Local Water Management Institutions and the Bulk Intersectoral Water Transfer: A Case Study of the Melamchi Water Transfer Project in Nepal[1]

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Abstract

To mitigate drinking water crisis in Kathmandu city, the Government of Nepal has recently initiated Melamchi water transfer project, which will divert water from the Melamchi River to Kathmandu city's water supply network. In the first phase, the project will divert 170,000 cubic meters of water per day (@ 1.97M^3/sec), which will be to triple-using the same infrastructure- as city water demand increases in the future. This paper analyzes some of the major local water management related changes brought by the water transfer project, and the changes in local water governance and CPR institutions in the Melamchi basin. Our study showed that traditional informal water management institutions were effective in regulating present water use practices, but the situation will vastly change because of this scale of water transfer decisions, and inequity in bargaining power due to the involvement of organized public sector at one side and dispersed and unorganized marginal waters users and FMIS institutions at the other end. This has made it difficult for the local farmers (users) and institutions to collectively bargain and negotiate with the central water transfer authority for fair share of the project benefits, and/or, due compensation of the losses imposed to them. The process and scale of project compensation for economic losses and equity over resources uses are at the heart of concerns and debates about the Melamchi water transfer decision. The Melamchi project has plan for one time fixed type of compensation package and about one percent of revenue sharing package from the city collected water revenue with the basin of water origin. The main issues here are what forms of compensation packages and water rights structures would emerge in relation to the project activities that are socially acceptable and also ensure equitable distribution of the project benefits between the two water sharing basin-communities. This paper illustrates some of these issues exclusively in the case of Melamchi water transfer project in Nepal, but these issues are equally applicable to wider regions of other developing countries where such rural to urban water transfer decisions are in discussions.

Key words: *Institutional implications of intersectoral water transfer; Compensation of water transfer project; Melamchi water transfer project; Kathmandu city water supply; Nepal.*

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Local Water Management Institutions and the Bulk Intersectoral Water Transfer: A Case Study of the Melamchi Water Transfer Project in Nepal

Introduction

To mitigate drinking water crisis in Kathmandu city, the Government of Nepal has recently commenced a Melamchi water transfer project, which will divert water from the Melamchi River -located in upstream rural communities- to Kathmandu city's water supply network. In the first phase, the project will divert 170,000 cubic meters of water per day (@ 1.97 m^3/sec) using the 26 km tunnel in the high Himalayas, but the plan is to triple the volume of water transfer using the same tunnel infrastructure as city water demand increases. The planned project cost is of about US$464 million[3], if it is completed by 2008/9. This project in fact represents both an intersectoral and interbasin water transfer decisions, and because of the scale and size of the project, it will have large extent of impacts on local water management and common property institutions in the Melamchi basin, located in upper Himalayan region in central Nepal. In this context, this paper describes some of the key socioeconomic and hydrological implications of the project in the basin of water supply (i.e., Melamchi basin community), and the distribution of the project benefits and the project `s planned project compensations.

The demand for intersectoral water transfer is growing rapidly worldwide because of rapidly increasing urban sector water demand, this is more so in the case of developing world because of the fast pace of urban population growth and inadequate services rendered by the existing system. In South Asia the intersectoral water transfer practices are mostly done under a tight governmental fist (organization) with least participation of stakeholders. Compared to the cases in developed countries where water transfers are taking place for longtime, the water transfer institutions in South Asia are at infant stage; but the intersectoral water pressure is very rapidly increasing in this region in the recent past. Taking a case study approach at the Melamchi water transfer decision, this paper illustrates some of these institutional and policy issues in intersectoral reallocation that are in fact equally also apply to several other places in the South Asia, where such intersectoral water reallocation plans are in discussions.

[3] According to the recent communication from the Melamchi project authority and others involved in the project, it is likely that the project gets delayed more than 5 years of schedule time, and accordingly increases on the planned project costs.

In relation to institutional impacts of the Melamchi water transfer project, some of the pertinent issues that need to be examined are:

- Who are existing water users, the patterns of water uses by sector, and water uses related income in the Melamchi basin? Who are left out in the process?
- What are the formal and informal arrangements for managing water in its different uses within the basin? What are the water rights arrangements and means for conflict resolution in the basin?
- What is the degree of scarcity and competition for water resources ?
- What are possible impacts of the proposed Melamchi water transfer on water use patterns, local water institutions, and local level management of the water resources? Which sectors and/or water use groups in the basin will be affected? How do different user groups respond to this?
- What are the project compensation mechanisms adopted and how can interests of disadvantaged groups be better protected and served?

This study attempts to address some of these questions and concerns related to the Melamchi water transfer project. This is done by adopting an exploratory case study approach of research methodology to carry out the field study[4] in Nepal. Because of the unavailability of detailed field data on water uses among various sectors, and the informal nature of functioning of the local level water institutions, this study relied on exploratory and participatory data collection methodology (PRA type of methodologies). Therefore, the nature and scope of the study also need to be judged considering these limitations on analyses and scope of the study.

The information collected from the short case studies in the Melamchi basin is again supplemented by secondary sources of information adopting a thorough desktop study by review of past studies, including government documents and other gray literature (local publications) in Nepal. The location of project and water transfer process is illustrated in figures 1 and 2.

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[4] This paper synthesizes key findings of several short case studies carried out earlier in the water-supplying basin, the Indrawati River basin, in relation to the Melamchi project. These case studies include, Process Documentation Research of the Melamchi project (Devkota and Bhattarai, 2001), Formal and Informal Institutions study (Pant and Bhattarai, 2001), Water Accounting study (Mishra, 2000), and the IWMI-WECS Indrawati project synthesis report (Bhattarai, *et al*., 2002). The authors acknowledge contribution of all of these studies and authors involved in these case studies in the Indrawati basin carried out by IWMI and WECS/Nepal (2000-2001), and to the Ford Foundation, Delhi, for providing the research grant support to carry the project work in Nepal.

