

**Generating and Sharing Knowledge on  
Sustainable Water Resource Management Principles and  
Practices Among all Stakeholders**

**FINAL REPORT**

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# CHAPTER-1

## Introduction

### 1.1 Background

Water resource potential of Nepal is the country's unbounded wealth, posing a paradox to its alarming poverty. The vast surface flow and underground aquifers having mostly a perennial character combined with a most favourable topography of the country hold out the promise of a high order of social and economic prosperity to the country. The potential can be addressed to the amelioration of the social and economic life of the country ranging from poverty alleviation, safe water, sanitation, secure water rights and employment to fast industrial growth, protection of ecosystem and improvement of international trade.

Nepal's water resources have their sources in the Himalayan snows, annual rain and underground aquifers. There are four Himalayan snow fed river-basins, six Mahabharat river basins, and eight groups of rivers emerging from the Siwalik forming the southern river basin. The total average annual surface run-off is estimated about 224 billion cubic metres out of which 170 billion cubic meters come from areas within the territory of Nepal. About 80% of the total surface run-off occurs within four months i.e. June-September. Most of the winter precipitation on the Himalayas is turned into snow. Average snow cover is about 1.2 m thick. The melting of the natural snow reservoir occurs within the months of April to June which serves to augment the flow of the rivers giving them perennial character. Nepal is rich in groundwater resources, although they have yet to be properly quantified. Broad assessments of groundwater by the geologist indicate availability of about 12 billion cubic meters. Of this, about 50% can be safely extracted annually for irrigation and other purposes. This vast magnitude of resources and the expanse of catchment have placed on the shoulder of the nation a tremendous responsibility of sustainable resource management.

### 1.2 Objective of the Study

The main objective of this study is to generate and share knowledge on sustainable water resources management principles and practices among all stakeholders of the water resources sector working in Nepal

### 1.3 Scope of Work

The scope of work for this study as mentioned in the TOR is as follows:

- Identify stakeholders in the water resources sector from both the government and non-government sectors
- Prepare inventory of various programs and practices carried out/under implementation by various water related development agencies and organizations on sustainable water resources management.
- Review the programs keeping in mind the principles of Integrated Water Resources Management (IWRM)
- Conduct discussion/dialogue on various approaches and practices including pros and cons of each approach/practice based on the finding with a series of main activities in water sector
- Identify the under lying issues in the water resources sector of Nepal.

#### **1.4 Methodology**

The study is basically dependent on the secondary data collected from various reports, and websites. The study is confined to the water supply sector, irrigation sector and the hydropower sectors. Review of Institutional arrangement and policy framework in the water resources sector is also studied and presented.

## Chapter-2

### The Legal Framework

#### 2.1 Water Resources Act-2049

Water Resources Act, 2049 which has replaced the earlier Canal, Electricity and Related Water Resources Act, 2024 is the first of its kind in the field of water rights, uses and allocation. The Act takes all the water resource of the country under the ownership of the State and allows their uses under two conditions: one, by the license issued by the prescribed authority, and the second, without license, for individual of water such as for drinking, household purposes, running household water mill and boating for transportation. In the case of water standing on one's own land, the land-owner is entitled without permit to uses as specified.

The license can be taken only by those who come up in the form of water users' association registered under sectioned 5 of the Act. The licensing authority is the district water resources committee constituted under the chairmanship of the Chief District Officer (CDO).

The Act prescribes a hierarchy of uses of water in priority in which the drinking and household use come first and the irrigation, agricultural, hydropower, industrial and mining, navigation, recreation and other uses come one after the other. In case any dispute arises in the use of water this would be settled on the basis of the prescribed priorities of uses along with the degree of beneficial use made of water by the user.

The Act also undertakes to acquire land and houses for the license holder for the purpose of the construction of dam or embankment, or irrigation canal or tunnel and also offers security for any structures related to the permitted use of water. The Act includes provisions about prescribing quality of water for different uses as also tolerance limit for its pollution.

#### 2.2 The Soil and Watershed Protection Act, 2039

Under this Act the soil and watershed protection includes activities to make the volume and flow of water stable and torpid. The Act enables GON to declare any watershed as protected so that the watershed protection officer can carry on protective activities while prohibiting some specified activities to take place in such areas. There are at present 55 districts having watershed protection officers designated for such activities. The Act also enables GON to constitute a Natural Resources Protection Commission to give advice to it on the subject of the soil and watershed protection and specify its functions, duties and authority.

The Natural Resources Protection Commission was constituted in 1983 under the chairmanship of the Forest Minister and included Secretaries of the water related ministries. The rules under the Act were framed in 1985.

#### 2.3 Irrigation Policy 1992 (Revised-1997) and New Irrigation Policy, 2003

Against the backdrop of so many years of planned development and achievement in irrigation sector in terms of hectare and skilled manpower, the elected government, immediately after the restoration of multi-party democracy in 1990, felt that it had to streamline the efforts in irrigation development, which prompted the government formulate and declare its Irrigation Policy in 1992. The policy had objectives of cost-effectiveness and sustainability, uniformity in implementation procedure, reduction

of government's involvement, preserving traditional irrigation methods, institutional reform, and research capability enhancement. The 1992 policy was amended in 1997 with emphasis on rehabilitation of FMISs and additional objectives of reducing government's recurrent cost in irrigation and maintaining regional balance. Thus for the first time in 1997, an irrigation related official document explicitly declared regional balance as one of its objectives. However, irrigation development planned henceforth has not taken this objective into consideration except that small irrigation development programs in sector approach have planned and implemented on demand that covered every district of the country.

There seems a great departure in the new Irrigation Policy, 2003, that has been formulated and put in effect from the earlier ones. Year round irrigation with storage schemes, integrated water resources management with other sub-sectors and involvement of local bodies according to the decentralization policy have been stressed in the prevailing irrigation policy. Thus, the prevailing policy clearly depicts a realization of all involved in the development of the sub-sector that utilization of perennial source including multi-purpose storage schemes have to be resorted to, if cropping intensity in irrigated agriculture is to be increased with year round irrigation. The present policy has come out of the realization that, particularly in the surface irrigation, if irrigated cropping intensity is to be increased or year round irrigation is to be provided, the erstwhile strategy of taking up periodic streams, which carry virtually no water in dry season and carry more sediments than water in monsoon flash floods, has to be altered.

Followings are the objectives set by Irrigation Policy, 2003:

- To provide year round irrigation service to the irrigable land by effective utilization of the country's water resources;
- To develop users' institutions for the sustainable management of developed irrigation systems; and
- To enhance the knowledge, skill and institutional working capability of professionals, water users and non-governmental associations/organizations related to the development of irrigation sector.

Important features such as- participatory approach of irrigation management, focus on groundwater development (mainly STWs) for year round irrigation, river basin approaches of irrigation development, capability building of local users, etc., are also retained in the new policy. Some of the new provisions made by the Irrigation Policy, 2003 are:

- Empowerment of WUAs with required legal authority for administrating system operation and even collecting irrigation service fees (ISFs), especially in AMISs;
- Improvement in ISF collection by raising its rates based on the incremental production due to irrigation;
- Creation of a maintenance support fund under DOI;
- Involvement of private sector in managing public irrigation system; it also aims to involve private sector in irrigation development through the concept of BOOT (Built, Own, Operate and Transfer);
- Demarcation of land having irrigation facility and declare the same as irrigated area so that it remains free from encroachment;
- Transfer of possession and ownership of the irrigation infrastructure and the land, where such infrastructure are built to the concerned users;

- Initiation of non-conventional irrigation development program in marginal lands through adaptation of several technologies like water harvesting, cycle pump, treadle pump, drip and sprinkler irrigation with especial focus to poverty alleviation. The policy intends to implement this program through partnership with NGOs and private sector;
- Development of reservoir schemes for year-round irrigation. The policy encourages the potential production of electricity through such systems;
- Capacity enhancement of water professionals, local bodies and users for their effective participation in planning, construction and management of irrigation systems;
- Involvement of local bodies (DDCs and VDCs) in the development and management of small and medium irrigation systems;
- Application of quantitative monitoring system for the delivery of irrigation services to users through adequate quantity of water delivery for crops, irrigated area, and incremental agricultural production; etc.

## **2.4 Electricity Act 2049**

Electricity Act 2049 has provided for licensing the private sector for the generation, transmission and distribution of electricity. The maximum period of license will be 5 years for the project survey and 50 years for generation, transmission or distribution of electricity. However, no license is required for the generation, transmission and distribution of electricity up to 1000 kw. The Act guarantees that a license will not be issued for the second person in the same area. The license for conducting survey will be issued in 30 days and that for generation, transmission and distribution of electricity in 120 days. EDC provides a one window system for the applicant where the implications of several other sectors are checked and cleared by the Department itself instead of the applicant having to go around. However, the one window system has not been as effective as it should be.

The Act also provides for the appointment of the Inspector to carry out inspection and supervision which may be necessary from the point of view of following up the conditions of the license or the public safety or the environmental considerations.

There is an array of traditional incentives thrown open by the Electricity Act, 2049. They are:

- 1) Investors can come up in different formation such as purely private, government- private, national - foreign, national-foreign-government and so on.
- 2) Investors are given income tax exemption for 5 to 15 years.
- 3) Foreign exchange facilities will be provided for the foreign currency expenditures of the project and for the repatriation of the capital.
- 4) Assurance of the bulk purchase of power generated
- 5) The rate of electricity purchased to be calculated in a way that would pay back the total investment in 25 years.

## **2.5 Hydropower Development Policy-2001**

The Hydropower Development Policy, 2001 aims at propelling the economic growth and prosperity of the country by providing electricity at low cost and supplying to the people at reasonable prices through the optimal utilization of the available hydropower resources of the country. It pledges to integrate electrification with economic activities and to develop hydroelectricity to meet the domestic demand with due emphasis on rural electrification and export of surplus energy.

Hydropower Development Policy, 2049 also provides for the private development of hydropower for the internal energy needs as well as for bulk export and places the licensing requirement for the development of a project. The major objectives of the policy include the following

- Supply electricity as per the demand of the people in urban and rural areas;
- Enhance the development of hydropower to meet energy needs required for industrial and agricultural development;
- Motivate national and foreign private sector investment;
- Render assistance in the conservation of environment by supplying clean energy through hydro electric power.

## **2.6 National Water Supply Sector Policy (1998)**

This policy is comprehensive and embraces multifarious aspects relating to the drinking water supply sub-sector. It recognizes fresh water as limited and finite, and advocates demand management alongside supply management. It underlines the need for integrating "drinking water supply as a component of other water resources development projects whenever feasible".

An important feature of this policy is its approach towards " a shift from the traditional role of GON as a provider or implementor to a supporter or facilitator " in water supply and sanitation projects. It states: " The user groups and the local authorities shall be made fully responsible in the process of project formulation and operation/maintenance of the services." Four kinds of institutions are envisaged for this task, (i) municipality department operation, (ii) utility owned and managed by users' committees, (iii) independent public sector corporation and (iv) management contracts of whole or part of the utility functions to be handed out to a private enterprise. On the gender aspect, the policy advocates encouraging women's participation in all aspects of water supply planning, management, installation, operation and maintenance.

