Decree No. 1257 prescribes that the Ministry of the Environment can call for the revision of the EIAs of projects through public consultations. Although this is infrequent, during this process it could happen that a given project and its EIA be reviewed, or in an extreme case, that the project could be rejected or undergo major modifications.

Normally, during preparation of the EIA, opinion surveys and interviews are carried out with the inhabitants in the area around a project, informing these people about the objectives,

scope and benefits of the project. This process of mutual information exchange facilitates discovery of the expectations and opinions of the people, which can then be used to design and apply environmental measures, especially for these areas.

The use of means of communication to inform the public about these same areas leads to opinion matrices that can be converted into measurement elements concerning the perception and public opinion relating to the project.

ASIA AND OCEANIA

1. **Kazakhstan** : Kazakhstan is a Non-Annex I country under the UN Framework Convention on Climate Change (1995) and a signatory to the Kyoto Protocol (1999). The major environmental issues are radioactive and toxic chemical sites associated with former defense industries, industrial pollution, the disappearance of the Aral Sea after its two main river sources have been diverted for irrigation, pollution in the Caspian Sea, and soil pollution from chemicals and salination.
2. **Kyrgyzstan** : There is a law covering Nature Protection and another covering Specific Nature Protected Areas. The Environmental Public Prosecutions Office and the Ministry of Environment Protection are responsible for enforcing compliance.
3. **Mongolia** : There is a law for the protection of the environment and nature which requires all projects > 1 MW to have a detailed evaluation carried out of impacts on nature.
4. **New Zealand** : There is a framework in New Zealand for environmental impact assessment and management; all sizeable projects must comply with the Resource Management Act. This Act requires notification of/consultation with all affected parties.
5. **Vietnam** : The country has the following legislation for environment protection: 'Laws on Environmental Protection', passed by the National assembly in 1993; and Decree No 175-CP, issued by the Prime Minister in 1994, covering implementation guidelines for the Laws on Environmental Protection.

An EIA is required for most hydropower projects, which must be approved by the State authorities.

The best way to communicate with local people (that is, project-affected persons or PAPs) and to conduct public meetings is through local authorities. For PAPs to acquire a thorough understanding and awareness of a project, developers are required to contact the local authorities initially, after which they meet PAPs. It is more effective to explain project impacts to PAPs through local authorities; and, if possible, local authorities should be encouraged to visit the project sites.