Figure 1. Map of Nepal with District Boundaries Showing Indrawati River basin areas.
(Note: The diversion river site is located in Sindhupalchok district, an upper catchment of the city**).**
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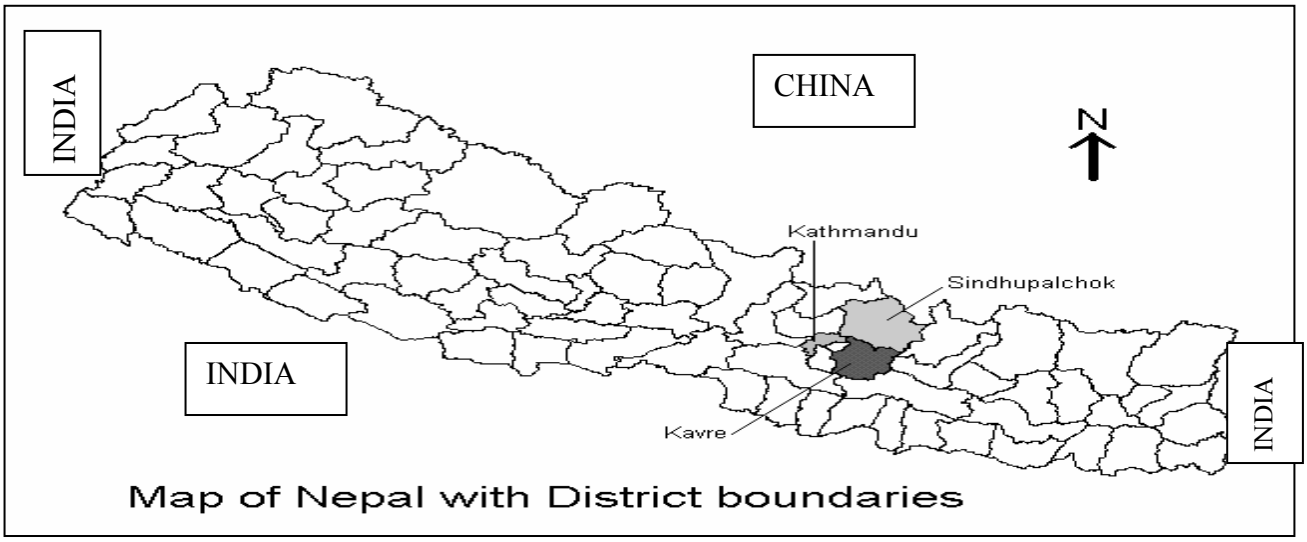
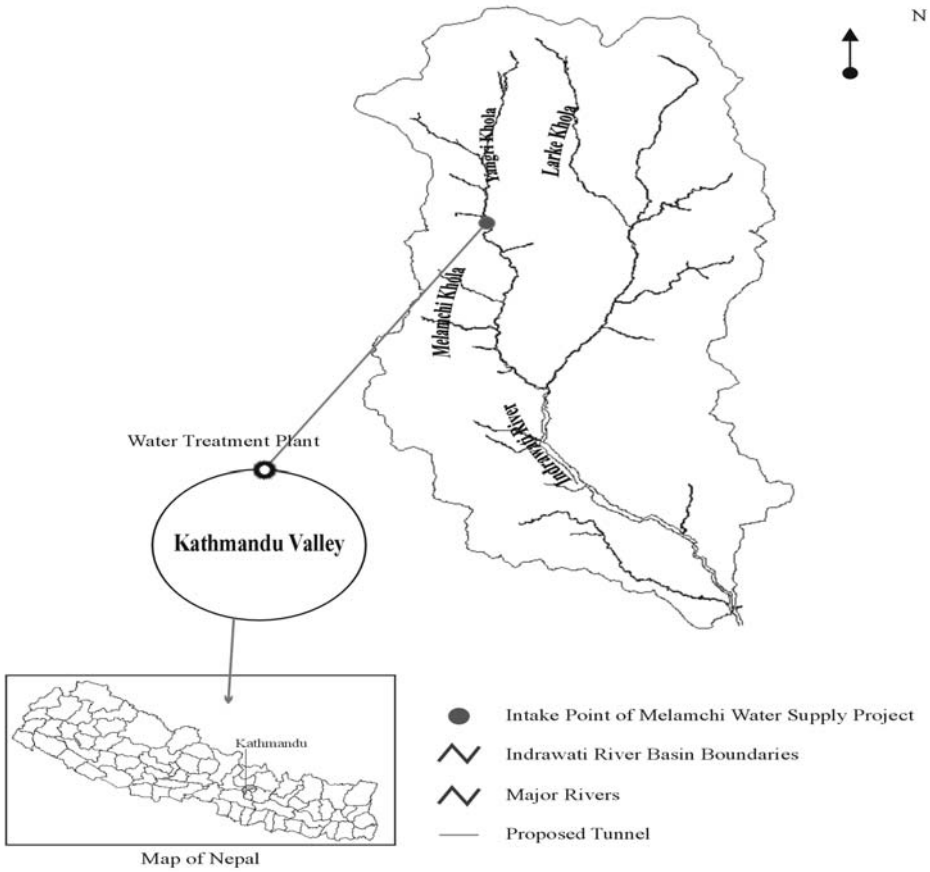


Figure 2: Melamchi water transfer scheme and the catment area of Indrawati River basin.



This study is expected to add an important piece of new information related to intersectoral and interbasin transfers in the context of developing countries, particularly on issues related to threat to the local resources management and compensation issues involved in the water transfer process. Most of the past studies on the topic are focused on the developed country experience. Yet, these water transfers are increasingly discussed and debated in the developing world, and recently more in Asia where the economic, social and institutional settings are much different than in the case of developed western countries where such transfer decisions have got a long history.

The second section of the paper describes the objectives and scope of the study. The third section briefly illustrates the water management practices and salient hydrological feature of the water exporting basin in relation to the water transfer project. The forth section describes the water management institutions in the basin, including information on formal and informal water rights structures adopted. The fifth section provides major aspect of project compensation and benefit-sharing mechanisms adopted by the water transfer project, and the consequence of the project to the livelihoods of the basin of water origin. The sixth section analyzes institutional implications of the water transfer project. The last section provides a synthesis and our conclusion of the study.

2. Objectives of the study

The main purpose of this paper is to analyze institutional and local level water management practices in the Indrawati (Melamchi) river basin, a water exporting basin, in relation to a proposed Melamchi intersectoral water re-allocation decision. The specific objectives are:

(i) To assess the major socioeconomic impacts of the Melamchi water transfer project in the water exporting (Melamchi) basin.

(ii) to evaluate the major institutional and governance related changes and threats posed by the water transfer project to the local institutions and CPR in the basin;

(iii) to assess the structures, functions, and efficacy of existing local water management institutions, both formal and informal, and existing water rights structures to address the newly imposed threats and concerns by the project; and

(iv) to asses the compensation mechanisms in terms of the protection of the water rights of the disadvantaged water users group in the basin.