Cost recovery is another significant feature of the NWSS Policy. With due attention to social aspects, the policy states: "The tariff policy for urban water supply systems should incorporate adequate cost recovery based on differential consumption which also provides a life-line rate for low income households with low consumption and a penalty rate for excessive consumption." With respect to rural water supply and sanitation projects, the policy is just "to raise sufficient water charges from users in order to meet O & M expenses". Capital cost recovery is not mentioned.

The policy envisages "private sector participation in water supply and sanitation development and management through provision of mutual public / private incentives within an appropriate legislative framework." Establishment of an independent Utility Commission / Tariff Board is also contemplated for price regulation.

## **2.7 Agriculture Perspective Plan (APP)-1995**

The 1995 ADB-sponsored 20-year Nepal Agricultural Perspective Plan (APP) has identified irrigation as the key input for agricultural development taking into consideration a large still undeveloped potential of the irrigation sub-sector.

As agreed and approved by GON, the APP has, in its strategy for a growth, given first priority in accelerating the agricultural growth from 3% to 5% per annum through concentrated investment in four input priorities out of which irrigation is the foremost. In the hills and mountains, surface irrigation is emphasized to utilize all the potentialities of streams to double the year round irrigation

area. For the Terai, in addition to rehabilitation and effective use of existing surface irrigation schemes, new groundwater schemes mainly shallow tubewells (STWs) are considered vital for the first half of the plan period (1995-2015). In the plan, management goal of the irrigation efforts is to expand farmer ownership and operation. Nearly all the schemes presently under agency management should become either farmer managed for small and medium and convert into joint management for the large systems by the end of the period. The APP has proposed to enhance agricultural growth by 2% (from 3% to 5%) per annum thus reducing the rural poor to 30% by the end of the two-decade plan period.

The integrated and coordinated programs that are spelt out in the APP are not seriously taken up for action; and it is being reviewed at present. GON has also formulated new Agriculture Policy-2004, which has recognised the role of APP in directing development of the agricultural sector to only to a limited extent. The policy has a long-term vision of improving living standard of people through transforming subsistence agricultural system to commercial and competitive one.

The APP targets for the irrigation development by the year 2017 are presented in *Table 2.2*.

**Table 2.1 : APP Irrigation Targets by 2017 in Hectare**

S. No.	Area	Mountain	Hill	Terai	Total
1	Irrigated area under surface water	53000	293000	486000	832000
	Year Round Irrigation	(40000)	(197000)	(277000)	(514000)
	Monsoon Irrigation	(13000)	(96000)	(209000)	(318000)
2	Irrigated Area under ground water			612000	612000
	Total	53000	293000	1098000	1444000

*Source: APP, 1995*

## **2.8 Water Resources Strategy-2002**

In 2002, GON formulated a national strategy for the development of water resources sector with a goal of *‘living conditions of Nepali people are significantly improved in a sustainable manner’*. The WRS itself was prepared following a rigorous process of identifying first the issues in different sub-sectors and setting objectively verifiable targets for short-term (up to 2007), medium-term (up to 2017) and long-term (up to 2027). Several strategies have then been adopted to achieve these different sub-sectoral targets. Another noteworthy feature of the WRS is that it assumes Integrated Water Resources Management (IWRM) as the approach to the development of sector.

Policy principles that were used to guide Nepal’s water sector during development of the Water Resources Strategy include:

- Development and management of water resources shall be undertaken in a holistic and systematic manner, relying on Integrated Water Resources Management;
- Water utilization shall be sustainable to ensure conservation of the resource and protection of the environment. Each river basin system shall be managed holistically;
- Delivery of water services shall be decentralized in a manner that involves autonomous and accountable agencies (e.g., public, private, community and user-based agencies);

- Economic efficiency and social equity shall guide water resource development and management;
- Participation of and consultation with all the stakeholders shall constitute the basis of water sector development;
- Sharing of water resource benefits among the riparian countries shall be on an equitable basis for mutual benefit;
- Institutional and legal frameworks for coordination and transparency shall be an essential feature of water sector management; and
- Wider adoption of the best existing technologies and practices, and rapid innovation and adaptation of both institutional arrangements and new technologies, shall be ensured.

Though the government approved the WRS from the cabinet, it has never been used to address the issues in its subsequent plans. The tragedy is that the government has neither owned this document nor disowned. The subsequent governments are busy in the preparation of new action plans particularly in the field of hydropower sector. The 10,000MW in 10 years plan introduced in 2008 and 25000 MW in 20 years introduced one year later in 2009 are among the few plans which are not mentioned in the WRS.

## **2.9 National Water Plan (NWP), 2005**

The NWP is basically the set of activities (programs and projects) that are being or will be implemented to achieve the strategic targets. It was prepared to operationalize the Water Sector strategy of Nepal approved by the Government in January 2002. The Water Plan includes programs in all strategically identified output activities so that all these programs, in consonance with each other will contribute in maximizing the sustainable benefits of water use.

The broad objective of the NWP is to contribute in a balanced manner to the overall national goals of economic development, poverty alleviation, food securities, public health and safety, decent standards of living for the people, and protection of the natural environment.

The NWP is a framework plan to guide, in an integrated and comprehensive manner, all stakeholders for developing and managing water resources and water services. The NWP has developed a set of specific short, medium and long term action plan for the water sector including program and project activities, investments and institutional aspects.

Like the WRS, the NWP also has been jeopardized by the government with the announcement of new plans like the 10,000MW in 10 years and 25,000 MW in 20 years which have come merely as political slogans without any concrete financing plans.

## **2.10 Three Years Interim Plan (2007-2010)**

The Three Year Interim Plan has taken Water Resources Strategy-2002 and National Water Plan-2005 as a basis for designing the programmes of the water sector. Accordingly, the river basin approach in developing the irrigation systems, establishment of effective coordinating mechanism with stakeholders including women and deprived community in planning, implementing, and operation and maintenance of the subprojects are incorporated in the planning document. The interim plan stresses on sustainability of the existing as well as the planned irrigation projects through management transfer and capacity building of the farmers.

## CHAPTER-3

### Institutions Involved in the Water Sector

#### 3.1 The Central Water Agencies

##### 3.1.1 Water Resources Development Council (WRDC)

The body of WRDC is headed by the Prime Minister and consists of most of the Ministers holding important and related portfolios. It was originally constituted in May 1992 and was reconstituted in May 1994 to include representatives from each political party and also free lancers in this field. The main functions of the Council are to bring up a national consensus in the proper utilization of water resources and to identify the strategic policy planning.

The Council is especially aimed to get across the government policy and program on water resources to different sectors of the government as well as various political parties in order to secure a smooth sailing. Although the terms of reference seem to allow discussion on matters concerning a central agency, it is so far used as a forum only for controversial issues of water. By the way it is composed it seems least likely that regular strategy issues will be discussed effectively in the whole body.

##### 3.1.2 Water and Energy Commission (WEC)

WEC was set-up in 1976. It is constituted under the chairmanship of the Minister, MOWR, with Secretaries of MOWR, MOF, NPC, MOAC, MFSC and MFA and also two renowned persons from non-governmental agencies or private sector as members. The Executive Secretary of Water and Energy Commission's Secretariate (WECS ) serves as Member-Secretary to WEC.

Basically, WEC is an advisory body to GON in the field of water and energy resources development. It is supposed to conduct studies, surveys and investigations and provide policy recommendations. The main areas of responsibilities of WEC are as follows:

- i. To formulate short and long term policies in the field of water and energy development.
- ii. To prepare necessary laws pertaining to Water and Energy Development.
- iii. To do and cause to be done comprehensive survey and investigation of the total water and energy resources of the country
- iv. To make and cause to be made studies of the total requirements (the present and the future requirement) of water and energy resources in the country.
- v. To study and analyze the bilateral and multilateral programs pertaining to water and energy development and formulate policies.
- vi. To prepare and cause to be prepared programmes for the conservation, development and beneficial utilization of water and energy resources.
- vii. To study and analyze the national and international laws, and bilateral and multilateral efforts on international understanding and agreements for the development of the water and energy sector.

##### 3.1.3 Water and Energy Commission's Secretariat (WECS)

WECS was established in 1981 long after the parent body was constituted. The main functions of WECS are to provide technical support to WEC as also to carry out its decisions. WECS is headed by the Executive Secretary and consists of four Directorates: 1) Energy Planning Directorate, 2) Water

Resources Planning Directorate, 3) Social, Economic and Environmental Directorate and 4) Legal and Institutional Arrangements Directorate. Canadian International Development Assistance (CIDA) has made a tremendous contribution to strengthening its human resources capabilities as well as bringing up the status of research on water and energy in Nepal. WECS with CIDA's help has completed a number of useful studies on water resources and energy in the past.

It is staffed with competent manpower in different disciplines necessary to do the central agency function. It could also play a vital role of policy resourcing to the policy and planning unit of the newly formed Ministry of Irrigation (MOI) and the Ministry of Energy(MOE) by dissolving the Ministry of Water Resources (MOWR). But presently WECS is not well fitted into the planning and policy formulation process relating to the water resources development. The limitations of WEC to function as central water agency and the plan preparation and policy resourcing unit to MOI and MOE are as follows:

- 1) lack of statutory authority and mandate
- 2) lack of structured relationship in the planning process and policy resourcing process
- 3) lack of status
- 4) the Commission members are not full time workers
- 5) lack of regulatory authority
- 6) lack of authority to generate needed hydrological data
- 7) lack of basin and district coordinating mechanism.

#### **3.1.4 Department of Hydrology and Meteorology (DHM)**

The Department of Hydrology and Meteorology (DHM) is under the Ministry of Environment. DHM started its function from 1967. Before this, the function of this Department was being done in the form of a UNDP project. However, later the Department was merged as a wing in DOI for some time and came into the present form late in 1987.

The central organization of DHM has four divisions. It has three basin offices at the field level, namely-Koshi Basin, Narayani Basin and Karnali & West Rapti Basin Office, covering the total activities in the country. The Department is operating a total of 176 river gauging stations. It also maintains a nation-wide network of 337 precipitation stations, 25 sediment stations, 68 climatic stations, 22 agro- meteorological stations, 9 synoptic stations and 6 aero-synoptic stations. The mandates of the Department include collection and dissemination of hydrological and meteorological information for water resources, agriculture, energy and other development activities; issue of hydrological and meteorological forecasts for public, mountaineering expedition, civil aviation and for the mitigation of natural disasters.

The general data are at present made available free of cost in the form of publication. So are the meteorological data for aviation, tourism, etc. But when data are generated and collected for specific purposes for some party, private or public, the cost is charged or the task is performed under contract. However, the sectoral agency gives very low priority to the collection of data. There is given very low priority for the data collection. This tendency has put DHM to run in very low profile.

There is no restriction whatsoever in the release of the data as there is found no serious interest at the national level in the generation and supply of hydrological data.

