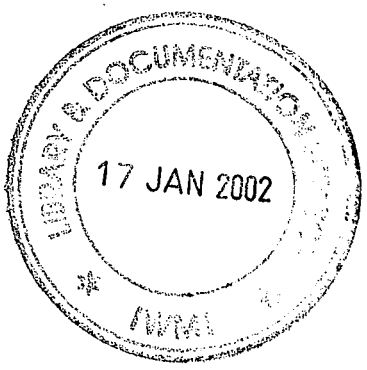
Integrated Development and Management of Nepal's Water Resources for Productive and Equitable Use

Project Completion Report

(December 1999 – December 2001)

Submitted to Ford Foundation, New Delhi.

December 2001



International Water Management Institute
P. O. Box 2075, Colombo, Sri Lanka

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1. Introduction

In December 1999, the Ford Foundation entered into an agreement with the International Water Management Institute to support a study on Integrated Development and Management of Water Resources for productive and equitable uses in Indrawati river basin in Nepal (Figure 1). This is the project completion report outlining the accomplishments achieved, major findings, project administrative report, and a financial accounting of expenditures. The further details of the project description, major findings, and policy implications are provided in a separate report (IWMI, 2001), attached as an annex 7 with this report.

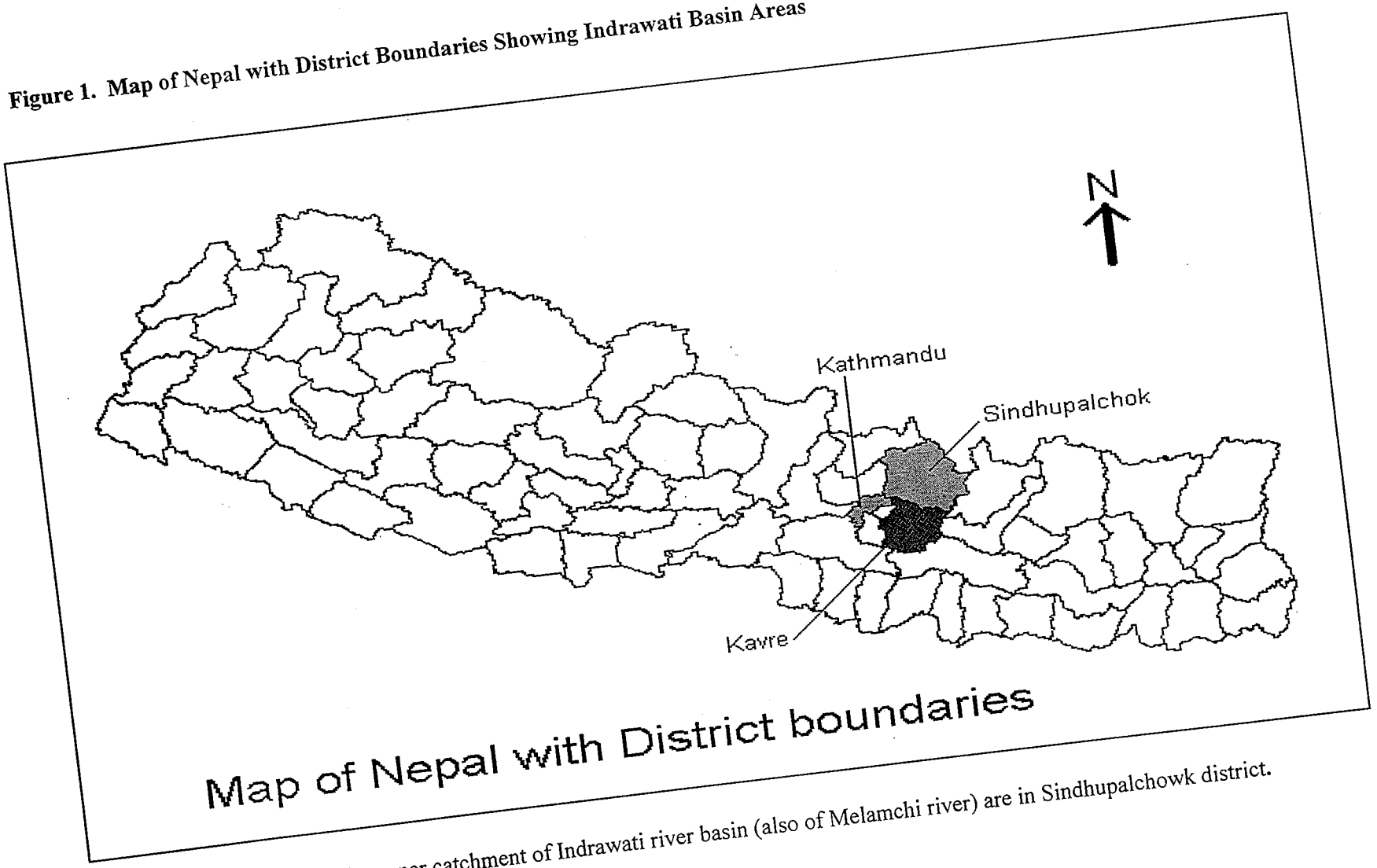
2. Project Background

Recently, an interbasin Melamchi water diversion project was initiated in Melamchi sub-basin of Indrawati river basin to meet the growing urban drinking water needs of Kathmandu City. The project will divert 1.97 M^3/sec of water through a 26.5 Km long tunnel to Kathmandu valley, however, there is also a plan to double the water diversion in the future, if the need arises. This is currently the largest water infrastructure project in Nepal, with a planned investment of nearly half billion US dollars over a seven year development period.

A perceived weakness in water sector planning and management in Nepal is a lack of integration in the working of the various departments and agencies concerned with the water allocations. Sectoral plans, developed by each agency in isolation from others, tend to ignore the hydrological interdependence of water resources across the sectors, e.g. farming vs. other uses, and upstream and downstream effects. Such sector specific planning and water allocation does not give due consideration to social and environmental uses of water resources, or sufficiently address equity aspects of water use decisions. Those likely to be most affected from such sector specific water allocation are often the already disadvantaged, poor and marginal segments of the population.

With the above background, this project has sought to document the current efficiency, equity and environmental aspects of water use in the basin, and the impacts of the Melamchi water diversion scheme on future water use by local communities. How will the water diversion project affect the local water institutions that have effectively managed water over a long period? Can we learn from these existing institutions mechanisms that can be incorporated into new institutions (operating rules and regulations) that will develop in the process of implementing such a large-scale water project in the region? In the long run, the adaptability and sustainability of any new institutions will be better ensured if the rules and regulations related to development and management of water resources are based on an understanding of existing practices and both the formal and informal arrangements in the communities.

Figure 1. Map of Nepal with District Boundaries Showing Indrawati Basin Areas



Note: Major portions of the upper catchment of Indrawati river basin (also of Melamchi river) are in Sindhupalchowk district.

It is posited that integrated water resources management (IWRM) would enhance productive water use and give due consideration to social equity and environmental issues involved in water use decisions. In this context, the hypotheses and research questions of this study were tailored to answer four major issues in water resources use in Nepal, they are:

- the need for integration of different water use sectors;
- the recognition of existing formal and informal arrangements of water resources management to designing new water sector project;
- the involvement of stakeholders at all levels; and
- equity issues involved in water sector projects.

This study was implemented as a first phase of a more comprehensive study proposed to be carried out in the river basin, by IWMI and WECS. The information collected in this phase will provide a sound base to carry out an in-depth analysis and long term monitoring and assessment of the impacts associated with inter basin water re-allocation. The long-term study was agreed earlier by the concerned local authorities (WECS, and Melamchi project authority). Considering the nature and scale of the Melamchi water project, the policy implications identified by this study will be valuable to other water infrastructure development and water re-allocation projects in Nepal. The study provides an improved information base for operationalization of IWRM principles in the context of Nepal, based on localized opportunities and constraints in the country.

Objectives

The main goal of this study was to assess different ways and means of attaining sustainable increases in productivity of water through better management of the multiple water uses in the river basin while enhancing equity, reducing poverty, and conserving the environment. The specific objectives of the project were:

1) Obtain increased understanding and awareness of the existing formal and informal arrangements for managing water, and the multiple uses and stakeholders of water within the basin.
2) Undertake a preliminary assessment of proposed and committed development initiatives in terms of likely benefits derived from the water resources and the potential impact on present stakeholders.
3) Provide key information and recommendations to Nepal Policy Makers on integrated water resource development and management strategies that combine the objectives of productivity, equity and resource conservation
4) Build the research and professional capacities in IWRM of national scientists and practitioners in IWRM.