3. Project description[5]

The Melamchi Water Supply Project (MWSP) is a comprehensive interbasin and intersectoral water transfer project designed to meet the long term (over 30-40 years) water demand of Kathmandu Valley (comprised of three major cities) in Bagmati basin by diverting water from the Melamchi River located upstream of adjoining Indrawati basin. This is done by construction of a 26 km long tunnel along the high Himalayan range, with the total capacity to transfer water up to 6 M^3/sec to meet the long-term water demands of the city. In addition to the infrastructure development, the Melamchi comprehensive project also plans for a comprehensive institutional reform and changes in the water governances of the city water supply system in the Kathmandu.

The Melamchi comprehensive project comprises of three main components, they are:

i. *Physical Infrastructure Development*. This includes development of infrastructure facilities such as, physical intake and river diversion structures, a 26 km tunnel, 25 km adit access road, 15 km of main access road, 22 km of approach road, water treatment plant with a capacity of 170 MLD in Kathmandu, bulk distribution systems (number of bulk transmission pipe lines and reservoirs around the Kathmandu valley), improvement of city water distribution network, improvement of wastewater system, and construction of wastewater treatment plants in the city.

ii. *Social and Environmental Support*. This includes project compensation programs to the adversely affected communities/households in the Melamchi basin. It has three major sub-components like a) Social Upliftment Programs (SUP) in the Melamchi valley communities, b) Resettlement Action Plan (RAP), and c) Environmental Management Plan.

iii. *Institutional Reforms*. This includes major changes in the present institutional/ management framework and governance of Kathmandu city water distribution system. Some of the major changes are: establishment of a National Water Supply Regulatory Board (NWSRB) to carry out regular functions and fix a water rate; establishment of a Water Authority (WA) to be the owner of assets and

[5] This short description of the Melamchi project is prepared based on the recent update and publications of the project. The authors greatly appreciate Suman Sharma, senior project engineer of the Melamchi project, for his assistance and cooperation in giving access to the project- related updated information.

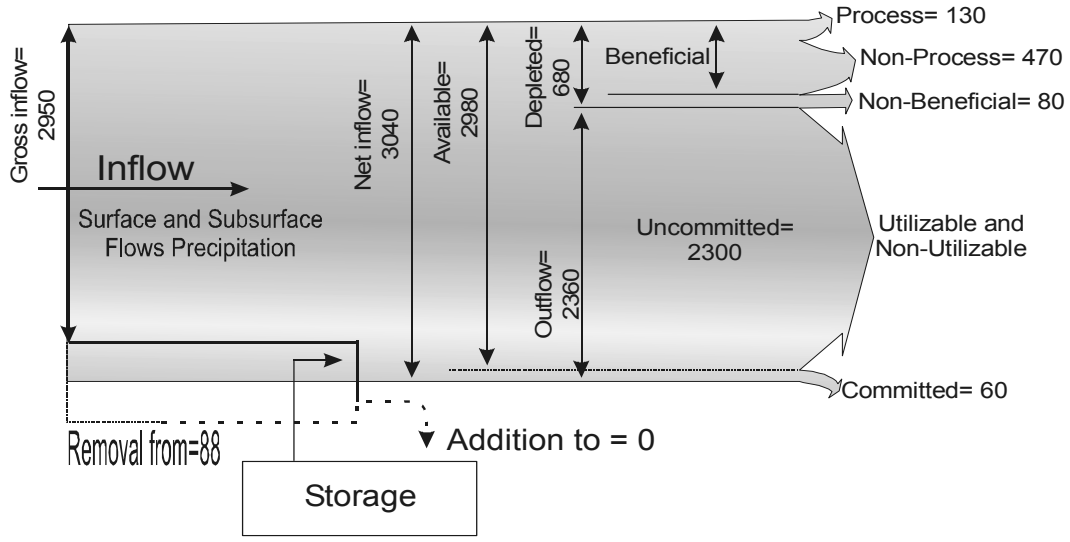
responsible for developing and overseeing policies for the water supply and wastewater services in the Kathmandu valley; establishment of an autonomous and commercially operated Water Utility Operator (WUO) for operating and managing the city water distribution system; enactment of groundwater licensing in the Kathmandu valley; introduction of private sector participation (PSP) modality for the urban water supply and wastewater service management; reform in the water service payments and collection system in the city.

4. Characteristics of the water exporting basin: Melamchi river[6]

Hydrological

The Melamchi River has a catchment area of 330 square km. Most of the water is consumed by forest and agriculture. A water accounting analysis for 20 years (1971-1990) was carried out to reflect the overall scenario of water use in the sub-basin with and without the Melamchi water supply scheme, and the results are as shown in the figure 3 and details are in Mishra (2001) and Bhattarai, et al. (2002).

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

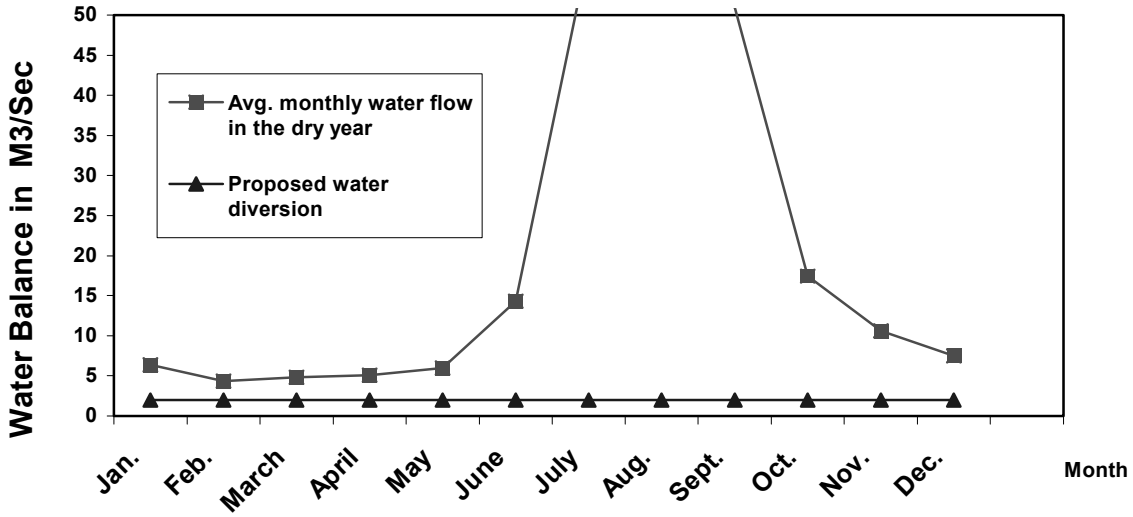


The planned water diversion (1.97 m^3/sec) accounts for 62 MCM per annum which is only 10 percent of the average annual river run-off in the Melamchi sub-basin (613 MCM)[7].