DHM can be considered to run in a self-sustained basis. That is, it can work on demand of the consuming sectors on charge basis so far as the project specific data are concerned. This will provide work- incentive for the employees and lead to an expansion of their business. There is a good scope to turn this business

to a public sector enterprise. This may have to be achieved in two stages : one, a phase of undertaking consultancy work on contract, and the second to run the whole programme in a self - sustained basis.

### **3.2 Policy Level Institutions**

#### **3.2.1 National Planning Commission (NPC)**

NPC is the highest planning unit having a planning jurisdiction over all the Ministries and public sector agencies in GON to formulate the periodic and annual plan and oversee its implementation but in an advisory capacity. The Commission is constituted under the chairmanship of the Prime Minister and with full time and ex-officio members. It does its functions under the broad directives given by the National Development Council which is a larger body comprising knowledgeable people from all walks of life so as to represent all sections of the nation. The main functions of NPC can be stated as follows:

- i. to formulate periodic plans on the basis of long term goals
- ii. to formulate annual plans within the framework of periodic plans
- iii. to issue directives to concerned Ministries and Departments and public sector agencies in connection with the formulation of development plans
- iv. to collect data and conduct research which are necessary for the formulation of national development plans
- v. to estimate internal and external resource each year and suggest ways and means to increase
- vi. to monitor and evaluate development projects

NPC has no source of statutory authority to pull in discharging the above functions except consultation with it on very limited items (such as targets amendment, feasibility study of the large projects etc.) made binding on sectoral agencies by the GON's Transaction of Business Rules. The only other way that it can exercise the formal authority is to attract the approval of the Prime Minister who is its chairman. But constitutionally every Minister is individually and collectively responsible to the parliament for his/her portfolio of responsibilities which has created an ambiguity as to how far the Prime Minister could go to meddle with the routine matters of the Ministers (especially when it is not one party government) unless it is a cabinet issue. Secondly, NPC's members are the political selection made by the cabinet decision which puts a limit to the extent to which they can displease the individual Minister.

Such a situation in the Nepalese context has by this time created for NPC the tradition of a subsidiary role to play rather than one of independent public body of experts. The staff provided to NPC has not been their choice, nor is it a specialized workforce belonging to a planning cadre - usually it is found to be a shunted staff. The NPC's organization itself is being designed after the bureaucratic way rather than a research and study entity. This is how NPC is incapacitated in discharging its public functions.

As a result the sanctity of planning priorities is usually flouted by political interests and planning document becomes a package of all good programs beyond the capacity of the organization and the resources. The planning directives issued by NPC have tended to be stereotyped and the annual planning has come to be the authentication of the Ministry's wishes. There is very little that NPC can assert as planning norms, priorities and strategies to be observed and followed by the Ministries, nor is it adequately equipped to closely monitor the agencies' activities and evaluate their performance on plan implementation. The two planning review meetings taking place every year generally end up with ritual proceedings.

### **3.2.2 Ministry of Irrigation (MOI)**

The Government of Nepal has recently formed two ministries the Ministry of Irrigation(MOI) and the Ministry of Energy (MOE) by dividing the then Ministry of Water Resources (MOWR). MOWR was one of the few oldest Ministries of GON with the mandate of developing water resources policy, plans and programs pertaining to irrigation and electricity. With the division of MOWR, a large number of plans and policies require to rewrite in order to address the particular policies of irrigation and energy. The MOI will be responsible for the matters related to irrigation and the water induced disaster prevention. Department of Irrigation(DOI) and the Department of Water Induced Disaster Prevention (DWIDP) are the two departments under this ministry. MOWR had at one time jurisdiction over irrigation, hydro-power and drinking water but the last sub-sector of water has gone out from MOWR to MHPP from 1989. Also watershed protection is under the jurisdiction of Ministry of Forest and Soil Conservation. There has been frequent changes in this sector.

### **3.2.3 Ministry of Energy (MOE)**

All the works related to hydropower that used to be looked after by the MOWR come under the jurisdiction of the newly formed Ministry of Energy. It provides license for survey, generation and distribution of electricity. A detailed work description of this ministry is yet to come from the government but at present this ministry is working with the hydropower sector only because other components of the energy viz. the petroleum fuel, solar energy, biogas, etc are under the jurisdiction of other ministries.

The new trend in the government as a whole and the hydropower sector strategies in particular call for a definite role of MOE. Water professionals criticize this decision of the government not being friendly to the water sector and demanded to revoke the decision. The executive members of Jalshrot Vikas Sanstha (JVS) recently met the Prime Minister to show their dissatisfaction in this decision of the government.

### **3.2.4 Ministry of Physical Planning and Works (MPPW)**

MPPW is responsible for drinking water supply at the policy making level since 1989. Earlier, drinking water supply was the responsibility of MOWR. The reason given for the shift was that the drinking water supply was a part of the housing concern which is completely a utilization aspect. Therefore, the placement of the water supply aspect in MPPW has created some problem in the aspects of water resource management as well as integrated water resources development. Within MPPW there is a separate Division in charge of a Joint Secretary to look after the drinking water supply. The main responsibilities at the Ministry level lie in developing policy strategies and institutions, arranging finance, making inter-sectoral coordination and monitoring and evaluation. Under MPPW there are DWSS and NWSC which we will discuss later under the section 'Operational and Implementing Agencies.'

## **3.3 Implementation Level Institutions**

### **3.3.1 Department of Water Supply and Sewerage (DWSS)**

DWSS was established in 1972 prior to which water supply was looked after by the Irrigation and Water Supply Department. Now, DWSS is the Lead Government Agency in water supply and sanitation sector in Nepal. It has envisioned improving health & hygiene condition of Nepalese people through the provision of access to water supply services & appropriate sanitation facilities. The mission of DWSS is to providing access to at least basic level of water supply services and sanitation facilities to all the people of Nepal. DWSS has its office in all the 75 districts of Nepal with 5

Regional Level Supervision & Monitoring Offices, 43 Divisional Offices and 27 Sub-Divisional Offices.

At present the role of DWSS has been transformed from a program implementer to facilitator. In order to successfully play such role DWSS need to provide necessary technical and managerial support to the local communities. Also, it has to support local authorities in preparing periodic plans, project preparation, preparing plans for repair maintenance and rehabilitation of the system, developing middle level skilled manpower for service operation, and collecting updating and disseminating services related information to the people. The service level of DWSS is mostly focused in the basic service level which is defined by the five indicators as given in the Table 3.1.

**Table 3.1: Water Supply Services Level Indicators**

Service Level	Indicators				
	Quantity	Quality	Accessibility	Continuity Hours/ day	Reliability Months/ year
High	112 ~ 150 Liters	WHO Water Quality Guidelines	Fully plumbed house connection	24	12
Medium	65 Liters	National Water Quality Guidelines	Yard Connection (within premises)	12	12
Basic	25 ~ 45 Liters	Potable	Stand post (within 20 min. walking distance)	4	12

The main activities of DWSS can be summarized as below:

*A. Increasing Coverage*

1. Water Supply : Demand Driven Community Based Approach
  - Programs on GON regular budget
  - ADB Aided Community based WSS Project
2. Appropriate Level Sanitation and Sewerage Facilities

*B. Improvement of Quality Services*

- Water quality improvement program
- Service level improvement program (on cost sharing basis)
- Arsenic (in drinking water) mitigation program

However, there are certain issues and constraints in DWSS. The growing dependency on external resources which is up to 70% of the sector budget for aided program is the main issue for a sustainable development in this sector. Also, there is a lack of funding for research and development activities. Lack of coordination among stakeholders and institutions causing duplication of works, and low priority for repair, maintenance and rehabilitation works because of low budgetary allocation in this area are other issues of this sector. The on-going political conflict in different parts of the country is posing serious problem in the implementation of various programmes in this sector.

### 3.3.2 Nepal Water Supply Corporation (NWSC)

NWSC was established in 1989 to replace Water Supply and Sanitation Board (WSSB) which started as a project in 1974 under the World bank loan to improve water supply system in the Kathmandu Valley and Pokhara in Phase I, Birgunj and Biratnagar in Phase II and 8 other urban areas (Banepa, Dharan, Janakpur, Birgunj, Hetauda, Butawal, Bhairahawa and Nepalgunj) in Phase III. The operation and maintenance responsibility of 13 municipal water supply systems carried by NWSC out of 36 urban systems (the rest is with DWSS) is thus just a historical inertia rather than any logical division of works.

GON has to chalk out an arrangement for the transfer of the water supply system in all the Municipal areas. The outside urban water supply systems suffer from lack of demand for pipe connections (due to free tubewell water) in some areas and lack of efficient management in all. Both are sure to find a solution under rational management operation. The Municipal body can decide to run them in a feasible size and add attractive incentives to get it run by the private sector. The Municipal body can also decide to cross subsidize the water supply system for a given period of time where it is not commercially feasible or beyond local affordability. NWSC has only to make available to the operating agency necessary technical manpower and assistance if need be.

There is a vast scope of improving supply in the Kathmandu Valley both in terms of coverage of population, supply hours and quality. Presently only less than 40% of the potential customers is being served and only with 6 hours supply. The quality of water and the service is anything but satisfactory.

In view of the deficit in the water supply, GON in collaboration with NWSC and some other private companies has set up the Melamchi Water Company to augment the supply. The total cost goes up to rupees 12 billion. This is the first venture of private investors in the water supply enterprise in Nepal. The company will by a diversion scheme on the Melamchi river deliver to Kathmandu by its 36 kilometre long tunnel a supply of raw water of the order of 127 million litres per day. This will be a big addition compared to the present status of 120 million litres in the wet season.

The entry of Melamchi Water Supply Company has unfolded a vista of new enterprises in the area of water supply in Kathmandu Valley in days to come: 1) There is the possibility of an enterprise in the area of filtration and treatment of raw water delivered by Melamchi Company. The treated water can be delivered by the main pipe to different points of distribution where it can be metered out to retailers. 2) There can come up many retailing companies to distribute water to consumers and offer a competitive price and service to their customers. 3) Some private sector company may specialise in meter reading and the collection of revenue and 4) still some will specialize on maintaining and expanding the system.

However, the progress of work in this project has been seriously affected by various demands of the local people including their right to the water, land and jungle. These people are also demanding a separate federal state on the basis of ethnicity and the Melamchi Water Supply Project always becomes victim of these demands.

In this changed scenario, NWSC will have to decide its own future role. NWSC can come up as a co-investor with the private sector in the installation and operation of the treatment plant. NWSC can check the standard and quality of water in treatment and distribution. The inherent area of competence of NWSC will be the expansion and maintenance of the system because this will have to do more of technical works and less of service to the community.

### **3.3.3 Kathmandu Upatyaka Khanepani Limited (KUKL)**

Kathmandu Upatyaka Khanepani Limited (KUKL), a public limited company was established in 2007 under the “Company’s Act” under a Public Private Partnership (PPP) model. The current shareholders of KUKL are the Government of Nepal (GON), Municipalities within the Kathmandu Valley (Kathmandu Metropolis and Lalitpur Sub-Metropolis), Federation of Nepalese Chamber of Commerce and Industries (FNCCI)/Nepal Chamber of Commerce (NCC) and the Employees Trust. The Board of Directors of the company consists of seven members including three independent Board Members.