4.2 Study Period (Jan 2000 – December 2001)

Four detailed case studies were implemented, and related short studies and the compilation of information undertaken. The case studies 'water accounting", "process documentation of Melamchi Water Supply Project", "inclusion and exclusion process of water projects" and "formal and informal institutional arrangements" were completed. Four research reports were published and disseminated among policy makers and research communities in Nepal. Three Nepal Policy Briefs and two IWMI working papers have been finalized and they are in publication process. Detailed project activities and the project related outputs are summarized in Annexes 1 and 3 of this report.

A one-day workshop was held in Kathmandu on 26th of April 2001 to present and discuss research findings. All together, 74 national level policy makers and researchers participated at the workshop. The proceedings of the workshop have been prepared and disseminated for discussion. After finalization, WECS will submit the proceeding to Ford Foundation. A summary of the workshop findings is attached with the report (Annex 8).

5. Project Implementation

5.1 Office Set-up

The study was implemented through the IWMI-Nepal office, located in the Department of Irrigation (DOI/Nepal). The office is staffed by a full time research coordinator and an office manager, co-funded through the Indrawati Study and IWMI core research funds. Project inputs were coordinated by IWMI-Nepal office and included research staff inputs from IWMI-HQ and national consultant researchers. Regular contact between IWMI-Nepal and HQ based staffs provided strong back-stopping for the project.

The Department of Irrigation (DOI/Nepal) provides IWMI/Nepal office in the DOI/Nepal building at Jawalakhel, Kathmandu. The DOI contributes expenses for electricity, local phone, and utilities. WECS has provided other technical and logistic support related to GIS lab and local researchers for other field activities in the basin.

5.2 Project Staffing

In addition to IWMI research staff, Short-term contracts (1-3 months) were awarded to local consultants and researchers, mostly seconded from DOI and WECS, to implement the field research and case studies. Technical back up for the project activities was provided through IWMI-HQ as and when needed. Working with local consultants with back up from IWMI-HQ has helped in capacity building for the research team in Nepal.

5.3 Project Advisory Committee

An interdisciplinary project advisory committee guided the research in Nepal. Relevant water sector planners and agency heads participated in the project advisory committee

from various governmental organizations. In addition, subject specialists were invited to the meetings as and when needed. The details of the Advisory Committee are given in the Annex 2.

Three advisory committee meetings were held during this project (December 1999 – December 2001). Each of the research findings and case study reports were presented to the advisory committee and detailed discussion held on the findings and policy implications. The advisory committee suggestions and feedback were incorporated in finalizing the case studies and project synthesis reports. Besides sharing the findings of various research activities in the meetings, the advisory committee also provided their approval and suggestions for planning field studies in the basin. The advisory committee provided valuable inputs and guidance and helped in information dissemination about project achievements and outputs to relevant government departments and NGOs in Nepal.

5.4 Collaboration with WECS

IWMI conducted this study in Nepal in close collaboration with Water and Energy Commission Secretariat (WECS) of His Majesty's Government of Nepal. IWMI and WECS researchers collaborated to carry out the field studies in Nepal. Advisory. All project related research activities, including the national workshops in Kathmandu, were organized jointly by WECS and IWMI.

5.5 Collaboration with Institute of Engineering (IOE)

The project also benefited from collaborative research arrangements with Institute of Engineering (IOE) in Kathmandu, under Tribhuvan University. The project supported two graduate students during their thesis research based on case studies in the basin.

5.6 Assistance to Researchers, Government Officials, Consultants, etc.

The project assisted a number of Nepalese researchers, government officials, and national and international water professionals by:

- sharing the research findings,
- inviting the researchers to national workshops and discussion meetings,
- participating in workshops, talk programs, and seminars organized by potential research partners and groups, policy makers, implementers, etc,
- making available research materials and related information available in IWMI/ Nepal's Office, etc, and
- Collaborative efforts with institutions in Nepal, and other local researchers.

6. Project Outputs

The project produced a range of reports and other outputs. These include 12 reports detailing research findings, three policy briefs and one workshop proceedings. One research paper was presented at US-CID conference in Colorado, USA, in July 2001. A bibliography of the project outputs is given in annex 3.

6.1 Nepal Policy Briefs

To achieve wide dissemination of important research findings to a wide audience in Nepal and elsewhere IWMI initiated the Nepal Policy Brief series. These four page documents summarize key research findings and distinct policy issues, in readily accessible language for non-specialist readers. The briefs provide a sufficient overview of the topic to enable decision makers to determine which topics are relevant to the decision making process. The policy briefs are supported by the larger body of detailed study synthesis report.

Ford Foundation has supported the IWMI Nepal Policy Brief series during earlier projects and three further Policy Briefs will be completed as a result of this study. They are:

- Brief 8. Study on Stakeholders' Inclusion-Exclusion Process in Indrawati River Basin.
- Brief 9. Water Institutions in Indrawati River basin
- Brief 10. Water Accounting for Indrawati River Basin.

These three draft documents are included in Annex 4. These Policy Briefs are in publication process at IWMI.

6.2 Workshops

The major findings of this project were discussed at a one-day national workshop organized in Kathmandu on April 26th 2001. The workshop was attended by 74 personnel representing from Nepal government's water sector policy makers, local researchers, local NGO personnel, and local stakeholders in the basin, donors, and international water experts. The local water stakeholders in the basin, including the chairmen of District Development Committee (Shindhupalchowk) and Village Development committee (where project is being constructed), and Melamchi project officials also participated at the workshop. The main objectives of organizing the workshop in Kathmandu were to highlight and discuss the research results/findings and the policy implications among the policy makers and local water professionals, which would better ensure use of the project outcomes in future policy formulation process in Nepal. The brief summary of the Kathmandu workshop is given in Annex 8, and the list of participants is given in Annex 6.

6.3 Impacts of this Research

The project contributions and its impacts in Nepal, specifically the direct impacts generated from this project, are reported in the following section. The indirect impacts of this project are also wide spread which will be fully realized only when policy makers of Nepal will use the project findings policy inputs in the policy formulation process.

- **Contributions to policy formulation process in Nepal and other impacts**

1. IWMI provided feedbacks and comments on the draft Water Resource Strategy 2001 of Nepal, being prepared by WECS/Nepal.
2. Research findings and recommendations from this project are reflected in the latest version of Nepal water sector policy strategy document prepared by WECS.
3. This research led to increased interest among the planners and decision-makers in Nepal to develop appropriate institutional mechanisms for river basin planning and management, and use of IWRM framework in Nepal. The conceptual basis for river basin planning and management of water is evolving in Nepal, and the research inputs from this sort of case study have significantly contributed to this process.
4. The study on water accounting has provided new information to the decision-makers on the actual water balance situation in the basin and improved information on the potential local impacts of water transfer out of the basin.

- **Capacity building**

Five international staff from IWMI Colombo visited Nepal at different stages of the research project. This provided an opportunity for local researchers in Nepal for better professional networking and to be in touch with the international initiatives in the water sector, and be familiar with the recent IWMI initiatives in the region. More specifically, the capacity building related activities of this project are:

1. Ten Nepalese researchers were involved in different components of the research activities and case studies in the Indrawati basin. Involvement in these studies has provided on-the-job training to these researchers, and improvement in their research capacity in the following ways:
   - Enhancing knowledge base
   - Developing research skills and analytical capacity.
   - Exposure to various research tools and methodologies used by IWMI, especially related to international literature on IWRM and analytical tools, like water accounting methods.
   - Familiarization with water sector crosscutting issues and with the latest literatures and international initiatives on IWRM and other related topics.
   - Contacts with IWMI's international researchers and establishing better professional network.
   - Better access to IWMI research findings and international literatures, and publications.

2. The involvement of the local researchers has helped to long run sustain the impact of the project since the local researchers and government officials would themselves implement some of the research outcomes in their works.
3. Two members of the research teams also presented research papers at international workshops.
4. The project also provided access of the research findings to local NGOs and scholars in Nepal through consultation meeting, workshop, etc., in addition to providing a forum to exchange issues and experiences on implementing IWRM framework in Nepal.