[6] Only silent feature of the Melamchi River in relation to the project impact is reported here, for detailed discussions, see Bhatarai, et al. 2002.

But, because of monsoon depended river run-off, there is high seasonal fluctuation of river flow, which creates difficulty in planning water use in the area. This is also illustrated figure 4. The monthly average river flow in the Melamchi River is substantially higher than the planned water diversion scheme, however, the average river flow drastically reduces during the dry seasons of January to May. The average river flow in Melamchi is more than 25 m^3/sec during the peak of Monsoon season (July and August), however, the river flow reduces to level of 4 to 5 M^3/sec during January to April. This is also the time when the water scarcity is also mostly felt in the basin. After completion of the project, the water flow in the downstream of the Melamchi River would reduce significantly during December to March, but the adverse impact could be limited to 1-2 kms downstream of the project intake until other tributaries confluence the Melamchi River. The project is designed to leave a minimum of 0.4 cm^3 as environmental flow for aquatic life (IUCN, 1999). The aggregate flow, however, does not reflect the temporal and spatial variations of water availability and it may not reflect "actual water uses/scarcity" scenario for various uses in the basin. The other key physical characteristics of the Melamchi River basin are reported in appendix table 1.

Figure 4. Average monthly water availability in the Melamchi River sub-basin**.**



[7] In the second and third phase of the water transfer project, there is another plan to divert water form Yangri and Larke khola to the same project intake and to augment the water supply in the Melamchi (see figure 2), detailed discussions are in Bhattarai, et al., 2002..

Socio-Economic

The total population in the basin is about 30 thousands. The water requirement for the basic drinking needs by this population is minimal considering the annual flow in the basin. Besides, for the drinking water, the communities depend upon the springs and small tributaries located in the upstream of the settlement. Majority of the farmers in the area belong to the marginal farmers dependent on subsistence farming, with only 12 % of the households having more than one ha of farm land (Pun, 2001). Majority of the farmers in the lower part of the basin grow three crops in a year. The water scarcity is particularly pronounced in the dry season of January to May, but for rest other parts of the season there are plenty of water available in the basin.

Cropping pattern

The farmers in the lower part of the basin (*lower phant*) harvest three crops in a year. But, at the higher altitude, the farmers plant only two crops as the spring paddy can not be grown in the higher altitude due to extreme cold climate. The plantation of spring paddy is significant for the household for their livelihood. However, the users reported that there is some water scarcity for winter and spring crop in the basin. They have to put more effort at the intake in increasing water and also checking leakage in the canal from mid-February to end of May because the available water allocation is not sufficient. Consequently, the cropped area in larger irrigation system decreases during winter and spring season.

5. Water right and water management institutions in the Melamchi area

General overview on water rights adopted in Nepal

Water law in Nepal consists of local law or customary rights and statutory laws. The customary right over water is acquired through years of usage. These rights have a codified status in the National Code of Nepal (Mulki Ain, 1963). The right to drinking water and irrigation was based on prior use, i.e., first come, first serve basis. However, on many occasions, the users themselves have made readjustments in water use from irrigation to drinking water, and vice versa. On the evolution of water law in Nepal, the Water Resources Act 1992 is the first attempt in Nepal in comprehensive approach of planning on use of the

available water resources[8] in a country. According to the act, the ownership of all the water resources in the country is vested to the state (central government). A government license is required for development of water resources other than reasonable scale of water resources use by a party. However, development of water for a reasonable level of water, and for individual and collective use for the drinking and irrigation purposes such license is not required.

In Nepal, the water rights are secured by water users in the following ways (Khadka, 1997). In fact, the same situation also exists in the Melamchi area.

- Natural right for developing water for limited purpose.
- Right acquired through license for developing water resource for specific purpose.
- Upper riparian has prior right compared to the lower riparian.
- Customary use right and prior appropriation right.

One can get natural rights to develop, manage, and use water for productive purposes throughout the river basin by first come basis, and with investment in this process (capital or labor, etc). That is those who invest on development of water infrastructure can claim stake on the use of water resources. The development of the irrigation system is based on both riparian and customary rights, wherein the upper riparian users have first right to divert the water for their reasonable use. Under the customary rights and prior appropriation rights adopted in the Melamchi basin area, no new irrigation system can be constructed within a distance of 100 meter upstream of the existing intake in the river stream affecting the operation of the existing irrigation systems downstream. All the users' adherence to his or her customary practice has been so far effective in containing the conflict within the system, or two systems near by to each other. However, what will be the roles and effectiveness of these institutions in the case of bulk intersectoral water transfer out of the basin, as practiced in the case of Melamchi project, is not yet clear.

The convention norm of property rights in water in Nepal includes principles by which water is allocated among farmers and the responsibilities that individuals have for maintenance of the system (Yoder, 1994). It is the collective decision and users' actions that define incentives in proportion to the level of contribution to irrigation development. Individuals in a group reach to a set of agreements, in other words, formal working rules that

[8] The water act of 1992 has also prioritized the water use in sequences as follow: Drinking & domestic use, Irrigation, Agricultural uses (animal husbandry), Hydropower, Cottage industry, industrial enterprises mining, Navigation, Recreational use and other uses.

define what is required, forbidden or permitted and monitor closely what has been done. In the Melamchi basin, the Water Users' Association (WUA) represents the collective interest of the respective users.

Water rights are also associated with land rights. This means that the rights to use water are automatically transferred to the offspring as land ownership is inherited. Similar is the case when land buyers acquire land ownership after purchase. In general, the access to irrigation water rights is tied up with the access to land rights. Water rights are also related to tenure system. Different kinds of tenure arrangements operate in the basin, e.g., owner-operator, share-cropping, mortgage, etc. Share-cropping is quite common practice after owner-operators. All operators hold possessions of water rights as they are required to contribute resource in terms of kind, cash or labor for the system development, acquisition, distribution and use of water resource for irrigation (or for other uses). Water rights of all sectors in the Melamchi basin area are secured in three ways:

- According to the first use (customary practice)
- Physical situation (priority to head-enders), and
- Social norms (social value).

