COUNTRY PAPER ON INTEGRATED WATER RESOURCES MANAGEMENT IN NEPAL

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COUNTRY BACKGROUND

Demographic and Development Information

Nepal sandwiched between two giant countries, People's Republic of China in the north and India in the south, is geographically located between the Tibetan Plateau and the Gangetic plain and cradled along the southern slope of the Himalayas with total land area of 147,181 km^2. The whole country is about 885 kilometers long along east-west and about

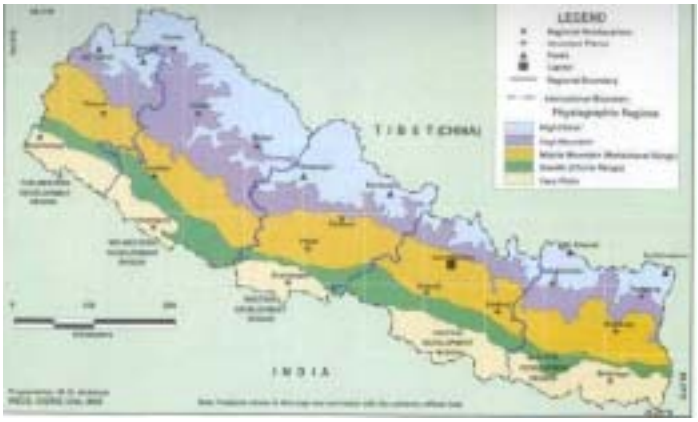

Figure - 1: Physiography of Nepal

145 to 248 kilometers wide along North-South. Topography of Nepal is characterized by mountains and extreme relief features. Three physiographic regions namely - Terai (plains), mid-hills, and high Himalayas - which run along the country longitudinally from east to west, divide whole Nepal.

Nepal is a multi-cultural and multi-ethnic country with more than 60 caste/ethnic groups. Most of the caste and ethnic groups come form Indo-aryan and Tibeto-mangoloid stock. Majority of the people practice Hinduism whereas, the second largest religious group is Buddhist. The 2001 population census has shown the population of Nepal is 23.15 million. By 2003, the population was estimated to be 24.21 million with a growth rate of 2.25 %.. This makes population density of the country at about 164 per sq.km.

According to the recent Human Development Report 2003, the Human Development Index (HDI) for Nepal has been computed at 0.499 which has ranked the country in 143rd place among a total of 175 countries. The HDI is a measure of human development, which is considered as one of the important indicators of overall Development of a country . Country's annual per capita Gross Domestic Product (GDP) is estimated to be about US $248.

Country's life expectancy at birth is about 61 years, with the average literacy rate of 53.7% (Population over the age of six). Net primary school enrollment has, however, moved upwards to 80.4% and infant mortality rate has come down to 64 per 1000 births. Access to drinking water supply has been provided to 71.6% of the population, by the end of July 2001.Despite implementation of nine periodic plans, poverty has been persisting for decades. About 38% of the population is living below the prescribed poverty line. There is a considerable variation in the incidence of poverty among 75 districts and regions of Nepal. It is greater and more pervasive in rural areas, 44% as compared to 23% for urban areas. Inequality of income distribution has increased over the last decade which is considered as one of the reasons for increase of poverty.

Around 80% of the people are engaged in subsistence agriculture practices generally on small and dispersed plots of low quality land. The demand of labor in such agriculture practice, is highly seasonal and there are few other opportunities available for employment. This has resulted in insufficient job opportunities and under employment, which is lingering around 50%. The number of absolute poor people has nearly doubled over the last 20 years.

Agriculture is the main source of livelihood for a majority of Nepalese people. Agriculture is the largest sector of economy and is contributing around 40% to the Gross Domestic Product of the country. During the period of 1994 to 2001, the average agriculture growth rate stood at 2.48% and meanwhile, non-agriculture growth rate was at 10.44%.

Hydrology

The main source of water in Nepal is the south-westerly monsoon system which lasts from June to September and brings in around 80 percent of its total average annual rainfall of 1530 mm. The mean annual precipitation ranges from more than 6000 mm along the southern slopes of Annapurna Range in central Nepal to less then 250 mm in north- central trans-Himalayan region.