- **Input to other research activities**

1. In addition to the water sector policy makers of Nepal, a wide range of local researchers, scholars, and graduate students in Nepal has used the research reports and policy outcomes from this project.
2. Water sector policy makers and other professionals in Nepal have developed a consensus view on implementation of water resources projects there in the principles of IWRM. The case study findings and research outputs and discussions from this project, an assessment of use of IWRM concept at the basin level, have also provided significant contributions in this process.

7. Research Findings from the Project

The study was conducted in the context of a planned interbasin transfer of water out of the Indrawati basin to Kathmandu City (Bagmati river basin) and the uncertainties associated with its impacts on the community. Local water use activities and other related issues on community resources use have been analyzed using an IWRM framework, i.e., maximizing the productive uses of the resource considering the social equity and environmental dimensions of resource use decisions. The detailed findings of these case studies have been separately provided in the attached annexes, however, the major findings are summarized here.

7.1 Issues, Opportunities and Lessons Learned

A. Melamchi Water Project

There is an acute drinking water shortage in the Kathmandu City, with the capacity of the public sector water supply authority to supply 120 to 140 million liter per day (MLD) in the rainy season, whereas the average daily water demands of Kathmandu valley is about 180 million-liter per day. The water supply level in the city falls drastically (less than 80 MLD) during the dry season of 3 to 4 months (February to May). In response, the government of Nepal has initiated this large-scale water transfer project (total costs of US $ 460 millions over 7 years) to meet the long-term water demands of its capital city, and to provide development opportunities to the city.

There were certain levels of skepticism about the local level impacts of the Melamchi Project, in particular the future water availability in the basin, social impacts and disruption of the social orders in the local communities, and the projects impacts on local hydrology of the basin. Therefore, this IWMI and WECS joint study in the basin has assessed some of these impacts brought by the project. Some of the major project findings in relation to Melamchi water project are summarized below.

Water balance in the basin

The water balance study in the Indrawati basin (Mishra, 2001) indicates that it is an open basin with less than four percent of the available water is process-consumed. From the river basin management perspective, the Indrawati river basin is at the development phase. Nearly 90 percent of utilizable water flows out of the basin as a run-off to down stream without any beneficial use to the community in the Indrawati basin. This is equivalent to 3080 million cubic meters (MCM) of water per annum, out of total annual net inflow of 3370 Million cubic meters into the basin. The details of the present water balance status in the basin have been shown in the standard water accounting finger diagram in Figure 1 and 2. The Melamchi inter basin water transfer scheme is designed to divert 1.97 M^3/sec, i.e., 62 million cubic meter (MCM) of water per annum, which is about two percent of the total annual river run-off out of the basin.

The Indrawati river confluences with Sun Koshi river basin in the downstream, which is again a huge water surplus basin. Moreover, the Indrawati river basin is likely to remain as an open basin for foreseeable future, except occasional seasonal scarcity in some portions of its tributaries, which can be managed with minimum addition of new infrastructure in the basin. The seasonal water scarcity is mainly due to high seasonal fluctuations of river flow and inadequate storage structures in the basin to smooth out the river flow and utilize the monsoon rainfall during June to October.

The water accounting study in the Indrawati Basin indicates that there is a potential to harness the available water in the basin, but water use in agriculture is constraint by the amount of available land in the mountain region. The total cultivable land in the Indrawati basin is less than 2 percent of the total river catchment area of the basin. The lack of infrastructure and storage (reservoir), and low level of developmental activities in the basin are some of the other major binding constraints for not being able to use available water resources. More then 90 percent of river flow occurs during four to five months of the monsoon season (June to October), whereas, a seasonal water scarcity like situation is also there in some of the tributaries during dry months (January to May). The Indrawati river originates from the snow peak of Himalayas so continuous supply of water is available in the basin through out the year due to year round snow-melting in its upper catchment area.

Figure 2. Finger Diagram Showing Water Account Result in the Indrawati River Basin for Dry Year (unit in million cubic meters)

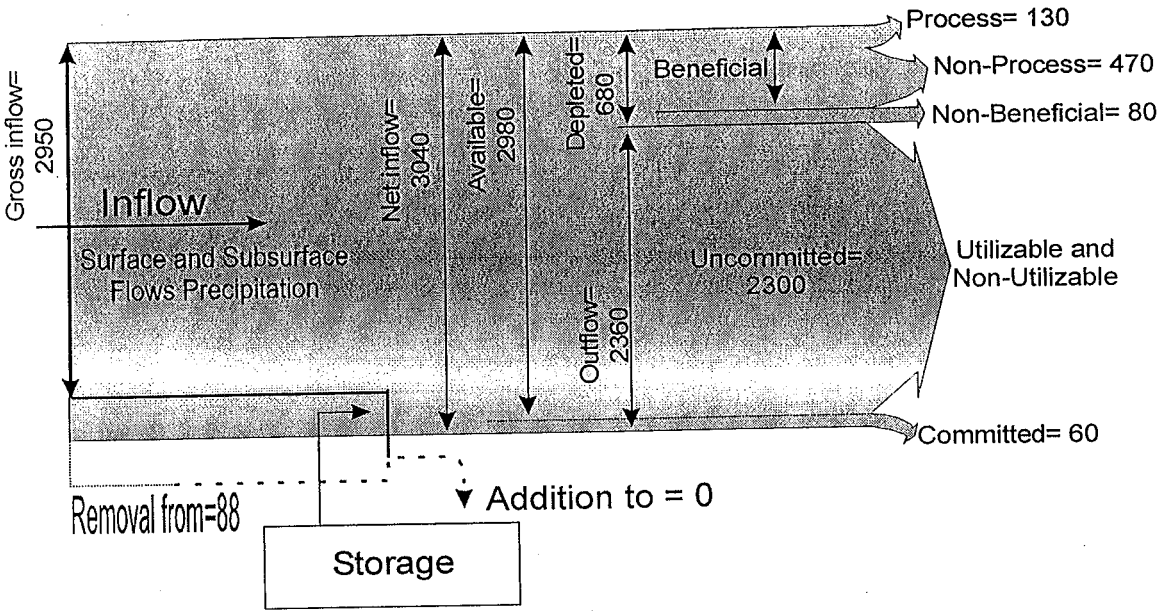
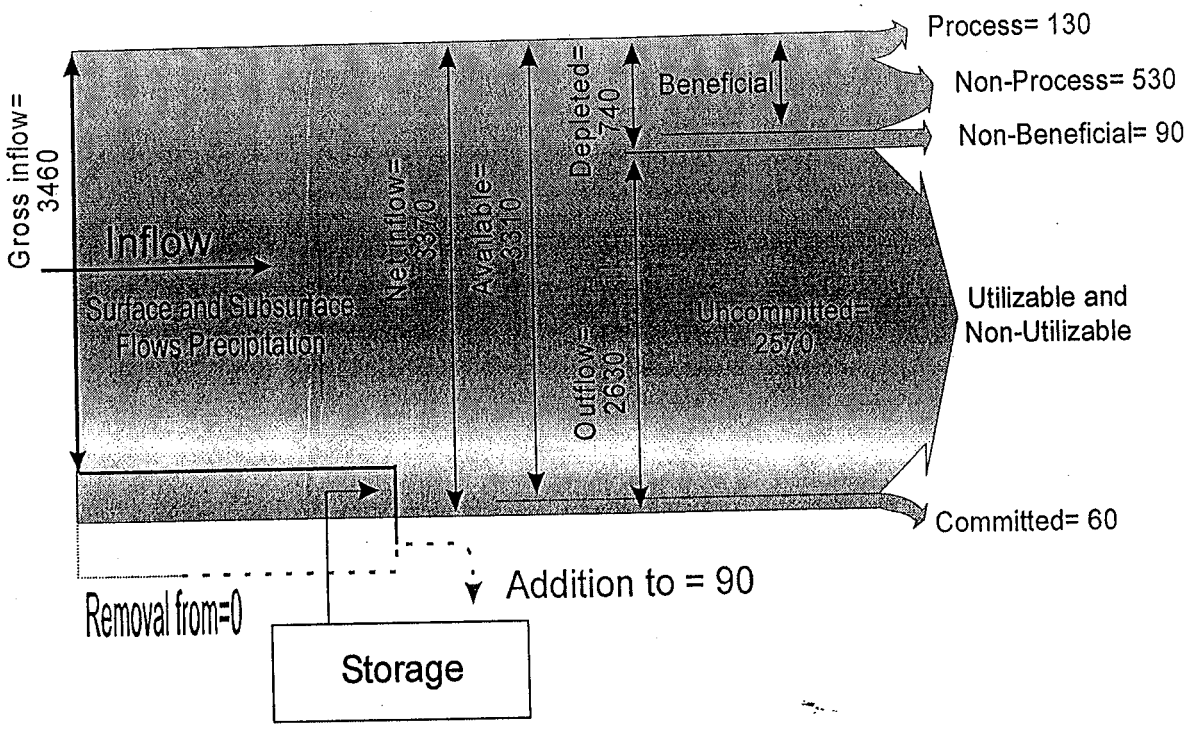