The most commonly prevailing practices of customary rights in the Melamchi basin are: water share based on investment, water right purchased from others and water rights proportionate to the land in irrigated area (Pradhan, 1989). In recent years, the development of micro-hydro by the community has guaranteed the communal right over the use of water resources, but the community micro-hydro has to also negotiate for it water rights with the prior water uses in the area. The negotiated rights of some of these sectors could be affected in future if adequate water is not available in the Melamchi River after the diversion. According to social practice adopted in the basin area, within a water channel with multiple water uses, irrigation gets a first priority in terms of water rights and then followed by the *Ghatta* and water mill, hydropower, and so on. However, if the drinking water is also supplied from the system, then drinking water gets the first priority over uses, which is a reasonable logic.

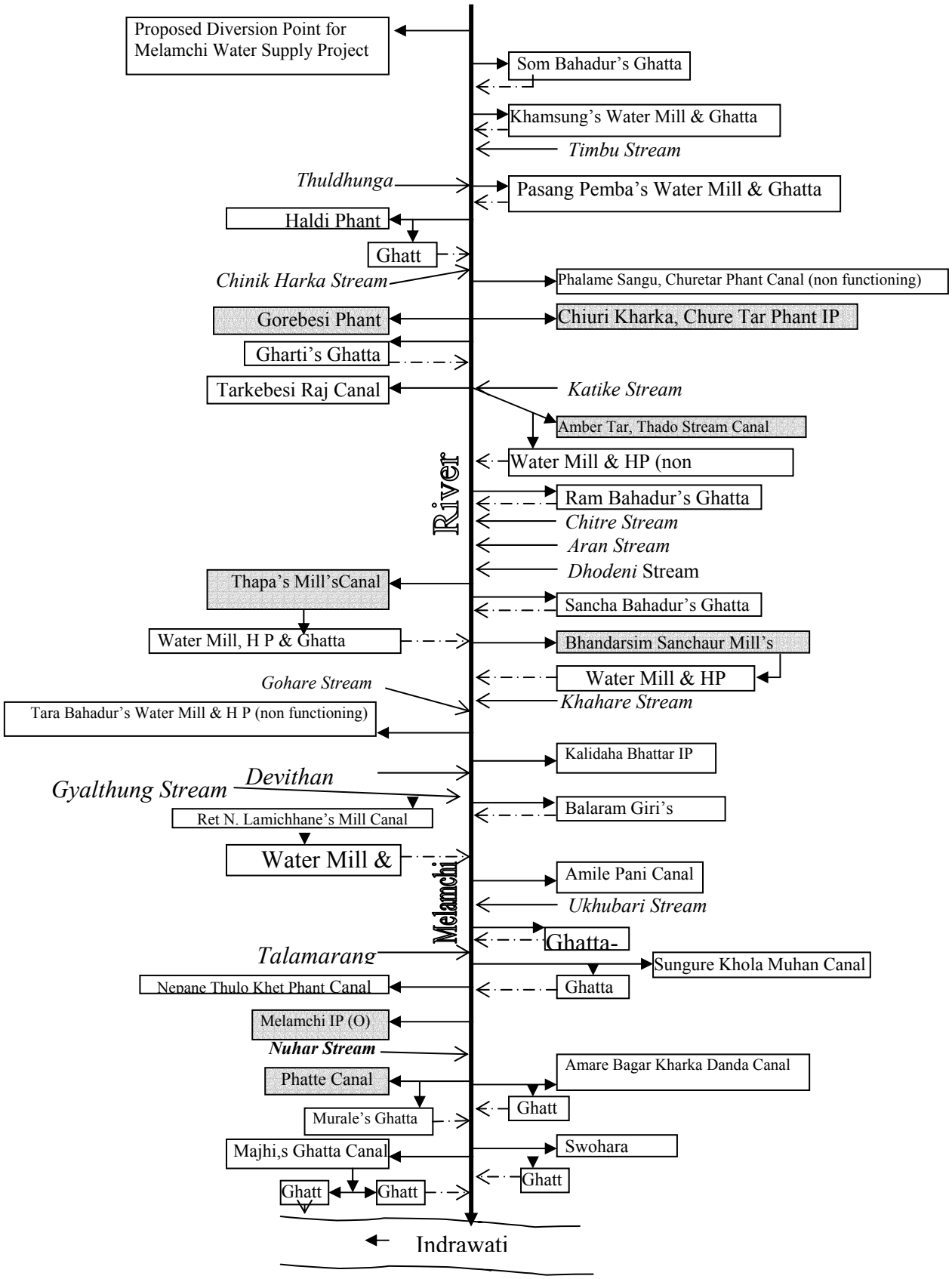
Water use practices and water-sharing in the basin

At present, the Melamchi River is used for multipurpose activities in the basin, as shown in Figure 5, and there are various sectoral roles involved. During the water scarcity period (December-May), some of they have developed water sharing mechanisms that have evolved through practices over a period of time. In recent years, some new water use activities have also emerged in the basin area (see figure 5).

The canal for bringing water to the water mill with turbines is also used for irrigation. The mill owner who constructed the headwork and canal shares water with irrigation in the upstream. The mill owner negotiated the right to use water with the irrigation users on the condition the mill owner will invest for the development of the canal and that the irrigation users get priority in the use of water over other uses during the certain period of water scarce season, although the mill owner does the operation and maintenance of the canal. Mill owner secured the right through investment in the construction of canal and its maintenance. This shows the changes in the water management structures based on mutual understanding for the benefit of both users based on the need. Since, secured irrigation provides three crops in a year from which the mill owner can also increase their total operation in a year because of the increased crops harvesting in the area. The positive aspect of this arrangement is that it recognizes the right of each other's and water allocation is adjusted according to the local need and genuine urgency, indicating flexibility on administration and enforcement of the agreed rules. From the field level survey, we found that there were occasions in the past when the mill owners had to close the mill for 2-3 hours in a day at the request of the farmers, particularly the water mills located at the tail end of filed channel.

In the Melamchi basin, the Ghatta (water operated traditional mill) owners have secured their water rights due to their prior appropriation in uses, and their earlier registration with Village Development Committees (VDC); however, occasionally, they also share the water use right with the irrigation as the irrigation has first use right, even the irrigation was constructed after *Ghatta*. This is largely due to the priority assigned by the locals for the irrigation. However, the canal is maintained both by the farmers (irrigation users) and *Ghatta* owners. When there is a sectoral water competition, or some sectors faces decrease in water supply, irrigators still enjoy assured water supply due to societal preference and higher priority assigned to farming over other uses of water in the area. This is a logical considering the predominantly farming based livelihood.