A thirty-year license was granted to KUKL on 13 February 2008 by the Kathmandu Valley Water Supply Management Board (KVWSMB) for operating the water supply and sanitation services in the service areas within Kathmandu Valley. KUKL took over responsibilities to operate the water supply and sanitation services under this license and a lease agreement for the same period (between KVWSMB and KUKL) on 13 Feb 2008.

### **3.3.4 Rural Water Supply and Sanitation Fund Development Board**

Government of Nepal created the Rural Water Supply and Sanitation Fund Development Board, on 14th March 1996 to promote sustainable and cost effective demand-led rural water supply and sanitation services in facilitation of Non-governmental and Private Organizations with full emphasis on community ownership in conformity with the Government's Eighth Plan (1992-97), Ninth Plan (1997-2002) and Tenth Plan (2002-2007) sector policies, which aimed at fundamental changes in rural water supply and sanitation service delivery mechanism in the country. The Ministry of Physical Planning and Works is the line ministry for the Board.

The Board is designed based on the experience of a field tested pilot project, acronymed 'JAKPAS' (the Nepali acronym of *Janata Ko Khanepani Ra Sarsafai Karyakram* - meaning People's Water Supply and Sanitation Program). Preparation studies for the pilot were carried out with funding by the United Nations Development Program (UNDP) and a grant from Japanese Grant Facility (JGF). The World Bank executed the pilot for a period of three years, during 1993-96, financed by two additional JGF grants.

The Board has completed its First Project (1996-2003) successfully and entered into Second Project (2004-2009) to support rural communities on implementation of water supply and sanitation schemes. The Board is being funded by World bank (IDA) and DFID.

The Board has a practice of conducting i) short term sustainability studies of schemes completed 3 years back and ii) long-term sustainability studies schemes completed 5 years back. The findings of these studies carried out in 2007/early 2008 for Batch - I schemes (6-10 years in operation) and Batch II schemes (5-8 years in operation) showed 76% and 78% sustainability rate (assessed using weighted scores for social/environmental (20 points), financial (15 points), institutional (35 points) and technical (30 points) criteria). It is noted that the Board is the only institution in the RWSS sector conducting this type of study considering all the four major dimensions to assess the sustainability of the scheme by employing third party services agencies.

The Board provides grant assistance to communities and SOs for the implementation of rural water supply and sanitation programs, which also integrates the following components:

1. community organization and mobilization;
2. non-formal education (NFE);

3. health, hygiene and sanitation education (HSE);
4. capacity building of SOs/SAs and communities;
5. environmental management;
6. school sanitation program;
7. skill-based training;
8. women's technical support service linking to income generation;
9. micro-irrigation; and
10. other programs to support sustainable and cost-effective water supply and sanitation development.

The Board follows a scheme cycle of about 37 calendar months required from Social Organizations and scheme selection to scheme completion. Each financial year a new batch of schemes with a new scheme cycle is introduced. Each scheme-cycle consists of three main phases as briefly described below:

**The Pre-development Phase** of a scheme lasts about 12 months and begins in October of any given year. Its main objective is to identify and select SOs and schemes that meet Board's eligibility criteria to enter into partnership between the Board, SOs and communities.

**The Development Phase** lasts about 12 months and begins in November of the second year with development phase contracts concluded between the Board and the SOs. In this phase, community organize institutionally and prepares scheme plan as a proposal for implementation phase. The community capacity would also be appropriately strengthened. Only those communities who successfully complete the development phase activities, and are willing to participate in the implementation phase, submit implementation phase proposals.

**The Implementation Phase** lasts about 13 months and begins in August of the second year. Tripartite implementation phase contracts are concluded between the Board, SOs and the communities, represented by WSUCs. The outcome of the implementation phase is the consolidation of all development and implementation phase activities, a completed and functioning water supply and sanitation scheme, and trained WSUC, VMW and community members to operate and maintain the scheme.

**The Post Implementation (Follow-up) Phase** lasts for 24 months after completion of the scheme. The primary objective of this phase is to follow-up on sustainability factors that include social, environment, institutional, financial and technical matters. During this phase SO will conduct quarterly follow-up sustainability monitoring units and provide technical support required to the community.

### 3.3.5 UNICEF

UNICEF's cooperation with GON started from 1970 and occupied a very important place among the donor agencies. The activities of UNICEF mainly included community water supply and sanitation (CWSS) for gravity flow water supplies in the hills, Terai Rural Water Supply and Sanitation with shallow tubewells in the terai areas and construction of household and institutional latrines. Also training of WSS technicians and other technical training courses, organization of special workshops and seminars and delivery of health education and personal and environmental hygiene education were conducted. UNICEF not only assisted to implement projects but also helped enormously to build village capacity for operating and maintaining completed projects by involving beneficiary people actively in the different phases of implementation process.

### **3.3.6 Department of Irrigation (DOI)**

The Department of Irrigation under the Ministry of Irrigation is responsible for the development and management of surface and groundwater. The functions of the Department are (a) planning, design and implementation of major and minor irrigation systems; and (b) sustained operation and management of the completed systems. The Department also plays a major role in designing the irrigation policy. The central organization has five divisions, each headed by a Deputy Director General. Director General is the chief of the organization.

Groundwater is widely used for drinking purposes in the Terai region and in the Kathmandu Valley. Large scale conflict of uses has not arisen yet because groundwater extraction for irrigation purpose in terai is still at a low level. With the expected increase in the use of groundwater for irrigation under the Agriculture Perspective Plan (APP), this will bound to affect domestic use. The situation of Kathmandu Valley has taken a serious turn because the extraction is three times greater than the recharge. Groundwater is being mined rather than harvested. Pollution is another serious matter for regulation and administration.

The National Irrigation Development Committee has been formed with a view to coordinating irrigation programmes and to utilize limited resources. The Minister is the Chairman of the Committee. The Committee includes members from various ministries, departments and related agencies. There is also a Groundwater Resources Development Board chaired by the Secretary of the ministry with membership from various ministries, departments and related agencies.

### **3.3.7 Department of Electricity Development (DOED)**

DOED is comparatively a newly set-up Department constituted at an operational level under MOWR in 1993. The main objective of this Department is to promote private investments in the generation, transmission and distribution of hydro-electric power as also to issue license for the private sector enterprises and regulate and inspect them. DOED is also responsible for conducting survey, investigation and feasibility study of multi-purpose projects and making a basin master plan. DOED, now comes under the newly formed Ministry of Energy.

The strategic functions of this Department comprises 1) Projects preparation, 2) Promotional activities, and 3) Privatisation.

#### *Projects Preparation*

One of the basic functions of DOED is to conduct necessary studies so as to prepare projects and make them available for investors in order to meet the demand for power. However, at present there is no such activity going on in the Department because of budget deficiency. To depend on the NEA's survey and study works in the present context is anomalous. Investors usually do not find much choice in the existing stock and would, therefore, prefer to survey and investigate new projects themselves.

#### *Privatisation*

GON has by its Hydropower Policy of 2049 and the subsequent Electricity Act has declared its policy of inviting the private sectors in the development of hydro-power resources. The policy has both short and long range objectives. In its short range view, the policy aims to get the private sector involved in the generation, transmission and distribution of electricity. There is a need to propagate small hydro-electric projects in the hilly and remote Himalayan region where the national electricity system has not been extended or would not be extended in the near future. Also, it has been of utmost necessity to extend distribution of electricity in rural areas in order to help develop agricultural production and cottage and

small scale industries. In the longer perspective, however, Nepal has got to make strategic use of its immense hydro-power potentialities for the national economic development. This means generation of more power for accelerating general industrial development, initiating specific power intensive industries, export of the surplus to improve the trade deficit and to hold a better negotiating position in the international trade.

National and international private sector investment in the hydropower sector of Nepal has already started to come. DOED has recently issued license to GMR-ITD Consortium, and Sutluj Jalvidyut Nigam of India to construct the Upper Karnali Hydroelectric Project (302 MW) and Arun-III Hydroelectric Project (402 MW) respectively on the basis of Build Own Operate and Transfer (BOOT) principle. This is one of the major breakthrough in the involvement of international private sector organizations in the hydropower development of Nepal

### **3.3.8 Nepal Electricity Authority (NEA)**

Nepal Electricity Authority was established in 1985 as a public corporation with the franchise for power generation, transmission and distribution throughout Nepal and engages in power exchange with India. NEA's responsibilities include 1) supporting GON to determine long term and short term power policy, 2) generating, transmitting and distributing electricity, 3) planning, constructing, operating and maintaining power stations, distribution systems and all associated facilities required to provide electricity.

NEA practically started four functions together: project preparation, project financing, constructing new projects and distributing the power. As a matter of fact, NEA has been made responsible for recommending short term and long term power supply policy to GON by NEA Act. Thus NEA became almost a monopoly in the development and sale of power.

However, NEA is not able to meet the tremendous gap between the supply and demand of power in Nepal. There was an 11.31% growth in peak power demand and 10.76% growth in energy demand in the last fiscal year 2007/08. In the dry months, shrinking of snow fed rivers further worsens the situation resulting in the load shedding to every customer. Because of this gap in the supply and demand, last year, NEA went for a load shedding of up to 18 hours a day (including the capital Kathmandu) in the winter season. This situation will worsen in the years to come if timely measures are not taken by the government.

Another factor affecting the management of hydropower is the low ratio of the average to the peak load of the system. In the last fiscal year 2007/08 the average peak load of the system is only 55.2% of the peak load which indicates that the peak load of the system needs to be flattened by employing various measures under the demand side management. A large volume of storage capacity is urgently required to balance the system against time of the day and the seasonal variations in demand and supply.

Of the 1.5 million customers 95.66% belong to the domestic category accounting for 42.52% of the total energy sale and 40.66 % of the total revenue earned in the fiscal year 2007/08. Industrial customers though representing only 1.67% of the total customers have significant contribution amounting to 38.81% of the total energy sales and 35.93 % of the total revenue earned in the fiscal year 2007/08.

NEA has started to construct some of the projects to meet this power demand. The important projects are Chameliya (30MW), Kulekhani-3 (14 MW), Upper Tamakoshi (302 MW) and other small hydropower projects viz. Haldung Small Hydropower (500 kW), Gamgad Small Hydropower(400kW) etc. Because of unlimited number of demands by the local people, the construction time and cost of the project is going to increase.

### 3.4 Regulatory Institutions

As the government has opted for a policy approach of getting the community organizations, NGOs and the private sector to gradually take over the functions of the public bureaucracy in producing goods and delivery of services, it has become necessary on the part of the government to provide for an appropriate institutional mechanism for their regulation. The more the government sends the programmes out to the community organizations and the private sector, the more will be the responsibility on the part of the government to see that these functions are being carried out properly and in the interests of the consumers. The purpose of regulation, however, is not to put restriction. Regulation needs to encourage or promote competition for better service and its sustained use.