Figure 3. Finger Diagram Showing Water Account Result in the Indrawati River Basin for Average Year (unit in million cubic meters)



The Melamchi interbasin water transfer project is being constructed in the Melamchi river, a major sub-basin of Indrawati river basin, which is also a water surplus sub-basin. Most of the water in Melamchi flows out of the sub-basin, as like that of Indrawati basin. A water balance study[1] and a simulated river flow analysis along the Melamchi river show that on average the Melamchi river flow is much higher than the present water requirement of the basin community. In nine out of twelve months, the river flow averages more than 25 M^3/sec (Mishra, 2000), which is substantially higher than the present water needs in the basin. The water flow in the basin reduces to an average of 4 to 5 M^3/sec during the non-monsoon season from January to April. This level of river flow is still higher than the planned water diversion by Melamchi project, which is at 1.97 M^3/sec.

At present, the beneficial uses of water in the Melamchi sub-basin is at minimum level, mostly for forestry and agriculture sector as a consumptive use[2]. Due to lack of flow data around the project intake site, a simulated water balance study was done in Melamchi downstream at its confluence with Indrawati River. In fact, another comprehensive water balance study at around the project intake site is needed to remove some of the skepticisms on future water availability attached with the Melamchi project. Because of the restricted scope of this study, we could not substantiate on the water availability around the project intake.

Project impacts on local water uses

Several case studies in the basin revealed that the local communities are not fully aware of the Melamchi Water Transfer Project and its likely impacts on their daily water use activities, may be due to poor community level consultation and their minimum level of involvement in the project planning process. The project intake site[3] is located in the interior of the mountain range, not settled by any villages nearby the site, nor any major intake of irrigation systems or major water related projects are within the one Km down stream of the proposed intake site. In particular, one to two Kms downstream of the project intake site could be the most adversely affected stretch of the Melamchi River after the water diversion. Two other small tributaries, Ribarma Khola (tributary) and Pranjana Khola, confluence with Melamchi within less than two Kms down stream of the proposed intake site. Timbu and Thuldhunga are other streams that confluence with Melamchi further downstream (details in annex 7 and 9).

The major implications of MWSP could be on the existing institutional practices of water management at the local level, more immediate downstream of the project intake site. The proposed bulk water transfer out of the basin may change some the local hydrological characteristics immediate downstream, which may create additional stress on traditional institutional mechanisms for water allocation and conflict resolution. Such

[1] Moreover, a comprehensive project site-specific water accounting study with detailed river flow measurement at the dry months from December to June has been proposed in the second phase of the study.
[2] The spring sources water is used for the household drinking purpose not the River flow. Hence, the water re-allocation in the Melamchi will not affect the survival of the local community.
[3] The project construction work (intake construction) has just begun in the basin.

water stress would be more pronounced during the dry season from January to May, where the river flow would be only about 10 percent of its peak flow level in the monsoon season. The question then is whether these existing community level institutional arrangements can cope with the institutional crises brought by the external shock of water transfer out of the basin. These traditional institutions have not been put to the test of negotiating formal water rights across the canal systems, along rivers, or for intersectoral reallocation of water. The bulk water transfer out of the basin may lead to change on some of the local water allocation procedures, and also could lead to establishing formal water allocation and water rights over the use of resources. Moreover, these local institutions are likely to be adequate to help buffer additional water allocation and competition problems brought about by reduced supply. There is an opportunity to use these existing institutional structures to develop better arrangements to manage water resources available in the basin.

The water accounting study has shown that the present level of process consumptive use of water in the Indrawati river basin is at low level (less than four percent), and there is a potential to increase water use efficiency and water productivity in the basin. Thus, addition of minimum water infrastructures in the basin can compensate the water transfer out of the basin, which is less than 2 percent of the total annual river run-off out of the basin. Furthermore, the effective implementation of the project compensation package is expected to minimize some of these adverse impacts on local water uses in the basin community.

Project compensation package

Compared to other infrastructure and water development projects in Nepal, the Melamchi project has given more attention to the project affected communities in the supplying basin. The project has got a plan to spend US $ 18.33 millions as project compensation and rehabilitation schemes for the welfare of local the communities in the Indrawati basin. This nature and scale of benefits sharing in a water infrastructural project was unprecedented in Nepal. It is expected that this will, to some extent, minimize the social inequity associated with water transfer out of the basin, due to sharing of the project benefits among different sections of the society. Compared to previous water projects in Nepal, the Melamchi project has involved local NGOs in the project implementation stage, more of this in the recent past. This could be because of several criticisms against the project, and a relatively longer time taken to materialize the project. The project had been in discussion among Nepalese planners for nearly two decades. Recently, UNDP, IUCN and other international agencies working in Nepal were also involved in the project stakeholder consultation meetings and in designing the project compensation packages in the basin. Involvement of these INGOs and international agencies will better ensure implementation of the project compensation package and timely delivery of the compensation benefits to the project affected communities.

Environmental impacts

Average water flow in the Melamchi river is well above the planned water diversion by the Melamchi project, the river flow is more than 25 times than that of the project planned water diversion (Mishra, 2000) during the monsoon. The river flow reduces considerably during the dry season, however, the Melamchi project has a plan to release at least a flow of 0.4 M^3/sec of water downstream of the intake as a minimum environmental flow. This level of water will be released even during the dry season to maintain environmental and natural fresh water ecosystem in the river system. Other studies showed that this flow is adequate to mitigate the project's related adverse environmental impacts on fresh water ecosystems, and on local hydrology in the basin. The potential hydrological impacts are mostly limited within 2 Kms immediate downstream reach of the project intake site. However, absence of any major settlement, or water project immediately downstream of the project intake site will minimize adverse social and environment impacts of the project in the basin.

The environmental impacts of Melamchi water project was examined and cross-checked by several project feasibility studies and independent Environmental Impact Assessment studies in the basin, including an Melamchi water diversion scheme EIA study by IUCN in 1999. All of these past EIA studies have given higher ranking (positive rating) for the Melamchi project over other alternatives of supplying additional water to Kathmandu City. These alternatives include high dam storage, rainwater harvesting, and upper watershed management for supplying water to Kathmandu City (details in project synthesis report, annex 7). The World Bank and ADB/Manila and several other donors from EU are involved in financing the Melamchi water diversion project, therefore, the Melamchi project EIA guidelines have also met most of these donors' environmental guidelines. In addition, the proposed water diversion scheme is a river run-off type of project with 6 meters high intake structure (dam). Run-off type of intake structures will have minimum negative impacts on fresh water river ecosystems and least obstruction to the natural river flow. Moreover, some of the negative impacts can be mitigated with effective implementation of the project compensation package.

B. Water institutions related issues

One of the major focuses of the IWMI/WECS study in the basin was to assess and document the existing local water institutions and various local water institutional issues involved in the large scale interbasin and intersectoral water transfer project in the basin. In particular, this study summarizes the existing local level water management institutions and how these traditionally practiced institutions have evolved in the face of growing water use competition in the Indrawati river basins of Nepal, and to analyze the external shocks brought by the interbasin transfer of water. The discussions on water institutions have been grouped into two sub-groups, first is on local water institutions issues in relation to Melamchi project, and the second is on general other local level water institutions working in the community.

Melamchi Project and institutional issues

The Melamchi Water Supply Project represents a situation that is common worldwide. Increasing drinking and sanitary water demands from cities are pulling water out from the surrounding rural sector water uses both within and outsides of the local basin area. The existing water institutions in the Indrawati basin are mostly informal in nature and based on tradition or customary in practices (customary law) evolved in the past to dealing for small-scale water allocation problems. They are insufficient to deal with issues of establishing formal water rights, river water reallocation, bulk inter-sectoral reallocation, and project compensation related negotiations with agencies from outside the basin (central government), however, these informal water institutions may provide a means to buffer the increasing stress brought by the diversion of water out of the basin, and intersectoral reallocation of water.