Figure 5. Flow Diagram of Melamchi Khola



Note: Ghatta – Traditional water mill used for milling grains, Water Mill – Improved turbine type water mill used for several purposes including milling grains, IP – Irrigation Project, (P) – Planned, (O) – Ongoing & HP – Hydro Power

In summary, the local users in the basin have developed their own institutional and water governance structure better suit the local needs, which are some time different from the norms defined by the statutory law or the customary practices. Sometimes VDCs intervene on the water disputes and make water turns for different sectoral uses when there is less water available at the source.

Project implementations and local participations

In the Melamchi basin, the management of water use activities is mostly based on the informal arrangements among the water users. And, water allocation rules are not formalized as observed in the form of national water acts; this is due to adherence to the customary practices among the water users. Therefore, formalized water governing structure may not have much role to play to regulate the activities of various users. This informal arrangements on water sharing practiced in the Melamchi area is in general efficient for the water (re) allocation within and across the systems, and local management of water resources, but not sure how these informal institutions can deal with the threat imposed by the bulk water transfer decision and the scale of water transfer proposed as in the case of Melamchi project.

In the case of Melamchi project planning process, the role of the formal water institutions, locally elected institutions, was very limited in the design and implementation of the project and for designing the project compensation schemes. However, NGOs participation is recently being encouraged in the project activities, and development of NGO Participation Plan (NGOPP) is also in the same line. According to the recent project update, these NGOs will be actively engaged for implementation of the Social Upliftment Programme (SUP) in the Melamchi basin in coordination with the concerned VDC and DDC.

The design of the NGO Participation Plan recently adopted by the Melamchi project is an acknowledgement of significant role of NGOs and local community in project implementation in the community, and getting the local support for the project. The involvement of NGOs in the project is in fact a positive aspect in terms of bridging the gap between the local people and the project authority. Unlike other water development projects in Nepal, the involvement of NGOs in water resource development is expected to add new dimension in long run water governance systems in the country, and evolution of the participatory institutions in a development project. Some of these institutional changes

brought by the Melamchi project, by establishing norms of local participation in a mega water project, may also likely to be adopted in other water development projects in the future.

6. Economics of water transfer decision.

6.1 Project benefits to the Kathmandu city

Our rapid assessment shows that there will be a considerable level of economic benefits attached with the Melamchi project, but these benefits are mostly captured by the urban residents of Kathmandu city. For example, the economic value of water, considering only the additional water revenue collected by the city utility company, out of the water transferred from Melamchi River to the Kathmandu city, alone will be around US $22 million per year[9]. This is based on the assumption of transferring an additional 62 million cubic meters of water (@ 1.97M^3/sec) into the city supply network during the first phase of the project. When the project starts to operate on full capacity, (i.e., 0.5 million cubic meters per day, or 5.9M^3/sec)) by 2015, then the gross water service fees collected by the city utility company from the project diverted water will be approximately US$67 million/year.[10] This is the direct economic benefits of the project to the water utility company (or to the city residence in general in terms of equivalent value of water) without considering other form of socio-economic benefits of saving on opportunity costs of the city residents. The scale of total economic benefits generated by the project, including secondary nature of indirect benefits (public health benefits) of improved water and sanitary services in the city, however, would be much higher than the financial returns (direct economic returns), as noted earlier. Of course, this also needs a huge investment in infrastructure construction and adequate operation and maintenance costs and management costs. In addition, the scale of project benefits realized to the society also greatly depends on the several other institutional and management reform of the city water distribution system, and efficacy of its functioning.

But, on the other hand, when we consider the present water scarcity situation in the Kathmandu city and the real opportunity costs of the water in the city, then the total

[9] This is based on the project planned water service fees in the city (@US$.40/$M^3$ or (how cost in Nepali is less than US $. The cost should be 0.4 cent per cubic meter) Nepali Rs. 30/M^3 (in constant price of 2000) by 2008/9, and under an assumption of 10 % of distribution losses of the water in the city's supply network.

[10] We have estimated this level of project benefit as per the projected water diversion planned and the water service fees that will be set by the city water distribution authority as per agreement with the external project financing agencies. This is also based on the assumption that the water services rate in Nepali currency (Rs.) is maintained at the constant US$ value level over the time.

economic benefits (at the opportunity cost level) of the Melamchi water transfer project will be much higher, and it is in the range of about US$37 million per annum during the first phase of the project. This is when we assume the opportunity cost of the water as US$1/$M^3$ (50% of the tanker supply water rate) and valuing the transferred water for 8 months of the non-monsoonal season from November to June. This scale of benefits is about 8 % of the total project cost, and about 30 % of the total project cost incurred for the construction of project intake and tunnel for transferring water from Melamchi River into the city distribution system. Setting a zero value of water for the other 4 months of the monsoon is a reasonable assumption, as there is reasonably adequate level of drinking water in the city during the four months of monsoon. The project benefits (at opportunity cost level) will however be increased to about US$111 million[11] per year after 2015 when the project (tunnel) is operating at its full capacity (i.e., water transferring @5.9 M^3/sec, or 510,600 M^3/day).

6.2 Project imposed economic costs to the water supplying basin

The major socioeconomic costs (direct and tangible costs) imposed by the project in the basin of water origin are like conversion of farmland due to other uses ─permanent acquisition of about 80 ha of farmland─, and displacement of about 75 households from their present location (Pant and Bhattarai, 2001). In addition, due to the reduced flow in the Melamchi River after the diversion of water, about 110 hectare of spring paddy field and nearly 15 traditional water mills (*Ghatta)* along the Melamchi *Khola* (tributary) downstream of the project diversion site are likely to be adversely affected during the dry season of February- May. According to the project compensation scheme, some of these direct and noticeable costs and loss of livelihoods (land acquisition, damage of assets like house, tree, etc.) caused by the project would be compensated. But, there are no clear provisions in the present project compensation plan to pay for the third party adverse effects (externalities) of the water diversion in the Melamchi basin such as, the loss of income of fishermen, traditional water mill owners (*Ghatta owners*), and other minority water users. This could be because of the prevailing land-based property right institutions, and the relatively absent of water rights practices in the region.

[11] This is estimated by multiplying 111 millions M^3 per year (assuming for 8 month of dry season and distribution loss of 10%) of water diversion by US$1/$M^3$. This level of project benefits is consistent with level of water scarcity in the city now, and the private household costs for procuring the drinking water supply there (see, Tiwari, 2000 and Whittington, *et al*., 2002).