The Water Resources Act, 1992 and the related regulations provide for a set of instruments for regulation of the use of water. As the ownership of water resources is vested on the government, the use of water is regulated through a system of permits. A system of license has been introduced. **The District Water Resources Committee** in each of the 75 districts is empowered to grant license for their utilization. Domestic uses have been put outside the domain of licensing for practical reasons. The Committee is chaired by the Chief District Officer and includes members from various district-level sectoral offices. They include district-level offices of agriculture, forestry, water supply, irrigation, project office of electricity, if any. The Committee also includes representative from the District Development Committee and the Local Development Officer is member-secretary. The office of the Local Development Officer is designated as the secretariat of the Committee. The Water Resources Regulations also provide for a joint meeting of two or more district committees if the related use extends beyond the jurisdiction of one district. Similarly, the Secretary of the MOE (split ministry from MOWR) grants permits for survey, generation and distribution of hydropower. In this case, the DOED processes the application for a request for license.

The WRA and the regulations under the Act provide for dispute resolution mechanisms. A **Water Resources Utilization Investigation Committee** at the national level has been provided, the membership of which consists of a representative of the MOWR as chairman and one representative each from the concerned DDC and the regional office of the National Planning Commission Secretariat. If the dispute is related with two or more districts, one representative from each of the concerned DDCs will be the member of the Committee. The Regulations provide for the guidance of the Committee detailed factors to be considered while deciding on the dispute. The Water Supply Regulations under the WRA, on the other hand, provide for two committees for the resolution of the dispute, one for water users' association and the other for individuals. The committee is called **Water Source Dispute Resolution Committee**. The Committee for water users' association consists of the DDC chairman as Chairman and representative of the District Irrigation Office, Administrative Officer of the District Administration Office as members and the Chief of the District Water supply Office as member-secretary. The Committee to decide on the dispute relating to water supply systems operated by individuals consists of a member nominated by the government as Chairman and one representative each from the MOPPW and the MOE and Chief of the District Water Supply Office as member-secretary.

The **Electricity Tariff Fixation Commission (the ETFC)** under the Electricity Act, 1992 has been established for fixing the tariff of electricity. The membership of the Commission consists of a representative of GON and other members include an economist and five others from among the agencies relating to generation, transmission and distribution and the consumer. The tariff is fixed after consideration of various factors including the rate of depreciation, return for the investment, royalty, operation cost and the consumer price index. The tariff is revised as and when necessary.

### **3.5 INGO Sector**

Several INGOs and NGOs are engaged with RWSS activities throughout Nepal and they have made significant contribution in the sub-sector. Involvements of NGOs and INGOs with the sub-sector activities at a time when additional resources in terms of both institutional and financial support are needed to complement and supplement the efforts of the government are welcome. REDD BARNA, GTZ, Action Aid, Save the Children (USA), Luthern World Service, Water Aid, Nepal Red Cross Society, United Mission to Nepal, South Asia Partnership (SAP), CARE, NEWAH, EASTAP, are some of the NGOs and INGOs who are active in WSS projects. A few of them has been described in the following section.

#### **3.5.1 Water Aid Nepal**

WaterAid began its water, sanitation and hygiene work in Nepal in 1986 and has continued despite the political instability and conflict in the recent past. It has aimed to improve the lives of poor people through its work with non governmental organizations (NGOs) partners, which in Nepal are: Nepal Water for Health (NEWAH), Lumanti, Environment and Public Health Organisation, Urban Environment Management Society, Centre for Integrated Urban Development, and NGO Forum. WaterAid also supports the Federation of Water and Sanitation Users Group (FEDWASUN) - a network with more than with 700 water and sanitation users groups representing 50,000 households - to make the voices of poor people heard by the local governments and service providers at the national level.

Ensuring the quality of water sources is a major challenge. In the Terai arsenic has been found in 17% of wells. WaterAid and its partners use arsenic detection and mitigation methods to keep wells safe. Falling water tables and ground water pollution pose additional challenges to providing water and sanitation services to poor people in Nepal.

In the hills projects use gravity flow piped supplies where water can be transported by pipe work from natural springs to tapstands placed near to homes, thus reducing the drudgery involved in carrying water a long way. In Kathmandu traditional wells are rehabilitated and shallow tubewells installed. WAN has carried out education on hygiene practices in communities, maximising the health benefits of improved water and sanitation services. Water-related diseases are common in Nepal but for the majority of the population the causes of ill-health are shrouded in superstition.

Hygiene education is always included in WaterAid projects so that communities learn the importance of handling water safely and associated hygiene practices. Hygiene education tiles on the walls of some villages' public latrines, depict images to promote the importance of washing hands after visiting the latrine or of washing vegetables before cooking. Other promotion methods include role play, puppet shows, songs, home visits and practical lessons.

#### **3.5.2 Helvetas/Nepal**

Helvetas/Nepal is working in the drinking water and sanitation sector in Nepal from more than 20 years. It has supported Self Reliant Drinking Water Support Programme (SRWSP), developed on the basis of its experiences in the Western Development Region (WDR) of Nepal. Significant achievements are in the field of social mobilization of the communities; the women in these communities; sanitation; capacity building of partners; and provision of high quality drinking water systems. Many of the problems in drinking water and sanitation sector are related to improper management of the water sources, which include frequent cases of source disputes; improper planning and use of the water sources. Helvetas Nepal's *modus operandi* involves defining wards and Village

Development Committees (VDCs), which are closer to the people for this type and scale of development work, as planning units. Through step-wise procedure and participatory planning, Helvetas/Nepal facilitates the formation of Water Resource Management Sub-committees (WRMSCs) at the ward and community levels. The WRMSCs represent themselves in a larger Water Resource Management Committee (WRMC) together with VDC members. Social and technical assessments of potentials, needs and possibilities regarding water source, distribution and usage are discussed and decided among WRMC members, which finally takes the shape of an officially recognized local water resources master plan for the VDC, which is called the WUMP. A WUMP covers four components of water resources management pertaining to water supply and sanitation, irrigation and drainage, environment and ecology and other issues like energy and power.

Helvetas/Nepal, in the irrigation sector, has implemented the Local Infrastructure for Livelihood Improvement Project (LILI). It intends to enable rural communities to build and sustain their infrastructures while strengthening local organizations to provide the necessary support services to communities. Main features of the LILI Programme are as follows:

- Communities build and manage in an equitable way reliable farmer managed irrigation schemes and appropriate public rural infrastructures.
- Capacity of technicians, local institutions and organizations for constructing local infrastructure is enhanced.
- The focus of LILI is on small irrigation schemes below 25 hectares, rural marketing and collection centres of agro-forestry products and rural service centres for health and education
- Demands for more than 205 community infrastructures have been brought forward by communities, most of these being irrigation schemes
- User's Groups take lead and are the main implementers
- Local Service Providers (LSP) provide support to User's Groups, and are undergoing capacity building by LILI
- External Service Providers provide expert support to LSPs and enhance their capacity; they advise on more complex infrastructures
- Local bodies of government as coordinators and facilitators

### **3.5.3 Jalshrot Vikash Sanstha (JVS), Nepal/ Nepal Water Partnership**

Jalshrot Vikash Sanstha (JVS), (Association for Water Resources Development), Nepal is a non-governmental, non-profit and non-partisan professional organization and was brought into being in 1999. It works in the field of water resources development and helps formulate policies on Integrated Water Resources Management (IWRM). It works as Nepal Water Partnership (NWP) office which is a local level institution of Global Water Partnership (GWP). JVS is involved in many projects in the field of water resources. It also works as a forum to the water professionals to discuss the various issues in water sector and provide feedback to the government from time to time. It is the only institution which reacted mostly and showed its concern with the government's decision of split of the MOWR into the Ministry of Irrigation and Ministry of Energy and submitted a memorandum to the Prime Minister.

### **3.5.4 Farmers Managed Irrigation System Promotion Trust (FMIST)**

FMIST was legally registered with the Government under the Association Registration Act 2034 BS in June 1998 as a non-profit, non-partisan, nongovernmental professional organization. The trust is moving ahead in the following identified area of program activities:

- Providing FMISs their due recognition, thereby enhancing them for their organizational and management innovations, and indigenous performance;
- Promoting the values of the FMISs in the wider context and sharing of information about their institutions;
- Bringing them into the global stream of creativity, well being and self governance in a way that makes themselves aware of the values and uniqueness of their own institutional assets;
- Disseminating the knowledge on FMIS through seminars, dialogue, workshops and research contributions; and
- Developing human resources through applied research, education and training in FMIS

The specific objectives of the trust are:

- (i) to annually recognize one FMIS by awarding it for its best practice in an operational theme that helps in sustainable organization, management and technology for an irrigated agricultural system;
- (ii) to provide the representative of this FMIS the latest global exposure and orientation to the irrigated agricultural system development and management practices;
- to globally disseminate the basic features of the Award winning FMIS;
- (iv) to conduct and encourage FMIS related research, education and training that directly helps to promote a knowledge-base on FMIS; and
- (v) to provide a forum for national and international dialogue on FMISs

### **3.5.5 Nepal Water Conservation Foundation (NWCF)**

NWCF promotes sustainable development and management of water through knowledge building and disseminating to be used in informed decision making. It undertakes research and promulgates findings through education and advocacy with a specific focus on capacity building of the upcoming generation as well as disadvantaged groups. It also publishes *Water Nepal*, an interdisciplinary journal on water management

### **3.5.6 Nepal Water for Health (NEWAH)**

NEWAH is involved with an objective of improved quality of life (socio-economic status) of the Nepalese people by providing services in safe water, health sanitation and livelihood opportunities. It implements integrated drinking water, health hygiene improvement and sanitation within a gender and poverty framework. Its support has enabled about 7,50,000 people get access to services. It has also involved in the drinking water sector as catalysts and social auditing organization.

NEWAH is helping communities to manage water and sanitation improvements and change their hygiene practices. It has piloted the establishment of a SaniMart to increase the accessibility of latrine parts in the Udayapur district in the Eastern region. SaniMarts are easily accessible shops, staffed by trained sanitation promoters, where latrine construction materials, which are usually hard to come by, are sold at affordable rates.

### **3.5.7 International Development Enterprises (IDE)**

IDE has been working in Nepal since 1992. IDE programs take a market-based approach by creating sustainable market systems that improve access to clean water, micro-irrigation, diversified agriculture, and economic opportunities. IDE in Nepal has about 106 staff and is implementing 10 projects in more than 24 districts covering the plains, hills and mountains. The program objective is sustained poverty alleviation through market participation of the poor as producers, buyers and sellers of products and services.