The local users in the basin do not have any institutional arrangements during the water transfer process to negotiate with external agencies, and manage available water effectively after the water transfer has taken place. Hence, the Melamchi interbasin diversion project may be an excellent opportunity to catalyze institutional development for managing water resources in the basin where water use competition may increase in the future. Rural water users have developed time tested water allocation mechanisms over centuries to meet the local needs, which may provide the building blocks to buffer any shocks caused by the bulk water transfer out of the basin.

Among the formal institutions in the basin, District Development Committee (DDC) at the district level and Village Development Committee (VDC) at the local village and/or community levels are the locally elected stakeholders for making decision on provision of public goods and services, including water resources use. These institutions however have had a minimum role to play for the Melamchi project planning process, since the project was basically a centrally designed project to supply adequate water to the capital, city. However, consultation with local stakeholders, including the local institutional stakeholders, has recently been intensified during the actual project implementation stage. As a result, several community level stakeholder consultation meetings were held in the recent past, also involving local NGOs, national level NGOS, and representatives from INGOs functioning in the area.

Other implications of existing water institutions

In the Indrawati basin, the water allocation procedures across the sectors are mostly governed by the customary water law, based on the informal traditions and needs based water allocation mechanisms. The local customary law provides first priority to irrigation, largely because of the agricultural based livelihoods of the communities and low level development stage of the community. This is acceptable whilst the basin remains open and at a low level of water use activities, however, the situation may demand alternate water institutions and clearly defined water allocation practices as the development of other water uses increases. Other water users (such as, Ghatta, Water Mill and Micro-hydro owner) in the basin are increasingly exerting pressures to change

the existing informal arrangement and to make the water allocations more transparent and formal, protecting each of their water rights. The increasing water use competition among various uses, and the need of bulk water transfer out of the basin, may provide the needed incentives to all local stakeholders for altering the customary law based water allocation procedures. Institutionalisation of appropriate formal water allocation mechanisms will better ensure the water rights of present users, including the minority users.

However, there is a lack of co-ordination among various local institutional stakeholders to manage the water resources in the basin. Some of the major local level water sectors formal stakeholders are: District Water Resources Committee (DWRC), District Development Committee (DDC), District Irrigation Offices (DIO), Village Development Committee (VDC), NGOs and other water users groups (UAs, and FMIS). The statutory functions of these local stakeholders are not clearly defined in the present water resources act (1993), resulting in conflicts between these water institutions over their statutory roles and limitations. This has lead to situations of non-performance of some of these institutions, like DWRC. Recently, the local DDC in the basin has even filed a court case at the supreme court seeking the judicial intervention in defining the roles of each governmental agencies involved in water sector in the district due to confusions on these different water sectors' laws and regulations.

At present, the roles of elected formal water institutions (DDC and VDC) for the water allocation decision are minimal, however, these elected bodies are exerting pressures to increase their roles in the water sector. The present water act (1993) has given regulatory functions of water resources use to District Water Resource Committee (DWRC). From the field studies in the basin, it was found that, in practice, DWRC is not functioning as an effective institution in planning and water re-allocation decisions in the district, mainly due to its structural constraints, despite a greater statutory role provided by the water act (1993). In reality, the DWRC setup is mostly represented by government bureaucrats, officials and technocrats, virtually none are from the local stakeholders and water users in the district.

C. Existing water allocations, water rights, and conflicts

Major water allocations and/or water use activities in the basin are irrigation systems, water turbine mills, Ghatta, and the micro-hydro. The existing water allocations across these sectors are mostly based on the customary practices and local traditions. Formal water allocation rules have not yet been locally adapted in the basin, may be due to low level of developmental stage, few competing water use activities, and the relative abundance of water in the basin. However, the new water use activities like micro-hydro, irrigation systems, water mills are increasing in the recent past. The water rights of water mill and micro-hydro operator are usually negotiated with the irrigation users (farmers). The owners of water mill and micro-hydro usually take the responsibility for O&M costs of the field canal and in return farmers give access to their land for construction of the canal. This is a kind of sharing of the *de-facto* water rights among different sectors (individuals) in the community. The owners of water mill, Ghatta, and micro-hydro think that the farmers should also share some of the maintenance costs of the field canal

delivering water to those end uses, since farmers are also equal beneficiaries of timely maintenance and smooth operation of the field canal because of assured supply of irrigation to their lands year around.

The trend for increasing water development projects in the basin may require changes to some of the existing water allocation mechanisms (based on customary law), which mostly favors irrigation uses over others. This has also created some frictions in operation of the water projects in the basin during some of the dry periods. The seasonal fluctuation of water in the basin is creating a water scarcity situation in some months, although on the average the basin as a whole is still an open basin. The existing informal institutions may not be able to resolve these large scale water allocation issues, like Melamchi water supply project and hydropower project in the basin, therefore, the seasonal scarcity of water may lead to development of new form of water institutions in the basin in near future.

D. Equity dimension of the water uses

The requirement for compulsory contributions of cash (and labor) to become eligible to receive the service from the new water use activities (micro-hydropower service) practiced in the local communities was detrimental to poor and marginal households in the community. This has indirectly contributed to exclusion of poor and marginal households in the basin from using these new water use services in the basin, particularly for services of micro-hydro and new irrigation systems. Moreover, this economic exclusion can be potentially avoided by targeting DDC and VDC subsidy on the water project, with specific requirement to serve some of these marginal households in the community for being eligible to receive the government subsidy in the water development projects. This type of exclusion (economic exclusion) was particularly seen more in the case of private micro-hydro operation there than in the case of the community own micro-hydro. Inability to pay monthly service fee by these marginal households is another reason for their exclusion in the case of privately operated micro-hydro, whereas, labor contribution, instead of monthly cash payment, is the usual practice followed in the community owned micro-hydro system.

In addition, it was also found that poor and socially deprived households are usually excluded from these new water use services because they are usually not sufficiently represented even in the group community decision-making processes for the resources use (i.e., social exclusion). Increasing their access to decision-making process in the community institutions would enable them for due sharing of the project benefits and water use activities, as like other members of the community. Better enforcement of formal water allocation rules may assist to minimize the level of social exclusion.

Occasionally, the prior use rights (prior appropriation rights) of water users are encroached without giving any compensation to the first users, particularly more seen in the case of water disputes between Ghatta vs. irrigation water uses in the community. The water rights of the Ghatta owners, who are usually marginal households in the

community, are more often encroached on when compared to water use rights of others in the basin.

7.2 Policy Recommendations

Increasing water use activities in the basin and the planned water diversion out of the basin have created uncertainties among the local community about the future water availability in the basin. Based on the case studies at the Indrawati River basin, a large number of policy issues have been identified, but we think the following are the most prominent policy implications derived from the project study at the basin. Details of the policy implications are also discussed in the project synthesis report (annex 7), and are summarized below:

In relation to Melamchi Project.

- Reallocation of water across the sectors, from lower value use to higher value use as planned in the Melamchi project, would increase the productive uses of the resources. However, due consideration should be given to social equity and environmental sustainability attached to the existing water uses in the water supplying basins. The water transfer task can be effectively facilitated with due sharing of the project benefits with the water supplying basin. Considering the water scarcity in the urban areas, the net social benefits generated by the project could be very high, sufficient to compensate the costs imposed in the donor basin (Indrawati basin) if effective project planning is done in time, and effective implementation of the project compensation package is achieved.
- While planning such a large water transfer project, local level consultations, building up local confidence early from the project planning stage, and due sharing of project information with the local communities would help to minimize the public reaction against the project. Frequent local level consultations, even during the implementation stage, will greatly boost the local level support for the project and ensure its long run success in the basin by minimizing the local level oppositions against the infrastructure project. Inequitable sharing of the benefits and costs of such infrastructure project is often at the heart of such criticisms against the project.
- The project compensation packages should be better targeted to the project affected members of the community. At present, the focus of compensation package is mostly on the construction of general public (or community level) infrastructure facilities, like, school, access road, health post, etc. The project-displaced households may not remain in the community to utilize the benefits of these facilities, after five to six years, when these infrastructure facilities will be built in the community. Therefore, restructuring of the compensation packages considering the time dimension of the resources use will enhance the effectiveness of the project compensation scheme.
- There is a need for new formal institutions and water laws and regulations for the bulk scale water transfer and its compensation mechanism. There could be a need for such bulk water transfer schemes also in other cities in Nepal in the near future.