Our estimates show that the opportunity cost attached with the loss of gross returns of paddy in the Melamchi basin is US$350/ha/per crop season.[12] In that case, because of the water stress, the total economic loss of spring paddy of 110 ha downstream of the project intake would be about US$39,000 per year.[13] This loss is a major third party effect of the water diversion at the downstream, if the farmers there would not grow any other spring crops on 110 ha of croplands due to acute water scarcity. Since, the agricultural production involved farm employment as well as other forward linkage activities. In addition, other indirect negative impacts of the project include the loss of other farm production in the community, deteriorated food security, and loss of local employment (farm and non-farm) and deteriorated rural livelihoods. The water-supplying basin will be further a net looser in this process, if other employment substitutions and rehabilitation programs are not timely provided to the project adversely affected communities and households.

Likewise, the project also adversely affects the traditional water mill owners (*Ghatta* owners), who have already lower bargaining power in the community because of their poor status and socio-political status. In the absence of *Ghatta* owners' (and other minority users) water rights, their concerns may not be heard during the process of project compensation and disbursement. As per the prevailing norms followed in the region, the compensation of the land-based and other tangible damages would get first priority over other form of losses. Therefore, the project may lead to their displacement if the project rehabilitation program does not provide timely consideration to their needs and livelihood requirements[14]. Therefore, there is a clear need for a more transparent project compensation scheme in the case of the Melamchi water transfer project, including for all form of third party adverse effects during the water transfer process.

7. Melamchi project compensation scheme

In water transfer decisions, the scale and process of project compensation to the adversely affected households, who bear all the present and future opportunity costs of the

[12] This is based on the estimation of Nepali Rs. 1320 per Ropani of returns (in 2000 prices), and 1 ha = 20 Ropany of land.

[13] During the spring season, some of these crop-fields may be, however, shifted from paddy to less water requiring crops such as potato, wheat, or maize,. etc. Then the level of project adverse effects downstream will be certainly less than this.

[14] In fact, the displaced villages/communities due to infrastructure development are common in South Asia, and this is one of the reasons for mass protest and local opposition to mega water projects in Asia and in other developing countries in the recent past (for details, see WCD, 2000).

water transfer decisions, are crucial to improve the total welfare and livelihoods in the water-supplying basin. In principle, project compensation is given to mitigate the loss caused by the external intervention (project) to the existing right holders of the resources (assets), or for the exchange of right to use the resources (e.g., land or water) in question. In the case of an intersectoral (interbasin) water transfer project, the compensation usually includes existing right holders of land and water resources who are adversely affected during the process of the water transfer. But, unlike in the developed countries where the water markets are relatively well developed, during the water transfer process in the case of developing countries, due compensation for the loss of minority water rights holders are still not established firmly, but only for the land right holders.

In fact, water rights (property rights on existing uses of water) are crucial issues and they should be intrinsically embedded in designing the scale and process of compensation structures in the case of an intersectoral (and interbasin) water reallocation project. This is particularly more relevant in the case of rising water scarcity. Moreover, in practice, only the land rights based compensation is given more priority than that of the water rights due to difficulty to enforce water rights, higher transaction costs, and the fugitive nature of the water resources; this was also the case seen in the case of the Melamchi project.

But, the project compensation only based on land rights, or formal resources use rights, may not adequately address the externality and indirect adverse effects (secondary level adverse impacts, or third party effects) caused by the water transfer, such as loss of employment and other water-based business opportunities in the water exporting basin. Also, it does not address the losses suffered by those who make an earning (and living) from the property of other right holders, such as tenant farmers and farm labor. In the case of the Melamchi project, the compensation package will not provide any benefit to the tenant farmers and the minority water users (e.g. fishermen, etc.) but only to the land owners, and to other whose property assets get directly damaged by the project. This means that these tenant farmers and others will lose their source of livelihoods once the water diversion takes place, and they have to either migrate from the villages or have to seek other livelihood options.

However, the scale of additional benefits generated by the Melamchi water transfer project, in terms of increased water revenue and other related benefits in the water recipient city, as noted earlier, sufficiently justify compensation for both the direct as well as third party losses in the Melamchi basin communities, and even more, such water transfer scheme should also provide a better path for improving the overall rural livelihood of the Melamchi basin which is already a resource poor area compared to the Kathmandu city.

The Melamchi project compensation scheme has a plan to spend about US$18.5 million for the general welfare improvement activities in the Melamchi basin, as a compensation to mitigate some of the adverse economic, social and environmental effects imposed by the water-transfer project.[15] The two major components of the project compensation package are: a) Resettlement Action Plans (RAP), with a budget of US$15 million; and b) Social Upliftment Programs (SUP), with a budget of US$3.5 million (MWSB, 2000a; 2000b). The Resettlement Action Plan (RAP) is designed for land acquisition, resettlement of the households displaced by the project, and for provision of local infrastructure. This includes a village connection road (8-10 kms), a secondary school, and a hospital in the Melamchi valley.

In addition, there is also a plan for a benefit sharing of @ Rs. 0. 25/m^3 of actual water transferred into the Kathmandu back to the Melamchi community, i.e., 1% of water levy collected, which seems a bit lower considering the scale of benefits accrued to the city residents, and the permanent loss of water and other water- use related opportunities in the Melamchi valley. However, contradictory to such water transfer cases in the past, the recognition of benefits sharing based on the volume of water transferred (additional water levy charged in the city) adopted in this project has provided an option to changing the alternation of the benefit-sharing mechanisms. It is a reasonable to assume that as the bargaining power of the Melamchi valley community increases vis-à-vis the power of the central authority in the Kathmandu valley in the future, the percentage of water levy given back to the Melamchi basin community could be increased. Moreover, a relatively high scale of benefit-sharing (water levy) mechanism with the rural community would also encourage for other intersectoral water reallocation schemes in the region (cities) because of the improved incentive to the water exporting basin, and in turn, providing the least opposition from the local communities, and an efficient utilization of the water resources available. This also helps in alleviating urban water scarcity with least cost options.

[15] This comes to about 4 % of the total project costs (MWSP). Considering the current development stage and socioeconomic activities in the Melamchi basin area, this level of compensation package represents a considerable sum.

Recently, the Melamchi Project Compensation Fixation Committee (CFC) has been formed and it has set up criteria to pay for the permanent land acquisition done by the project, which is higher than the land price recorded at the District Land Revenue Office in the area. Moreover, there are some concerns among the local communities about the process of determining land prices for acquisition, particularly the exclusion of Melamchi basin community in the decision making process, and the bureaucratic process adopted for setting the compensation level without any involvement and consultation of local stakeholders during the process.