Figure - 2: Precipitation in Nepal

The precipitation in the high Himalayan region, which spreads generously along the whole length of the country, specially at and above the elevation of 4500m., is generally in the form of snow. The snow packed mountains act as a reservoir and help maintain appreciable river flow round the year in the major river systems of Nepal. Nepal contributes about 70 percent of the Ganges flow during the dry season.

Surface Water Sources:

The major river systems of Nepal, which originate in the Himalayas are Koshi, Narayani (Gandaki), Karnali and Mahakali.

Figure - 3: River Basins of Nepal

The Koshi river basin is the largest river basin of Nepal which has 60, 400 sq km of catchment area and out of which 46 percent or 27,863 sq km lies within Nepal and the remaining lies in Tibet, China.. The average run-off (discharge) of Koshi river is around 1409 Cubic meters per second at Chatara and which is equivalent to around 45 billion cubic meters per annum.

The Narayani river basin has a total catchment area of 34,960 sq km and about 90 percent of the catchment lies within the Nepalese territory. The average run-off (discharge) of Narayani river at Narayanghat is around 1600 cubic meters per second.

The Karnali river at Chisapani has a total catchment area of 43,679 sq. km. Karnali river originates in the south of Mansarovar and Rokas lakes in Tibet. 94 percent of the catchment area lies within Nepal. The average run off at Chisapani is 1,397 cubic meters per second

The Mahakali river is a border river, in most of the reaches, and forms the western boundary between Nepal and India. Mahakali River originates in Api Himal. The total catchment of Mahakali basin is 15,260 Sq.Km. 34 % of the catchment area lies within Nepal. The average run off is about 573 cubic meters per second

There are five medium river basins, primarily all rain fed, originating from the Mahabharat range of mountains. These rivers are also perennial with the groundwater and springs sustaining the river flow during dry period.

'Southern' rivers or sometimes called Siwalik rivers, originate from the Siwalik hills (southernmost hills running east-west of Nepal). These rivers are shallow in depths and mostly dry up during the dry season. The average combined runoff is estimated to be 1,682 cubic meter per second.

Groundwater Sources:

The hydro-geological mapping indicates that the Terai has a tremendous potential of groundwater resources. The Terai with a thick sequence of saturated detrital sediments of alluvial and colluvial origin is one of the most productive aquifers of the sub-continent.

Groundwater recharge at specific area is estimated as high as 600mm per annum, however it is suggested that an overall safe figure of 450mm as recoverable recharge for all of the Terai area can be assumed. The Inner Terai areas like Chitwan, Dang and Surkhet is also estimated to hold good groundwater potential. It is, thus, estimated that rechargeable groundwater in the terai is between 5.8 billion cubic meters to 11.5 billion cubic meters.

At present, it is estimated that about 756 million cubic meter of groundwater resources is being used for irrigation purposes and 297 million cubic meters for domestic uses. Hence, there is huge potential of groundwater use in the form of Shallow Tube Wells and Deep Tube Wells for different usage in the Terai areas.

Water Resources Development

Nepal posses about 2.27 percent of the world's fresh water resources. Main water uses in the county are in the form of agriculture, domestic needs, industries, and hydropower. Agriculture consumes the maximum quantity of water followed by domestic needs. Since most of the water used for hydropower is from non-multipurpose run-of-river type of schemes, water used in hydropower is non-consumptive. In future, with the development of multipurpose reservoirs, the supply scenario of water for downstream uses would change more to consumptive use.

Irrigation for Agriculture

Out of the total area of the country, only 18 % of the area is cultivated. Currently 42 % of the cultivated area has some kind of irrigation facility. Out of the total irrigated area, only 41 % has year round irrigation. The Agriculture Perspective Plan, a 20 year framework has envisaged that irrigation will command about 55 % of the cultivated land in Nepal.

With growing future irrigation water demand, which vary with crop, soil and climate, the total abstraction of water for irrigation ranges between 337 m^3/sec in the month of January to 1,417 m3/sec in October. This need together with the need of feeding more and more of the population in coming years, the agricultural production has to be substantially increased with year round irrigation facility. An estimate has shown that by the year 2027, irrigation demands would be around 37,000 Million m3 per year from the present annual demand of 13,000 Million m3.