Formal procedures would help to maintain the equity in water use and benefits sharing across the sectors, and timely design project compensation schemes.

- In view of the long run operation of the Melamchi water diversion project (for more than 30 years), the phase-wise assessment study (Process Documentation) of the Melamchi project is recommended for the monitoring of the project activities in the basin. This would also help to timely avoid any adverse social impacts during the construction phase, and assist in restructuring the project compensation packages accordingly to the changing situations.
- Active involvement of the project authority in the research process (and PDR activities) will ensure timely application of the research outcomes and better operationalization of IWRM principles during the resources use decisions of the project.

Water balance situation

- We could not substantiate the water balance at the project intake site due to unavailability of river flow data at the project intake site. Therefore, a detailed water accounting study at the Melamchi-sub basin is needed, focused at the water diversion intake site. A detailed water balance study at the project intake site will also help to better quantify all other impacts of the Melamchi project in the basin, and help better target the project compensation package to the most affected households.
- There is a need to have a detailed monitoring of the water flow of the Melamchi river and its tributaries surrounding the proposed intake site. This is important particularly for documenting the dry season flow in the river when water scarcity occurs.

Water institutions

- Informal institutions have been adequate to manage water allocations for the present water demand in the basin, however, it is expected that the appropriate formal institutional mechanism of water allocation will evolve to manage the external stress brought by bulk water transfer out of the basin. These developments and dynamics of institutional evolution nevertheless should be closely monitored to understand the complexities involved in institutional development and adjustment in a changing context.
- There is a need to clearly define the statutory roles of all the institutional stakeholders and locally elected bodies involved in water sectors, like the legal authority and functions of District Development Committee (DDC) vs. District Water Resources Committee (DWRC), and the Village Development Committee (VDC).
- Based on the functions and statutory roles of district level organizations, the DDC is possibly the appropriate body for water resources planning and water allocations at the district level, and VDC body for water planning at the village and community level. DDC should be given authority to water allocation, even including taxations of small-scale hydropower (0-5 MW). The central government should play a greater

role in planning and regulating relatively larger scale water project (including hydropower projects) with a clear classification of project categories. Revenue sharing among these agencies is one of the problematic issues here. Involvement of local stakeholders, DDC and VDC institutions would however provide better equity in water resources use, and better participation of local stakeholders in water use decisions. Thereby, also ensure better application of IWRM principles.

- At present, DWRC is not functioning as per the spirit of the water act (1993), manly due to less representation by the local stakeholders into the executive committee body. However, DWRC could be a major catalytic force implementing IWRM principles in the basin context, and coordinating the water sectors activities within a district, and even across the adjacent districts. There is a clear need to reform the structural set up of the DWRC to make it more functional, with proper representation by local stakeholders like DDC, and also effective participation in the executive committee from other major water users associations functioning in the district.

Equity and social dimensions on water uses

- In the absence of enforcement of formal water rights, marginal communities and the disadvantaged sections of the society are the most adversely affected by any water re-allocation and/or bulk water transfer decisions. If the prior appropriation water rights of the existing water users, even minority users, are established then that could better protect the water rights of the marginal communities and low-income households in the society.
- The provision of registration of secure water rights at VDC and DDC, or at DWRC, would greatly facilitate the design of better project compensation packages and benefits sharing on reallocation of water within the local community, out of the community, or out of the basin. This could also encourage private sector investment in the water sector projects by removing ambiguities and uncertainties about social issues involved in water uses, and will minimize the transaction costs associated with the project negotiation process.
- While implementing community project like micro-hydro, instead of general subsidy from the government (DDC), if targeted subsidy is given with the condition attached with the guarantee services to the certain numbers of poor and marginal households in the community, then that would facilitate for better social inclusions in the use of new water services. This would effectively provide incentives to micro-hydro owner also to include lower income households in the water service uses who cannot pay monthly service in cash, and/or who cannot provide cash contribution during the construction of the project. At the same time, such targeted DDC subsidy will also not deter the local level private investment in the micro-hydro services.

Implications to IWRM and River basin management

- Two district level institutions, District water Resource Committee (DWRC) and District Development Committee (DDC), responsible for planning and regulating local level water use activities in the district should complement each others' roles

for initiating the Integrated Water Resource Management framework in Nepal. There is a need to make a distinction between planning and regulative (administrative) function of the formal water institutions. Planning and legislative function could be assigned to DDC and the regulative function to DWRC.

- The role of DDC chairman and the concerned water authority (District Irrigation officer) should be clearly stated in the functioning of DWRC, so that the concerned local water officials and institutional stakeholders would take initiative for effective functioning of DWRC, and follow up the agendas at the meeting. Inclusion of representative from other local water users in the set up of DWRC may provide more decentralized decisions in managing the water resources and effective coordination across the sectors in the district.
- Based on the current setting of DWRC, its function can be expanded to include inter districts coordination within a basin in the framework of IWRM, and initiating basin level planning. This could be done through DWRC with minimal disturbance to other agencies, and minimal additional shake up on the functions of the existing administrative and political boundaries in Nepal. At the same time, this would also facilitate implementation of the hydrological concepts of river basin planning, and implementation of institutional framework of IWRM. Application of some of the IWRM principles through DWRC, in principle, will involve relatively less transaction costs. DWRC could provide a forum for information sharing and initiating river planning even across the districts where water has already become a binding factor in the development process. Extended role of DWRC in this process will also be less opposed from other existing local stakeholders.

Implications for Future Research

Based on the assessment of water use activities in the basin and in the context of on going Melamchi Water Diversion Project in the basin, this study suggests the following policy-oriented research activities in the Indrawati river basin.

1. Conducting a detailed water balance study at Melamchi river and its tributaries, particularly, at the major confluences along 2 KM upstream and 2 Km down stream from the proposed project intake site. The detailed water balance study in Melamchi would clarify the present confusions and skepticisms attached with the water diversion project in relation to future water availability of the basin, and its likely differential impacts across the sectors, and across the locations.
2. There is a need to have a proper assessment of the economic and societal benefits (costs) of water transfer out of the Melamchi sub-basin to Kathmandu, including the social and environmental costs (benefits) attached with such interbasin water transfer scheme. Information from such comprehensive economic analyses would provide detailed assessment on who will get what benefits from the water diversion scheme, and where most of the social costs (benefits) will be imposed (realized). This information provides basis for judging adequacy of the project compensation criteria. This information will

also useful in designing effective compensation packages and project benefits sharing mechanism during the project construction, as well project operation phase. Not only for Melamchi project, but these sorts of information will equally be useful in other water infrastructure projects in Nepal.

3. Considering the nature of the project, there is also need to assess the total social and economic benefits generated out of the Melamchi water diversion scheme, at its opportunity costs level. This information will also be useful to other water transfer and intersectoral water projects in Nepal.
4. There is also a need to continue Process Documentation Research (PDR) of Melamchi water supply project. The information generated should be incorporated within the Melamchi review process and monitoring, and lead to better implementation of the project compensation package.
5. There is also need to have a review and analysis of governmental acts and regulations in water sector, i.e., functions of DWRC, DDC, and the VDC. A comprehensive assessment of institutional level water allocation rules and regulations would provide a better picture on how the future role of DWRC and DDC in water sector could be adjusted in line with the IWRM principles.

8. Other Activities taken up by IWMI in Nepal

The research activities and outputs on this project have provided valuable inputs to on going other research projects of IWMI-Nepal office. These include:

1. A cross-country study on "Creating Effective Water Management Institutions for Managing River Basins", with the funding support from the Asian Development Bank, has commenced from July 1999 in the East Rapti river basin. The methodology applied in Indrawati study and its finding has been helpful for the ADB study in East Rapti river basin, particularly water accounting and institutional analysis.
2. A three-year research project " Poverty-focused small holder water management" is on going and study on the impact of drip irrigation has been completed with funding support from Department for International Development, UK. The project impact assessment methodology was particularly useful in this process.

Similarly, there are several new concept papers and research proposals have been developed, according to the theme area of IWMI research, and are listed below:

Integrated Water Resource Management for Agriculture

1. Applied research on ongoing projects in the hills-irrigation technology, and agriculture technology (water application).
2. Impact evaluation of rehabilitated surface irrigation and ground water irrigation systems and its sustainability implications (evaluation of NISP).