## Chapter-4

### Integrated Water Resource Management and Sustainable Development

#### 4.1 General

Since the 1992 Dublin Conference, Integrated Water Resource Management (IWRM) has increasingly been recognized as the holistic, people and environment focused paradigm by which water should be managed; a message that has been further reinforced at the 2nd World Water Forum in the Hague, the Bonn International Conference on Freshwater and many other national and international fora. These gatherings sought to breakdown sectoral and disciplinary boundaries, to ensure that water is managed at the most appropriate level, by the most appropriate people, and in a manner that acknowledges the rights of other uses and users. The Ministerial Declaration at the end of the Hague World Water Forum in 2002 advocated sustainable water resource management as a way of protecting ecosystems. Its underlying purpose was to assure water security in the 21<sup>st</sup> century.

Poor or marginal communities risk losing out to larger, more focused, and better organized competitors (commercial agriculture, industry, etc.) in water user fora. Priority should be to ensure that communities - and the individuals and households who make them up - become winners rather than losers in IWRM. This will entail focusing on the community level of IWRM; strengthening communities' skills in decision-making and negotiation- while at the same time empowering communities and helping local level support agencies to provide the necessary backup.

Natural resources like water are instrumental and critical in developing sustainable community based facilities. IWRM approach is essential in planning, developing and managing available water resources. It can minimize water source use conflicts and can reach to their resolution. It has been widely accepted in different fora that conservation and protection of water resource for the productive use of water and gender balance is possible through IWRM.

#### 4.2 IWRM framework and Practices in Nepal

Although experiences in Nepal vis-à-vis IWRM approach are limited, there are several avenues where this approach attaches greater significance. Sustainability of IWRM at the micro level is dependent largely on the community, which should be responsible for the decision-making as well as implementation and management of interventions done at the local level. The issues of conservation, appropriate and efficient management leading to equitable allocation of resources, capacity building and sustainability with gender balance are the key issues to a successful planning and implementation of IWRM policy at the micro / community level.

Water resources development has been accorded a high priority in the national development context in Nepal. There have been several acts and regulations, which have been promulgated by the Government (discussed in Chapter-2) to effectively facilitate sustainable development of water resources in particular at the local as well as national level. It is within this legal framework that community's involvement in planning and management of water supply schemes has received more encouragement in Nepal. There are a number of successful examples both at the program and project level. Similarly, such successful examples in drinking water supply, community irrigation and micro hydropower also exist. However, these are sector specific interventions, which have not yet demonstrated cross-sectoral integration in planning and development.

The Water Resources Strategy 2002 and the National Water Plan 2005 are the first documents prepared by the governments on the basis of IWRM principles. The NWP is a framework plan to guide, in an integrated and comprehensive manner, all stakeholders for developing and managing water resources and water services. The NWP has developed a set of specific short, medium and long term action plan for the water sector including program and project activities, investments and institutional aspects.

### **4.3 Sustainable Development of Water Resources**

Given Nepal's tremendous variation in spatial and temporal water supply potential, analysis of aggregate supply potential is not adequate for efficient and sustainable development and management of water resources. A detailed assessment of water supply potential in relation to demand for both consumptive and non-conjunctive uses is necessary on river basin basis. This is possible only when river-basin is treated as a fundamental planning unit to manage, utilize and regulate the water sector. In the absence of such river basin policy-approach intervention in water sector water resources sector, at present, is being managed in an ad-hoc basis

With growing population, urbanization and changing structure of the economy, claims on available water resources for various uses will also grow over time. Unless developed and managed efficiently on the basis of trade-offs between competing claims based on some kind of basin-wise optimization model, contribution of water sector will not measure up to its full potential for both economic growth and social welfare, creating, at the same time, serious imbalance between demand for and supply of water. More than anything else, sustainability of water resources alone needs efficient use of water.

The administration and management of water resources has been patterned so far largely along their sectoral uses. The administration of water uses such as irrigation, hydropower and water supply has been entrusted to separate departments and under different Ministries, resulting in piecemeal approach. The policy orientation in favor of river basin in some of the earlier strategies and plans viz. the Water Resources Strategy, 2002 and the National Water Plan, 2005 could not materialize in the absence of appropriate institutional framework or mechanism to give effect to such policy thrust. Even the present comprehensive Water Resources Act, 1992 embracing all uses of water has not visualized administration and management of water resources in a unified manner, using particular river basin as a fundamental entity. For efficient and sustainable development of water resources, basin planning is essential. This requires the organization set-up on basin-basis which is otherwise in the present context. With the division of MOWR into MOI and MOE by the government, the IWRM approach as envisioned in the WRS and NWP has fallen into peril. Almost all the Acts, regulations, plans and policies in the water sector need to be rewritten with this division of MOWR.

There has been increasing concern about the environmental implications of water resources development in Nepal. Although none can deny the urgent need to accelerate economic development through water resources development, such development should aim at minimizing adverse impact on the environment. At the same time, the perceived environmental harms should not unnecessarily constrain water resources development. The environmental problems related to water resources development that need due attention are biodiversity conservation, surface and groundwater pollution, lowering of groundwater level, landslide and flood, effective implementation of environmental guidelines including enforcement of Initial Environmental Examination(IEE) and Environmental Impact Assessment (EIA) norms and, above all, the need for widespread environmental awareness among the people. In brief, all these environment- related issues emanate from the problem of mainstreaming of environmental concerns into the planning and decision making process in water sector development and management.

Likewise, the possible impact of water resources development on certain sections of the society such as the poor, the women and the project affected people needs to be carefully assessed and the stakes of these groups also need to be integrated into the process of water sector development and management with focus on identification of these groups as social stakeholders, social groups' participation in and access to water resources development, social management of flood-prone areas, effects of inundation on social order in border areas, social appropriateness of technology in water resources development.

#### **4.4 Delivery of Water Services**

Development of water resources has traditionally been undertaken by the stakeholders themselves within their limitations. Later on, the government got involved in numerous development activities in water sector. Development so far is, however, limited. No major breakthrough has taken place, especially in hydro-power sector. A multipurpose project is yet to be initiated. Government's own resources are limited to venture into large projects. Without private, domestic as well as foreign participation, large scale development of the country's water resources is not possible. With the liberalization of economic policy, the water resource sector has been opened up to the private sector. The private sector has demonstrated interest in the development of hydropower. Some interest has been noticed in drinking water supply in metropolitan areas e.g. the involvement of Kathmandu Upatyka Khanepani Limited (KUKL) in the management of water supply in the Kathmandu Valley. Irrigation has not yet attracted any private sector interest apart from the local stakeholders. Thus, while hydropower development could be left largely to the private sector, the government will have to be involved in the irrigation and drinking water supply and sanitation, particularly in rural areas, more as facilitator than as provider. However, in order to promote an integrated approach to the development of water resources, the government may have to join hands with prospective private investors interested only in hydropower development.

For all this, it is necessary to create conducive socio-political and economic environment for maximum private sector involvement in the development of water resources through a package of incentives adequate to offset environmental disadvantages of the country, simplification of procedural matter, privatization of the existing government owned enterprises, particularly in the electricity sub-sector to bring about public-private partnership, acceleration of the process of transferring agency-managed irrigation systems to the stakeholders and handing over drinking water and sanitation systems to local users groups, ensuring stakeholders' effective participation in the whole process of development and management in respect of new or rehabilitation projects so as to promote demand-driven approach to new development or rehabilitation of irrigation and drinking water/sanitation projects.

However, for the success of such policy-reorientation, one pre-condition is an effective mechanism for regular surveillance, monitoring and follow-up so that necessary corrective or promotional measures could be taken on time. Such mechanism should be transparent for forging better understanding and cooperation with all stakeholders and the people at large.

## Chapter- 5

### Issues and Gaps in the Water Sector

#### 5.1 Drinking Water Sector

A large number of issues exist in the drinking water sector. These issues, if not tackled, ultimately lead to the increase in Social Sector Health Costs.

##### 5.1.1 National Level Issues

- a) Lack of monitoring and updated databases and information so as to quantify the impacts of the sector on the environment and human health for effective planning.
- b) Inadequate and unreliable provision of safe drinking water even in the capital.
- c) Inadequate sanitation, drainage, solid waste management (including toxic hospital wastes), sewerage and absence of wastewater treatment facilities.
- d) Risk of water bodies, air and land contamination by (i) Industrial Wastes (ii) Domestic Wastes (iii) Improper Solid Waste Management
- e) Lack of awareness that water is an economic good.
- f) High non-revenue water due to poor O&M
- g) Lack of water conservation, recycling and reuse strategies.
- h) Lack of inter-sectoral coordination.
- i) Lack of enforcement of zoning, resulting in scattered and haphazard growth of industries and urban housing.
- j) Lack of well equipped laboratories for monitoring air and water quality.
- k) Lack of environmental awareness among industrial entrepreneurs, management of industrial districts, technicians and skilled laborers who should realize that pollution prevention pays.
- l) Lack of qualified pollution expertise in the industrial districts.

##### 5.1.2 Drinking Water Issues of the Kathmandu Valley

- a) Umpteen number of plans and reports but very slow or no action due to lack of political commitment.
- b) Gross pollution of drinking water, rivers, land and air.
- c) Mining of groundwater and lack of management measures for its extraction.
- d) Polluting industries with high water demand located in the Valley.
- e) Centralization of Government Departments in the Valley.
- f) Frequent changes in leadership in NWSC without bringing any drastic changes to increased efficiency.
- g) Non-rehabilitation of the *Raj Kulos* (Irrigation Canals) and *Dhungedhara* (stone spouts) systems that ancestors built for sustained water augmentation.

##### 5.1.3 Issues with Foreign Assistance

Receipt and utilization of external assistance has not remained without problem. A lack of coordination between donor agencies has been felt sometimes leading to duplication of efforts and wastage of scarce resources. Non-uniform approach in implementation process too had created some problems in the past. GON has not yet formulated a broad policy with regard to accept or reject an external support to match its requirements.

## **5.2 Irrigation Sector**

### **5.2.1 Technical Issues**

- a) Water supply is inadequate for the designated command area of most of the irrigation projects. Shortage of water is observed during winter and spring seasons and even in critical periods of the monsoon season in most of the run-off river irrigation projects. The shortage of water is further aggravated at demand points in small and medium size rivers due to the upstream withdrawal of water by existing FMIS during critical periods if rains fail during the monsoon period.
- b) Deficient system planning and design due to non-availability of Hydrological information of the river flow and sediment information as these rivers are not gauged and sediment data are not available.
- c) Inadequate Irrigation System Management is a major issue which affects badly the irrigation services to the farmers. The government managed irrigation sub-sector performance in terms of water control and utilization is extremely poor. In the existing management mode, the cost recovery for operation and maintenance of the project is not being realized from beneficiary farmers.
- d) Lack of proper drainage causing water logging and water borne diseases in the Terai irrigation projects.
- e) Concrete technology in remote places of Hills and Mountains ecological belt is an issue. Appropriate and sustainable technology using local materials and local skill need to be developed in remote places of Hills and Mountains.
- f) Irrigation efficiency is very low. This low efficiency is common in almost all the irrigation projects of the country.