Domestic use

Domestic use is another consumptive water utilisation in Nepal. The source of supply is primarily ground water in the Terai, and springs / streams in the hills. At present, 66 per cent of the population has access to improved drinking water systems. Consumption of domestic water use is estimated to be 800 Million m3 per year, which is supposed to grow to 1,800 Million m3 per year by the year 2027.

Hydropower

The theoretical hydropower potential of Nepal is 83,000 MW. Out of which, 43, 000 is considered to be techno-economically feasible. Out of 43,000 MW, 49 % is shared by storage type of projects and the remaining 51 % is shared by run-of-river type of projects.

Both public and private enterprises are involved in the development of hydropower sector. Currently, the total hydroelectricity production in the country is about 553 MW out of which a total of 144 MW is contributed by private sector.

Industrial use

Industry is another potential water utilising sector in Nepal. According to the current estimate, industrial consumption is about 80 Million m3per year, which is expected to be 180 Million m3 by 2027 or more depending on Nepal's future industrialisation.

Other Uses

In addition to the water uses listed above, there are other uses, which are likely to compete or conflict with the main uses with diversified expansion of development of various activities, which include:

- Recreation and tourism;
- Traditional and commercial fishing;
- Navigation – which could give an access to sea to a land-locked country like Nepal;
- Protection of natural aquatic habitat and wetlands; and
- Cultural and religious.

INTEGRATED WATER RESOURCE MANAGEMENT IN NEPALESE CONTEXT

National Water Plan (NWP), a key policy document under preparation, has the objective to operationalize the outputs of government endorsed Water Resource Strategy (WRS). This document has acknowledged the importance of integrated water resource management for the overall development of country's water resource sector. The major principle of water plan to achieve Integrated Water Resources Management (IWRM) would be through integration, coordination, participation, equity, and implementation of water related programs.

Integration

Integration of all water related programs is to be carried out from lowest level of river basin entities. Water users' groups will be formed (and in some cases, it needs to be encouraged to be formed) in each of the sub-river basin, based on the needs of the basin. A sub-basin committee, with appropriate number of members, representing all water users' group, will be elected to function as the executive body. Appropriate representation of local bodies will be foreseen during formation of the sub-basin committee.

Likewise, District Water Resources Committee (DWRC) will be restructured and redefined to include the responsibility of integrated water resources management under its jurisdiction besides the regulating responsibilities.

In order to address development of water resources projects in basin wise context, a River Basin Authority will be constituted in WECS whose main functions would be to collect data and creating database; develop and implement IWRM policies, guidelines, and manuals; and provide advice and support to river basin entities.

Co-ordination

Co-ordination is the centerpiece of management function.. Hence, it has been envisaged to designate WECS, at central level, as a single neutral coordinator and administrator responsible for integrated national water planning, policy analysis and development, development of appropriate legislation, and mechanisms for other broad water management functions and practices including central level program fixation and resource allocations.

Similarly DWRCs will be made responsible to co-ordinate the activities and programs at the district level. Co-ordination is seen as a top-down approach, if co-ordination can be achieved at higher or central level, and it would be much easier to achieve co-ordination at different lower tiers of management.

Public Participation

The participatory approach not only involves in raising the awareness of the importance of water among all stakeholders but it also helps in attainment of the optimum use of the water resources as well as building consensus in the overall development. It also helps in fostering community ownership of the development activities, which, in turn, ensure Sustained Development. The formation of users group in each sub-sector activities as well as formation of sub-basin committee(s), will ensure popular participation in the integrated water resources development and management in Nepal.

Equity

Equity, Women participation and social inclusion are some of key elements in the country's commitment to shared growth. Equity enhancing policies not only inspires stakeholders of enthusiasm in popular participation in decision-making process, it also instills confidence in the governance system.

LEGAL INSTITUTIONAL AND POLICY FRAMEWORK

Historical background

The rights of people for the usage of water resources as incident to ownership of land adjacent to the river or stream was established by the National Code, 1910. Specific provisions were made in this code regarding water resources utilisation for irrigation. Introduction of Irrigation Act in 1961 marks the first attempt in making a specific legal provision for the use of water resources. Later on in 1967, a more comprehensive Canal, Electricity and Water Resources related Act followed with a concept of water tax and licensing for water use.