3. Integrated land and water resource management in Pokhara valley (priority identified by *WECS and* concept note has been developed).
4. Assessment of the past investment (10 years period) in irrigation by HMG/N to look at its impact on food production in relation to poverty alleviation in poor communities (concept note developed).
5. Integrated Natural Resources Management in Nepal: linking Forests, Water and Land. Draft concept paper developed in collaboration with John Soussan of University of Leeds, UK for submission to DfID.
6. Mr. Adhikari, an M. Sc. Student from IHE (Netherlands), is now working for his thesis research in West Gandak systems, funding provided by IWMI.

Sustainable Smallholder Land and Water Management Systems

1. Impacts of Irrigation on poverty in Nepal.
2. Introduction of small size water pumps for irrigation. This is in continuation to the ongoing study on drip irrigation by RITI consultant. Concept note was developed in October 2000.
3. Impacts of hill irrigation on poverty alleviation.

Sustainable Groundwater Management

1. Groundwater use both as alternative to surface water and as conjunctive use in ERRB and other areas.
2. Subsidy removal in shallow tube-wells and its implication in agriculture production and marketing (priority of *WECS*).
3. Post transfer support for Deep-tube wells in Bhairawa-Lumbini Ground Water Project (This could be part of second phase of IMTP study. Likewise, BLGWP is interested in looking at the impacts of tube wells installed during first two phases).
4. Consumptive use of Ground water in the Nepal Terai.

Water Resource Institutions and Policies

1. Institutional arrangement for river basin management (priority sector of *WECS*)
2. Post transfer support in IMT systems (What type of support required to enable users to manage irrigation systems properly?). Whether recommended support (IWMI study, 1999) have been provided or not? Whether the present focus of IMT (which is heavily biased towards infrastructure improvement) is conducive to successful management transfer.
3. Water scarcity, water right and institutional arrangement in various pockets of ERRB, what are the arrangements in the area left out by ERIP? (Priority sector of *WECS/Nepal*)
4. Water Productivity and the economic value of water under alternate uses. Water pricing study. (Priority of *WECS/Nepal).*
5. Action research on Basin Planning in ERRB, or Indrawati river basin.
6. Process documentation research of Melamchi Water Supply Project.

7. Institutional Development Support in Kankai Irrigation System (concept note was developed on the basis of discussion held in CC meeting of September 1998).
8. Documentation of I/NGOs involved in irrigation and agriculture development and their performance assessment in promoting food security among poor rural households.
9. Impact of extension services in irrigated agriculture and institutional constraint in its dissemination.

Water, Health and Environment

1. Environmental economics/environmental and social costs and benefits of water transfer out of the Indrawati Basin. (Priority sector of WECS)
2. Impact of urban development in Katmandu Valley on irrigated agriculture.

Comprehensive Assessment

1. Irrigation Impact study - case study Nepal – possibly Pokhara Valley
2. Irrigation Impact study in surface irrigation system

Other miscellaneous activities undertaken by the IWMI/Nepal office:

1. IWMI/Nepal is on the National Network for Water Harvesting Studies.
2. Inputs on efforts to creating National Federation for Water Users Association in Nepal

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Annexes

Annex 1 – Schedule of Completed Activities: Indrawati River Basin Study

ACTIVITIES	99	2000												2001												Leading*
	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	Agency
A. Ground works																										
I. Formation of advisory committee	■																									WECS
II. Field visit for inception report	■																									
B Research activities	■																									IWMI, WECS
I. Initial assessment																										
I.1 Assessment of present status of resource base		■	■																							WECS
I.2 Field visits			■	■																						WECS
I.3 Prepare detailed basin map				■	■																					WECS
I.4 Report					■																					WECS
II. Water use patterns																										
II.1 Identification of various sectoral water uses					■	■																				WECS
II.2 Estimation of sectoral water uses						■	■																			WECS
II.3 Assess degree of water scarcity and						■	■	■																		WECS, IWMI
Competition for water							■																			IWMI, WECS
II.4 Report and brief writing														■	■											IWMI
III. Formal and informal arrangements																										
III.1 Identification of existing formal & informal																										IWMI, WECS
Institutions associated with water management										■	■	■														
III.2 Documentation of formal and informal																										IWMI
water management rights and allocation																										
Arrangements										■	■	■														
III.3 Documentation of formal and informal																										IWMI
Conflict resolution mechanisms											■	■														
III.4 Report and brief writing												■	■													IWMI
IV. Ongoing and new development projects																										
IV.1 Identification of ongoing and new			■	■	■																					IWMI, WECS
water development efforts																										
IV.2 Study on inclusion and exclusion processes										■	■	■														IWMI
IV.3 Process documentation on Melamchi																										IWMI
and other projects														■	■											
IV.4 Potential impacts of water development														■	■											IWMI, WECS
IV.5 Report and brief writing															■											IWMI
V. Project Recommandations																										IWMI, WECS
V.1 Synthesis Report writings																					■	■	■	■		IWMI
V.2 Policy brief writings																					■	■	■	■		IWMI
C Workshop																										
C1. Workshop																	■									WECS,
C2. Proceeding writing																						■				WECS,
D Technical Advisory committee meetings			■						■					■			■									WECS, IWMI
E Stakeholders meetings				■							■															WECS, IWMI

* Despite the identified lead agency, all the activities were undertaken in mutual collaboration between WECS and IWMI.

Annex 2 – List of Advisory Committee Members of Indrawati Project

1 Mr. Bidhya Nath Nepal, Executive Secretary, WECS – Chairman
2 Mr. Purna Bhadra Adiga, Co-ordinator, WRSF/WECS – Member
3 Mr. S.K. Sharma, Sr. Div. Engineer, MOWR – Member
4 Mr. Shiv Sundar Shrestha, Chief Agr. Ext. Office, MOAC – Member
5 Mr. J. P. Thanju, Sr. Div. Engineer, WECS – Member
6 Mr. Tara Man Gurung, Sr. Div. Engineer, DOI – Member
7 Mr. Gautam Raj Karnikar, Sr. Div. Engineer, WECS – Member
8 Mr. Sanju Upadhaya, Engineer, WECS – Member
9 Mr. Krishna Rana, Sr. Div. Engineer, MWSP - Member
10 Dr. Ujjwal Pradhan, Programme Officer, Ford Foundation – Member
11 Dr. Neeraj Joshi, IAAS – Member
12 Mr. Scott G. Furguson, Project Director, Inst. Dev. Proj./WECS - Member
13 Representative, IWMI/Sri Lanka – Member
14 Mr. K. C. Prashad Shah/Dr. Dhruba Pant, IWMI/Nepal - Member

Annex 3 – List of Grant-related Publications/Monographs

I. IWMI/Nepal and WECS related project documents and publications

In 2000.

WECS and IWMI. 2000. Inception Report on Integrated Development and Management of Water Resources in the Indrawati River Basin, Nepal. (January 2000).

Mishra, D.S. 2000. Water Accounting for Indrawati River basin, IWMI/WECS, Nepal. Kathmandu, Nepal.

Gupta, A. K. 2000. Identification of Ongoing and New Water Resources Development Activities in the Indrawati river Basin. IWMI/Nepal and WECS. (April 2000).

Rajkarnikar, Gautam. 2000. Initial Assessment of Resource Base in Indrawati River Basin, Nepal. WECS and IWMI. (May 2000).

Rajkarnikar, G. and K. Prasad 2000. Initial Findings from the Research Works on Integrated Development and Management of Water Resources in Indrawati River Basin, Nepal. Paper presented in the Workshop on Development of the Effective Water Management Institutions in East Rapti River Basin, Katmandu, August 18, 2000.

Shrestha, R. K., 2000. GIS Assisted Water Resources Development and Management: A Case Study in Indrawati River Basin, Nepal. Water Resources Engineering Division, Institute of Engineering. (September 2000).

Pun, S. 2000. Study on Stakeholders' Inclusion - Exclusion Processes in Indrawati River Basin. IWMI and WECS. (December 2000).

In 2001

Pant, D. and M. Bhattarai, 2001. Integrated Development and Management of Water Resources in Indrawati River Basin, Nepal: A Study on Formal and Informal Institutions on Water Management. IWMI/Nepal and WECS. (January 2001).

Mishra, V.S. and R. L. Shilpakar, 2001. Integrated Development and Management of Water Resources for Productive and Equitable Use: Water Accounting for Indrawati River Basin, Nepal. WECS and IWMI/Nepal (Draft). (February 2001).