### **5.2.2 Institutional Issues**

- a) Under the present socio-political environment in irrigated areas, Institution Capacity of DOI and WUAs is not geared to undertake joint participatory management. Inadequate institutional capacity of concerned agencies is an issue in managing irrigation projects to deliver the required services to farmers.
- b) There is lack of coordination between DOI and DOAC
- c) Redefining the role of DOI as facilitator to WUAs in small size subprojects in the remote areas of Hills ecological belts. Let WUAs should rehabilitate and develop subprojects using appropriate local knowledge based technology.
- d) The decentralization policy should strengthen and empower WUAs in true sense so that they can function as corporate body in managing irrigation systems. There is also a lack of enabling legislation which should recognize WUAs as a multi-functional socio-economic institution with base in irrigated agriculture free from local politics.
- e) The planning, design, monitoring and evaluation capacity within DOI is weak and should be strengthened.

### **5.2.3 Legal and International Issues**

- a) Non-compliance of treaty by India for the supply of 24.1 m<sup>3</sup>/sec of water in Nepal Eastern Canal from Don Branch Canal of Gandak Project with year round supply is a major issue. The water supply from India is erratic and unreliable.
- b) There are conflicts between irrigation water uses at different withdrawal points from the same source within the basin and conflicts between irrigation uses and power uses in the basin. Conflicts are also recorded between irrigation and drinking water using water resource of the same streams.

#### **5.2.4 Environmental Issues**

- a) Watershed management is an issue. The present trends of sediment flow, erosion and flood events show catchment area encroachment by hill people for fuels, fodder, cattle grazing and farming in marginal lands has resulted the deterioration of forest cover in the catchment. Human and cattle population, agricultural fertilizers and pesticide altogether pollutes the river water in rural area whereas industries wastes, city sewage pollutes water in urban area.
- b) Riverbed rise due to high sediment and debris deposit, and flood damage of irrigation infrastructures in the different parts of the country is a constant threat to canal infrastructures. Damaged Watershed of main and cross drainage rivers is a issue which aggravates the flood intensity, decrease river flow in winter and spring seasons and increase high sediment loads in monsoon causing heavy damages to the canal infrastructures.
- c) The impact of storage project will cause the displacement of population, loss of agriculture land, forest land and flora and fauna (ecosystem) in the reservoir area.
- d) Waterborne disease are found common in water logged area of Terai Irrigation Projects due to mosquitoes breeding.

#### **5.2.5 Economical Issues**

- a) Deferred maintenance of irrigation systems for want of an adequate maintenance budget by central government is an issue. Inadequate resources (budget) allocation for operation and maintenance of completed projects by central government always remained inadequate.
- b) Non-realization of the irrigation fee of the order of Rs. 1000/ha from beneficiary farmers to meet O&M cost of surface irrigation projects in Terai and Hills surface irrigation is an issue. Full realization of water charges equivalent to O&M expenditures is not achieved in DOI managed irrigation schemes which raises the question of sustainability of public irrigation projects.
- c) Operation and maintenance cost of Tubewell is high. Most of the tubewells are running about 50% of the required operation hours or even less. The full operation and maintenance of DOI deep tubewells are not realized from beneficiary farmers, though WUAs of DTW have started paying the electric charges of their wells.
- d) Low absorption capacity of foreign loans or grants due to existing financial rules and regulations, strict and sometimes impractical covenants from the donors, weak institutional capacity, prevailing insecurity and also weak contracting industry.

### **5.3 Hydropower Sector**

The use of water in hydropower is non-consumptive. If pre agreement is made for the use of water, other uses of water do not affect the hydropower use. So far, negligible amount of water resources have been used for hydropower development in Nepal. The ambitious Agriculture Perspective Plan requires about 500 MW power to operate deep and shallow tubewells. It is obvious that timely and adequate growth in power supply is the minimum condition for the overall economic growth. The load forecast for base case scenario considers an irrigation annual average growth of 18.6% with the energy requirement reaching 640 GWh in 2020. This growth is largely due to Agriculture Perspective Plan requirement.

GON has recently formed the Ministry of Energy with a view to develop comprehensively the energy sector. Though the share of hydropower in the national energy supply is only about 3%, this sector will remain the main agenda of development of this ministry. Other sectors of energy viz. the petroleum, solar energy, bio-gas, wind energy etc. are outside the scope of the ministry which is not matching with its name. The Ministry of Water Resources was the main agency to take care of the

water sector and acting as a guardian organization. Now with its dismissal the whole water sector has been orphaned.

The issues in the hydropower sub-sector are concerned with (i) technical aspect focusing on inadequate supply, system planning and rural electrification in particular; (ii) investment and financing and (iii) institutional aspects. Besides these, the issues related to environmental and social implications will also be dominating the development of hydroelectric power and water resources as a whole.

### **5.3.1 Inadequacy of Supply**

Last year, the country faced an acute power supply deficit and forced to undergo a load shedding of up to 18 hours a day. The whole economy has been affected with this load shedding. There is no possibility of any improvement in this power shortage scenario in the coming next two to three years. Although the generating capacity will increase with the completion of on-going hydro projects, the deficit in peaking capacity is likely to continue because the capacity availability from run-of-river schemes is substantially reduced during period of lean flow in rivers.

Efficiency of Utilization has remained around 75% since a decade. In other words the gross system losses are high around 25%. Moreover, the system losses, according to NEA estimate, also has a non-technical component of around 11%.

### **5.3.2 Improving System Planning**

Inadequate data and lack of confidence on the basic elements viz. hydrology and geological information entailed designing of the generation schemes with high safety measures thus leading to the higher costs. There is also a tendency to install higher capacities in the run-of-river schemes with no pondage to apparently lower the specific costs and improve the economic and financial objectives of the project assuming that all average energy (including secondary) will be utilized.

No proper system (or ground rules) for study and selection of appropriate (generation) projects exists. Since most of project studies are conducted through donor's employing foreign consultants, the standards, norms and criteria are not in consistent. At times, even candidate projects are not brought to the same level of preparation thus suffering from ambiguity in comparison.

There is lack of clear understanding towards matching the expansion plan with the system requirement particularly in terms of base and peak constituents of the demand. Thus, the supply expansion plans, with run-of-river schemes only, would generate full capacity energy during wet (high flow) season when the demand is minimum and provide reduced capacity, upto one-third of the installed, during the peak loading in the system because there will be not enough water in rivers.

### **5.3.3 Rural Electrification**

Access to electricity is very low in the rural population. Private sector is not interested at all in the rural electrification and the government investment is the only option in this sector. Because of the dispersed location of villages particularly in the hills and mountains, the cost of rural electrification is very high not confirming the economic criteria.

There is lack of co-ordination in the implementation between rural electrification and tubewell irrigation. The basic focus of the GON's Agriculture Perspective Plan (1995) is to expand the groundwater irrigated area by over 600,000 ha with the widespread use of shallow and deep tubewells

by year 2015. The Plan has linked the electrification of tubewell pumps (8800 units a year) with the rural electrification in the area and has projected a combined investment of over US\$ 170 million. The Plan has estimated an additional generation of about 600 MW during APP.

## Chapter-6

### Conclusion and Recommendation

#### 6.1 Conclusion

The water supply sector of Nepal is so vulnerable that it needs high priority. It has immediate impacts on the environment and health of the people. Adverse impacts of unreliable and unsafe water supply, ill-managed solid wastes and discharge of untreated domestic and industrial wastewater are well documented regionally and globally and need not be discussed again. The recent outbreak of Cholera and diarrhea in the Jajarkot, Rukum and other districts of the Mid-western Nepal should be an eye opener to the planners. Hundreds of people died in these areas from these diseases. Resources are scarce with the government and when available have to be managed optimally. Awareness and participation among the people are very important. It is clear that the Government alone cannot solve the problems in the years to come and there is a need for the private sector to step in. It is important that the Government should immediately set standards and regulations on water and air quality, wastewater effluent and introduce the "Polluters Pay Principle" and act on them. Acts on private sector participation and bulk water rights have to be legislated as private sectors find it uneasy to invest in this new sector. The outcome of the Melamchi Water Limited will set an example on whether the PPP principle works in Nepal in the water sector. The frequent strikes in the Melamchi Water Supply Project by the local population in the name of indigenous people's right are major threats to the future of private sector involvement in this sector.

The quality of drinking water supplied in the Kathmandu valley is very poor. Most of the people of Kathmandu do not trust the quality of the water provided by NWSC and so boil the water before drinking. A small calculation shows that each household spends 30% more on top of the water tariff monthly for boiling and pumping. This cost excludes the cost of the storage reservoir and the overhead tank. This is a positive sign that the people are willing to pay more for a reliable and safe supply of water. Sanitary conditions within the Kathmandu Valley are hazardous. A visual tour of the Valley is sufficient to conclude that rivers, drains and streams are highly polluted with sewage and industrial wastes. Defecation on roadsides, drains, river banks and agricultural fields is common.

Because of the temporal and spatial variation of rainfall, the water availability in the rivers of Nepal is not uniform. A large portion of irrigable area is dependent on the rainfall. Year round irrigation is not available in major part of the irrigated area. Conjunctive use of surface and ground water in the terai region is one option to achieve the year round irrigation. This variation in the rainfall and river flows has demanded storage schemes which can supply regulated flow to the command area providing year round irrigation.

Efficiency of the irrigation systems is another issue which should be improved to irrigate more area with small amount of water. Participatory irrigation management is yet another issue in the irrigation sector which is responsible for the sustainability of the irrigation systems once they are constructed by the government fund. Involvement of the local beneficiaries is important to take the ownership of the system once it is completed.

The energy sector, particularly the hydropower sector is very important for the overall development of Nepal. National development cannot be imagined without the development of this sector. Industries, tourism, irrigation, transportation and other sectors are mainly dependent upon this sector. Despite the huge potential of hydropower generation, the present trend of electricity generation is not able to meet the ever rising energy demand of the country.

With the split of MOWR into the Ministry of Energy and Ministry of Irrigation, the water sector has suffered a lot. Confusion has prevailed as to who is going to lead the overall management of water resources which was being carried out by the then Ministry of Water Resources. This split has damaged the core value of IWRM and a large number of plans and strategies become useless. The prevailing Acts, Policies and Regulations all need revision because of this split. Further, confusion prevails as to who is going to lead the bilateral committees and commissions on water resources between Nepal and India. Though, the government has decided that the Ministry of Energy will lead these committees, the leadership of MOE on the issues of irrigation, navigation, inundation etc. will not be practical. A new institution is necessary to look after comprehensively the water sector of Nepal.

## **6.2 Recommendations**

In order to achieve the objectives of the water resources sector the following major components is recommended, serving as the basic framework of this study.

### **6.2.1 Integrated Development of Water Resources**

Integrated development of water resources is articulated within the long-term planning and macro-economic framework, treating water as a component and potential input to other sectors of the economy to attain necessary economic growth rates for poverty alleviation, food security and health security, among others, within a reasonable time-span. The split of Ministry of Water Resources has created a vacuum in the comprehensive development of water resources. Hence, a new institution is necessary to deal comprehensively the national and bilateral issues of water sector.