After the restoration of democracy in 1990, His Majesty's Government of Nepal (HMGN) began the task of revising a number of Acts and producing new Regulations under the present constitution. The most important change was the drafting of a new Water Resources Act 1992 and Water Resources Regulation 1992, as the umbrella legislation for hydropower, irrigation, drinking water and other water usage. In addition, separate Electricity Act 1992 and Electricity Regulation 1993 were promulgated to specify legislation for the power sector. Since then, other Regulations have been drafted under the Water Resources Act, including the Drinking Water Supply Regulation, Irrigation Regulation and Groundwater Regulation.

There are some Acts and Regulations which do not belong to the water sector but do have direct impact on resources development and management. These include the Environment Protection Act 1996, the Local Self-Governance Act 1998 and the Nepal Electricity Authority (NEA) Act 1984.

The common practice in Nepal is to draft a policy document at first which will be reviewed by stakeholders afterwards for the purpose of building consensus and then preparation of Acts and Regulations are carried out. The lack of comprehensive water resources policy has withheld incorporation of the concept of integrated water resources management in any Acts and Regulation in the sector of water resources development.

Existing Policy towards IWRM

Despite the existence of various Acts and Regulations, the concept of Integrated Water Resource Management/Development has not yet been legally adopted. Considering the above fact, HMGN, in the amended Hydropower Development Policy, 2001, has adopted following strategies to ensure integrated water resource development:

- To make the river basins of specific rivers as the basis of development and management of water resources in order to achieve maximum benefits from the utilisation of water resources of Nepal; and
- To adopt a broader perspective on national development in the context of macro-economy in developing and managing hydropower in line with the concept of developing water resources in an integrated manner.

A comprehensive water resources policy document in the form of Water Resources Strategy, which has been approved by HMGN in 2002, has also realised the need of adopting an Integrated National Water Resources Policy. This policy is said to encompass the existing sub-sector policies within the water resources sector: Hydropower, Irrigation, and Drinking Water Supply.

Likewise, recently adopted Irrigation Policy, 2003, has also stressed the need of adopting the principles of integrated water resources management by stating one of its policy directives as:

- Project formulation shall be guided by the principles of Integrated Water Resources Management to insure water availability for all stakeholders, return of investment, investment sharing and self-insurance against natural calamities.

From the above policy it is evident that, HMGN is committed for the development and management of countries water resources sector in an integrated manner.

Institutional Framework

Different institutions are involved in policy, planning and decision making process in the water resources sector. National Water Resources Development Council is the apex decision making body on water related issues in Nepal. It is widely represented by political parties, senior government officials, and representative from civil society. The National Planning Commission (NPC) is responsible for overall planning and co-ordination encompassing all sectors. The Water and Energy Commission (WEC) and its Secretariat (WECS) are responsible for water related policy formulation and co-ordinating different agencies involved in the water resources sector.

At the administration, management, and execution level two line ministries are involved in water resources sector. The Ministry of Water Resources is responsible for the development of hydropower, irrigation, and disaster prevention sector whereas, the Ministry of Physical Planning and Works (MOPPW) is responsible for the development of drinking water supply together with urban infrastructure and roads. Water resources sector projects are executed through various agencies and departments at both central and local level, which are under these ministries.

Though HMGN has adopted a policy of undertaking water resources project in an IWRM approach through various strategy and policy documents, the current institutional set up has not been functioning in a coordinated way concurrent to the spirit of IWRM concept. Rather they have been discretely dealing water resources projects, which necessitates establishment of a central level institution like River Basin Authority.

ACTION PLAN FOR NARBO

Integration, coordination, public participation, equity, and implementation of water related programs being the principle of IWRM, are equally important for the river basins that are shared by two or more states. The burgeoning population in the region will create increasing demands of every kind of water related usage putting extreme pressure on river water in the coming years. The stress on water resource surely will be experienced with the population growth and increase in the socio-economic development activities in the

countries of the Asian Region. Thus, there is a need of optimum utilisation of water resources of the river basins for providing food and livelihood to the citizens of the region. While doing so, it is important to ensure that management of river system should be done in coordinated way.