Devkota, H. and M. Bhattarai. 2001. Process Documentation Research for Melamchi Water Supply Project. IWMI/Nepal and WECS. (March 2001).

Koirala, Ramesh P. 2001. Decision Support System for River Basin Planning: A case of Indrawati River Basin. (May 2001).

Sharma, C. and D. Pant. 2001. Proceedings of the workshop on Integrated Development and Management of Nepal Water Resources: case of Indrawati River Basin (Sept. 2001).

II. IWMI technical paper and referred publications

IWMI 2001/2. Integrated Development of Water Resources in the Indrawati River Basin, Nepal (Project synthesis report). This project report will be soon published as an IWMI working paper or as a peer reviewed IWMI Research Report series.

IWMI 2001/2. Three Policy Briefs on topics like "Formal and Informal Institution", "Stakeholder Inclusion and Exclusion Process" and "Water Accounting situation in the Indrawati basin." (These three policy briefs are finalized and under publication process at IWMI, the draft copies of the Policy Briefs are provided separately).

Pant D.; M. Bhattarai; H. Devkota; K. Prasad; G. Rajkarnikar and D. Molden. 2001. Interbasin Water Transfer and Changes in Rural Water Management Institutions: A case Study from the Melamchi River Basin in Nepal. A conference paper presented at US-CID Transbasin Water Transfer workshop in Colorado USA, June 27-30, 2001. The paper has been published in US-CID workshop proceeding.

Annex 4 – Nepal Policy Briefs

1. IWMI/Nepal Brief No 8. Study on Stakeholders' Inclusion - Exclusion Processes in Indrawati River Basin.

2. IWMI/Nepal Brief No 9. Water Institutions in Indrawati River Basin.

3. IWMI/Nepal Brief No 10. Water Balance for Indrawati River Basin.

(These Policy Briefs are separately included in the attached folder)

Annex 5 – Paper presented at United State Committee on Irrigation and Drainage Conference on Transbasin Water Transfer, Denver, Colorado, June, 27-30, 2001 June

Pant D.; M. Bhattarai; H. Devkota; K. Prasad; G. Rajkarnikar and D. Molden. 2001. Interbasin Water Transfer and Changes in Rural Water Management Institutions: A case Study from the Melamchi River Basin in Nepal. A conference paper presented at US-CID Transbasin Water Transfer workshop in Colorado USA, June 26, 2001. The paper has been published in US-CID workshop proceeding.

(A photocopy of this published paper is separately included in the attached folder)

Annex 6 – List of Participants in the workshop on Indrawati River Basin Study

1. Dr. Dhruba Pant, IWMI Nepal
2. Dr. Divas B. Basnet, WRSF Consultant
3. Dr. Indra L. Kalu, Ex. Director, RITI Consultants
4. Dr. K. B. Aryal, Executive Director, WECS
5. Dr. K. R. Sharma, Coordinator, NISP, Department of Irrigation (DOI)
6. Dr. Madar Samad, IWMI-HQ
7. Dr. Madhusudan Bhattarai, IWMI-HQ
8. Dr. Prachanda Pradhan, FMIS Trust
9. Dr. R. P. Yadav, Program Director, Winrock International
10. Dr. U. Parajuli, Chief, RTDB, DOI
11. Dr. Ujwal Pradhan, Ford Foundation
12. Dr. Upendra Gautam, WRSF Consultants
13. Mr. A. N. Baidya, Department of Agriculture
14. Mr. Ajay Bista, Agri. Economist, Ministry of Agriculture and Cooperative
15. Mr. B. Baniaya, Section Officer, WECS
16. Mr. B. R. Adhikari, Senior Divisional Engineer, WECS
17. Mr. B. R. kaini, Deputy Director General, Department of Agriculture
18. Mr. Bharat Purasaini, Project Coordinator, Dept. of Soil Conservation and Watershed Mgmt.
19. Mr. Bhubanesh K. Pradhan, Chairperson, ARMS
20. Mr. Chiramjivi Sharma, SISP Consultant
21. Mr. Chitra Dev Bhatta, Advisor, NPC
22. Mr. D. D. Baral, Engineer, DOI
23. Mr. D. P. Kharel, Engineer, DOI
24. Mr. D. R. Regmi, Joint Secretary, MOWR
25. Mr. Damber Aryal, Vice Chairman, DDC Sindhupalchowk
26. Mr. Dhirendra Bhattarai, Engineer, WRSF/WECS
27. Mr. Duman Thapa, Executive Director, MRMG
28. Mr. Ganesh B. Khatri, Local Dev. Officer, Sindhupalchowk
29. Mr. Gautam Rajkarnikar, WECS
30. Mr. Gokul P. Sharma, Project Coordinator, WIDP
31. Mr. Govinda D. Sharestha, WRSF Consultants
32. Mr. Hari Devkota, IWMI Nepal
33. Mr. Hari Hemchuri, Engineer, Department of Irrigation
34. Mr. Iswor R. Onta, WRSF Consultants
35. Mr. J. R. Sharma, Coordinator, IMTP, Department of Irrigation
36. Mr. Janak L. Maharjan, Draft person, WECS
37. Mr. K. B. Bhurtel, Executive Director, WECS
38. Mr. K. Sharma, Director, CRID
39. Mr. Keshav R. Adhikari, Coordinator WMSG/IAAS
40. Mr. Kiran P. Giri, Economist, WECS
41. Mr. L. P. Bhattarai, Sociologist, DOI
42. Mr. Laxman Kharel, Engineer, MWSDB
43. Mr. Laxmi N. Chaudhari, Nepal Engineering College

44. Mr. M. L. Shrestha, Senior Divisional Engineer, DIO Sindhupalchowk
45. Mr. Mukti N. Manandhar, Project Manager, RTP/Department of Irrigation
46. Mr. N. K. Agarwal, WRSF Consultant
47. Mr. N. N. Vaidya, DDG, Department of Irrigation
48. Mr. Narayan P. Bhattarai, Deputy Director General, DOI
49. Mr. P. B. Adiga, Executive Director, WECS
50. Mr. Padam P. Aryal, WUA Federation Nepal
51. Mr. Prabhat Kumar, Engineer, Melamchi WSDB
52. Mr. Prem Raj Purkoli, WIDP/WECS
53. Mr. R. C. Arya, Senior Divisional Engineer, WECS
54. Mr. R. N. Kayastha, Project Manager, WRSF/WECS
55. Mr. Rajendra K. Chettri, Joint Secretary, Parliament Secretariat
56. Mr. Rajendra L. Shilpakar, IWMI Nepal
57. Mr. S. N. Poudel, Director, SILT Consultants
58. Mr. S. N. Sharma, WRSF Consultants
59. Mr. S. P. Sharma, Joint Secretary, MOWR, Singh Durbar
60. Mr. Saleem Sial, Asstt Coordinator (Water), ICIMOD
61. Mr. Sanjay Dhungel, Engineer WECS
62. Mr. Sanjeev Singh, Project Administrator, WIDP/WECS
63. Mr. Sanju Upadhyaya, Engineer, WECS
64. Mr. Saresh Nepal, Chairperson, DDC Sindhupalchowk
65. Mr. Shiva K. Sharma, Senior Divisional Engineer, Ministry of Water Resources
66. Mr. Sunden Lepcha, Accountant WIDP
67. Mr. Tara Man Gurung, SDE, CRID, Ekantakuna, Lalitpur
68. Mr. Vijay S. Mishra, Engineer, DOI
69. Mr. Vinod K. Shah, Chief, District Agriculture Dev. Office, Sindhupalchowk
70. Mr. Yukta B. Adhikari, Local Informant, Melamchi
71. Ms. Bimala Pradhan, Social Service Officer, WECS
72. Ms. Janaki Karmacharya, Librarian, WECS
73. Ms. Mandira S. Shrestha, Senior Hydrologist, Tahal Consultants
74. Ms. Sanchita Sharma, Consultant

Annex 7 – Project Synthesis Report.

(This project synthesis report is separately included in the attached folder)

Annex 8 – Kathmandu National Workshop Brief

(Two pages workshop brief is separately included in the attached folder).

Annex 9 – Detailed of Individual Case Studies in the Indrawati Basin.

(Detailed case study reports are separately included in the attached folder).

Annex 10 – Financial Statement

(Project financial statement is separately included in the attached folder).