### **6.2.2 Sustainable Development of Water Resources**

For the sustainable development of water resources sector, the following actions should be taken by the concerned agencies involved in this sector:

#### **(i) River Basin Modeling**

Future demand for water for consumptive and non-consumptive use should be matched by supply of water, both spatially and temporally for efficiency and sustainability in the long run. Given the country's tremendous variation in spatial and temporal supply potential, a detailed assessment of supply potential against the projected (potential) demand should be made on river basin-basis. The major issues in most river basins are (i) presence of multiple stakeholders, (ii) upstream/downstream (inter-regional) conflicts and (iii) inter-sectoral conflicts. It is, therefore, recommended:

- To treat river basin as a fundamental planning unit;
- To adopt water balance simulation model along with database system as a decision support tool for future utilization of water potential; and
- To take steps for necessary basin-wise interventions including flow regulating reservoirs, inter-basin transfers, demand side management etc. as recommended to maintain a judicious balance between demand and supply for sustainability.

#### **(ii) Database and Its Management**

- In order to meet the bottom line of minimum density of hydrological and meteorological stations network, it is recommended to strengthen the existing observation system,

expand the network as recommended by WMO, addressing properly the pronounced orographic effects and standardise the procedure of observation and data management;

- For strengthening flood forecasting and warning system, it is recommended to develop nationwide flood forecasting and warning system by expanding the services of Master Station at Dhanagadhi and establishing adequate network of remote stations with meteorburst telemetry system for real time data transmission;
- A large volume of available information and data relevant to water resources planning and management were compiled in a digital format and stored in a GIS database in WECS. It is, therefore, recommended to maintain and update it regularly, serving as a tool of decision support system.

### **(iii) Protection of Environment**

- Environment Impact Assessment must be viewed from the macro and meso level right from the policy level through planning and programming to the project level to consider environmental aspects. For this the Strategic Environment Assessment approach should be adopted as early as possible.
- There should be some effective institutional mechanism within the government decision making process which is capable of mainstreaming environment concerns into such decision making process. For this a number of legal and institutional measures as suggested should be implemented.
- Biodiversity conservation aspect is to be integrated with the existing project level EIA system applicable to water resource development projects. The impacts on biophysical aspects of development activities and their mitigation measures identified by EIA and stringent monitoring system need to be adopted during project implementation.
- There should be a specific regulatory agency responsible for the registration and licensing of wells and enforcement of the groundwater legislation when it comes into effect.
- Environment conservation awareness programme must be integrated with the development process in a participatory approach and mutually supporting manner by conducting sensitization programmes.
- Conservation of water resources in the upper watershed, river training and embankment, construction of retention walls, and the rehabilitation of critical land within the framework of integrated and sustainable management of a river basin should be implemented to mitigate the damage and loss from landslide, sedimentation and flood.
- Watershed management should be a major component in all water resource development programme especially in *Bhabar* zone the major sources of groundwater recharging in the Terai.

### **(iv) Social Concerns**

In order to deal with the problems of inundation, displacement of people, and potential social disarray, it is recommended to implement, among others, the following :

- A comprehensive policy on involuntary resettlement needs to be formulated.
- Declaration of flood-plain zones as common property resources to be managed and shared by the people in the neighborhood.
- Encouraging the local people to transform the inundated areas into wetland under community management.

- Influx of outsiders to a project site should be regulated and such outsiders should be sensitised to the social norms and behaviour of the local people. Any dispute between the outsiders and local inhabitants on behavioural issues should be resolved expeditiously and for this a panel of three distinguished persons be constituted with necessary authority.

### **6.2.3 Delivery of Water Services**

#### **6.2.3.1 Hydropower**

##### ***Improving Power System Planning***

To achieve a better balance between demand and supply as well as making the system generation cost effective by reducing or making use of spill energy among the several options such as (i) all hydro option (ii) generation mix and (iii) hydropower mix with imported thermal power, all hydro option based on indigenous renewable resource is recommended with the following improvements in system planning.

- (a) Run-off the river plant with daily pondage;
- (b) Hydropower plants mix with storage project with adequate water to balance production with daily and seasonal requirement;
- (c) Cascade development of plant to minimize the cost;
- (d) Demand management to reduce spillage of energy and
- (e) Reduction in system losses to a desired level.

##### ***Increasing Access to Electrification in Rural Areas***

Among the several options, low cost grid extension is recommended with integrated rural development package and for implementation, it is recommended to create an "Autonomous Rural Electrification Agency" working as a facilitator providing technical assistance and guidance to rural electrification schemes initiated by user groups and mobilising resources from donor community as well.

##### ***Encouraging Private Investment in Hydropower***

To encourage private investment some of the options would be to (i) establish a regulatory body (ii) create an effective one-window- system for assisting private sector (iii) develop a strong promotional body with increasing inventory of the projects (iv) set up a clear and transparent mechanism for techno-economic clearance. (i) open access to grid policy (ii) provide access to distribution area. It will be equally important to develop standard Implementation Agreement and Power Purchase Agreement. The Implementation Agreement should deal with (i) water right issue on the river stretch (ii) sovereign guarantee against nationalization (iii) guarantee to the developer against change of law and (iv) guarantee for making available all the facilities as has been provided by the policy. The power Purchase Agreement should include (i) transparent price fixing mechanism (ii) risk sharing mechanism and (iii) ways and means to handle rehabilitation and resettlement procedures.

##### ***Promoting Power Exchange and Export***

In view of the timeframe (15 years) required to commission a major project of Karnali (Chisapani) dimension and the time required to fully reform the SEBs (State Electricity Boards) in India, it is time to gear up activities which will pave the way for the implementation of export oriented projects of such magnitude. This includes issues like realizing the downstream benefits, mechanism to fix the price of electricity etc.

### **6.2.3.2 Drinking Water and Sanitation**

#### ***Developing an appropriate approach to rural water supply***

A system which can bring the users and beneficiaries to the centre stage with authority, responsibility and accountability, while relegating the role of the government to that of a facilitator and supporter, is recommended as a viable and sustainable option. As NWSSP is exactly along this line, it is recommended to speed up its implementation.

#### ***Setting and Managing Water Quality Standard***

It is recommended to constitute an expert committee to work out norms for both urban and rural areas for safeguarding micro-biological, chemical and physical quality of drinking water, taking into account the necessary infrastructural facilities for enforcement of such norms by a regulatory institution at necessary levels.

### **6.2.3.3 Irrigation**

#### ***Service Delivery Policy Orientation***

The present policy thrust towards supply-driven approach giving way to demand-driven approach, farmer management replacing the agency management, rehabilitation and extension of the existing surface irrigation substituting the construction of new projects and above all, the role of the government changing from a supplier to a facilitator, needs to be continued more expeditiously along with the following complementary measures.

- A critical review of implementation of APP shows a serious shortfall in irrigation, particularly groundwater irrigation. It is recommended that the suggested measures for effective implementation of APP be duly considered.
- Tubewell expansion as well its efficient utilization are the serious problems at present. Several measures suggested for addressing these problems should be implemented.
- Sustainability of irrigation infrastructure is yet another problem which needs to be addressed.
- The problem of low water utilization in various types of irrigation in Terai, hills and mountains under various management systems also needs to be dealt with by implementing a number of measures as suggested.
- As envisaged in Irrigation Policy, the coordination mechanism for establishing a symbiotic relationship between agriculture and irrigation has not been effective. Such relationship between the planning divisions of the two agencies with NPC playing a catalytic role would be an appropriate arrangement.
- At the micro level, it is extremely necessary to strengthen WUAs and for this a separate section already envisaged under IMD as per organizational reform of DOI and the provision of WUA training at RID should be made pro-active.
- Despite enormous efforts and huge investment, weak institutional capability of irrigation sector is still a nagging issue and the fundamental requirement in DOI is reorientation from a dispensing agency to a farmer friendly one and from a construction-oriented organization to a result-oriented one.

### **6.2.4 Economic Efficiency and Social Equity**

- Appropriate pricing policy of water services can ensure both economic efficiency and social equity. Cost recovery serves as the basis for water pricing from the producers'

perspective, whereas the consumers' affordability and willingness to pay should serve as the basis of water pricing from consumers' perspective.

- In order to deal with the serious problem of vicious circle of cost recovery, particularly for sustaining irrigation and rural water supply, the present policy of transferring the completed projects and involving the beneficiaries in new projects should be implemented more speedily.
- This should be done in conjunction with other complementary measures such as affordable tariff rates, capacity building of WUCs, creating public awareness about water as an economic good and enforcement of legal provision for penalising the defaulters.
- In the case of urban water supply and electricity, the serious problem of leakage (40% of water supply) and 25% electricity generation) should be addressed adequately and effectively along with rationalization of tariff structure on the basis of affordability and willingness to pay.

### **6.2.5 Participation and Consultation**

- While the present policy reorientation of the government in irrigation, hydropower, drinking water and sanitation has provided opportunities for stakeholders participation and consultation such consultation and participation process should be institutionalized at the national, basin, local and gender levels with the following measures:
- At the national level, the existing institutions, namely, NDC and NWRDC can and should provide forum for regular consultation with and participation of stakeholders on water-related policies and strategies of national importance.
- At the basin level, the proposed basin committees should also hold regular consultations with local and grassroots institutions such as DDCs, VDCs, WUAs, and WUGs but for whose understanding and support, basin level allocation of water between competing claims could be difficult.
- At the local level, the existing legal confusion regarding organization and registration of WUA and WUC should be avoided.
- At the gender level, ensure water right to every member of the family including women and introduction of disaggregated indicators for assessment of women participation in water use, development and management are recommended.

### **6.2.6 Institutional Framework**

#### ***Absence of Effective Central Planning Organization***

In order to evolve an effective central planning agency for water sector; at a time when the Ministry of Water Resources has been dissolved to form two ministries, the Ministry of Irrigation and the Ministry of Energy, the present Water and Energy Commission is to be reorganized as a professional body with additional functions and authority and its present Secretariat (WECS) also needs to be strengthened with professional staff as a stable and permanent institution.

#### ***Absence of an Institutional Framework for a Coordinated and Integrated Development at the Basin Level***

As river-basin is considered as a fundamental planning unit, it is recommended to constitute initially three basin committees for a unified national water resources development planning and management, serving as the technical wings and consultation forum of the WECS.

***Jurisdictional Overlapping and the Challenges of Maintaining Coordination between Public and Local Bodies for Effective Service Delivery***

- (i) **Licensing**  
Until the basin committees become operational, the present system of District Water Resources Committee as licensing authority be continued.
  
- (ii) **Implementation and Operation**  
The present conflicting legal provisions regarding the registration of WUAs be amended in such a way as to make District Water Resources Committee clearly and fully responsible for registration of WUAs.
  
- (iii) **Dispute Resolution**  
The different and conflicting sets of dispute resolution mechanisms under different regulations be replaced by a single dispute resolution committee under the chairmanship of CDO in each district until basin committees become operational.
  
- (iv) **Service Fees**  
As several regulations provide different mechanisms for fixing service fees, it is recommend to constitute a single committee in each district for fixing water supply and irrigation fees.