The experiences in the implementation of bilateral agreements, in which Nepal has entered into, indicate the need for a more confident approach and better understanding among the countries in benefit sharing, water governance, and water resources reform programs. It is pertinent to note here that during the 12th 'SAARC Summit' in Islamabad, an agreement on South Asian Free Trade Area (SAFTA) has been reached which augurs for the regional cooperation in relation to the power trade and water resources benefit sharing mechanisms in coming future.

In order to achieve regional cooperation for substantial mutual benefits, Nepal has proposed short term, medium term and long term targets, which is summarised as:

Short-term,

- Emphasise the need to develop and implement an improved framework for regional cooperation;
- Existing water-sharing treaties will be monitored in conjunction with an effective mechanism for ensuring compliance;
- Evaluate regional water use demands and the potential for hydropower trade with its neighbouring countries ; and
- Continue to explore appropriate treaty mechanisms for equitable sharing of water.

Medium term

- Riparian issues between neighbouring countries will be resolved; and
- Effective bilateral and multilateral agreements for equitable water sharing will be in place.

Long Term

- Various bilateral and multilateral projects for irrigation, hydropower, flood control, transmission grid and navigation will be completed; and
- Substantial mutual benefits will be achieved.

For achieving above targets, NWP has been identified following action plans.

- Appraise and understand the water-related needs of neighbouring countries;
- Pursue confidence building measures with neighbours; and
- Implement mutually beneficial development programs.

In fulfilling these action plans, Network of Asian River Basin Organisation (NARBO) can play a very important role in the area of exchange of information and experience. It can provide an appropriate forum to all member countries for interaction exchange of ideas and thoughts between / amongst the countries, government organisations, non-governmental organisations, financial institutions, civil society, etc. related to IWRM. In such forum the best practices of river basin organisations and success stories can be presented and other river basin organisations could have an opportunity to learn from each other. The experience, best practices, and lessons learned pertaining to IWRM from river basin organisations in the member countries could help in policy reform process, institutional strengthening, stakeholder participation, and sustainable water resources development in member countries.

Realising above benefits of NARBO establishment, following action plans have been proposed:

Short Term

- Establishing a focal institution in each member country;
- Identification of possible partners from each member countries;
- Making a data base of the policies of each member country regarding IWRM to use and manage the water resources, and bilateral agreements taken place between/amongst the member countries;

- Collecting the best practices and lessons learned from each member countries;
- Need assessment for strengthening and capacity building of collaborating partners in each member countries, which have not yet been able to establish River Basin Organisation (RBO) and promote good water governance; and
- Establishment of official web site of NARBO for dissemination of information.

Medium Term

- Develop collaborating mechanism among the member countries/RBOs;
- Develop mechanism for exchange of information;
- Disseminate best practices and lessons learned from each member countries; and
- Strengthening and capacity building of collaborating partners in each member countries through field observations and site visits in other member countries.

Long Term

- Work towards making NARBO a possible forum for resolution of bilateral or multilateral riparian conflicts;
- Create a mechanism for involving education and research institutes of member countries to develop, improve, and exchange better water resource management practices;
- Foster cooperation between member countries and RBOs for optimum use of water, particularly in developing projects in a trans-boundary river; and
- Continue strengthening and capacity building of collaborating partners in each member countries through field observations and site visits in other member countries.

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ACRONYMS

1. DWRCDistrict Water Resource Council
2. GDP Gross Domestic Product
3. HDI Human Development Index
4. HMGN His Majesty's Government of Nepal
5. IWRM Integrated Water Resources Management
6. MOPPW Ministry of Physical Planning and Works
7. NARBO Network of Asian River Basin Organisations
8. NEA Nepal Electricity Authority
9. NPC National Planning Commission
10. NWP National Water Plan
11. RBO River Basin Organisations
12. SAARC South Asian Association for Regional Cooperation
13. SAFTA South Asian Free Trade Area
14. WEC Water and Energy Commission
15. WECS Water and Energy Commission Secretariat
16. WRS Water Resources Strategy

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