8. Implications of MWSP in local water management practices and institutions

For the case of minority users like *Ghattas* owner, the operation of the Ghatta is the primary source for their household income. They have to pay about NRs. 10 (US$ 0.15) monthly to the VDC as a water service fees to secure their water right; thus, their water rights have been formally recognized in the Melamchi basin. But, the *Ghatta* owners have so far been not consulted about the project and its likely impacts on their livelihoods in the basin. The project in fact excluded these groups of minority users, but who have major stake in the river water and its access in time. Furthermore, because of their lower socio-economic strata and a lower socio-cultural class of the community in the area, these *Ghatta* owner welfare and their water rights could hardly be protected in the process.

In terms of the existing land renting system in the basin, the crop income from the main crop (main rice yield) is paid as a land rent to the land owner, and the tenant would keep all the second and third crops (winter and spring crops) grown on the land in a year. This means that these tenant farmers fully depend on the winter and spring crops for their livelihood; and if enough water is not available after the water diversion by the Melamchi project then they would not be able to cultivate these non-monsoonal season crops. The project has also not shared all the hydrological information on the water flows in the river after the project diversion. However, the major irrigation systems do not originate within 1-2 km downstream of the project intake, where most of the adverse impact of the water transfer will be concentrated.

Likewise, fishing is another main occupation of certain communities (households) in the area during the off-season of farming. The fisher men living there some times earn up to NRs. 500 (US$7) a day during November-January, who opined that they might not have enough fish catching in the future after water diversion by the Melamchi project, and they might

loose a good part of their livelihood income. However, the additional employment and other opportunities during the project construction could compensate the loss of income of some of these households, if these adversely affected households would actually get the employment at the project activities.

An absence of collective bargaining authority at the Melamchi basin (or basin authority) significantly affected the institutional linkage between the local water uses and water management institutions and the Melamchi project authority. Our study has found that the local elected representatives (and local governmental agencies) were also apprehensive about the central government overriding role on water management, and not recognition of the role of local institutions like the District Development Committee (DDC) during the process of development of the Melamchi project. According to country's water act (1992, 2002), DDC has the mandate for planning and development of the water resources within its jurisdictions, The local elected institutions had minimal role in the process of planning and development of the Melamchi project; in fact they could have assigned an important role in establishing linkage between the local people community and the project authority.

Lately, the project has realized this shortcoming and has involved the local District Development Committee (DDC) and Village Development Committee (VDC) in the implementation of Social Upliftment Programme (SUP) in the Melamchi area. The project has envisaged the continuation of this SUP related activities in the basin for a long time through the one percent water levy received from the urban users in Kathmandu. The local demand for water levy however was for 5 percent of the revenue collected from the urban water supply, instead of one percent provided by the project authority. At present, the local users however lack appropriate institutional mechanism to negotiate with the powerful government agency implementing the project, including lack of a mechanism to deal with the users in Kathmandu valley for appropriate compensation mechanism. Here, a greater involvement of NGOs, and even the elected institutions, would resolve some of these coordination and benefit-sharing negotiation process.

In summary, despite of having a plan of huge scale of rural development related expenditures in the Melamchi basin, the Melamchi project has not given due attention to the other social needs of the water for the upper basin community. During the scarcity and hard hit time, it is always the weak and vulnerable section of the society who also often looses the water rights. Moreover, the existing informal institutions might be able to buffer the scarcity situation to some extents. However, in absence of formal institutional mechanism, the priority for irrigation use over other form of uses in the basin might not take into account the need of

other uses. There is likely scenario that this sudden created future water scarcity situation in the basin may alter the existing informal water institutions in several ways, including going for more formal water allocation institutions which gives equal rights to all water uses.

9. Discussions and Conclusions

The Melamchi Water Transfer Project represents a situation that is common in several other developing countries. In the face of increasing water scarcity, increasing urban demands for water for drinking and sanitary purposes pulls water out away from nearby rural uses. Reallocation of water across the sectors (and uses) has created conflicts and tension. Such intersectoral transfer of water has large implications on underlying water institutions, governance, and water laws operating in the society. In fact, the case study of Melamchi water project in Nepal also provides several examples on institutional changes and evolution of new water management institutions in the process of a large-scale water transfer project in other developing countries.

The Melamchi river (and Indrawati basin) as such on an aggregate level is a water surplus basin. But, the available information indicates that remaining water, after diversion by the Melamchi project, may not be sufficient for present and future water needs of the area, especially during the dry season (January to May) water needs of the community residing 1-2 kms immediate downstream of the basin. They are the ones who may have to bear all the blunt of all the opportunity costs of the project, if proper care for their water needs and compensation of their welfare loss are not done on time.

Our study suggests that the local water institutions in the Melamchi basin have evolved over a period of time through the agreements, various negotiation processes and compromises among the various water users groups. The significant aspect of these agreements is to accommodate the need of various users and also to maximize the benefit from the available water on various alternate uses in the basin. Institutionalization of this process locally on various water uses has helped in reducing conflict between various uses, but mostly within an irrigation system or near by of the two systems. This was also feasible possibly due to sufficient availability of water for present use. But these local costumes and traditional institutions and FMIS institutions are evolved mostly to handle the small water allocation conflicts, whereas, the situation in the case of Melamchi water diversion may be going to be a much complicated one and beyond their capability to cope with the institutional stress.

Unlike the other large-scale water development project, the involvement of local elected institutions and NGOS at the project activities is other significant changes brought by the Melamchi water transfer project in the evolution of participatory water management institutions in Nepal. This has potentially opened up the avenues for involvement of local elected institutions in future water development projects. Until now, the role of local elected institutions was confined only to provide financial support to small scale projects, despite the fact that the Local Governance Act (1998) has assigned much bigger role to these local institutions in planning and co-ordination of development activities. Providing linkages between the local users, local elected institutions and project authority places them in central position for the successful completion of the project, avoiding the criticism against the project in the long run.

In the absence of formal water rights in the water exporting basin community, Nepal government has brought a one time project compensation package of US$ 18.5 million for both sharing benefits and to mitigate some of the negative impacts of the Melamchi water transfer decision. This is a one time fix level of compensation to the water supplying communities for their loss of water rights. This level of compensation package was materialized after several years of project related discussion and consultation in central level decision making institutions, whereas the individual level disbursement of the compensation based on actual damage into the individual households, farmlands, etc., is still in the process of finalization. The nature and scale of the compensation package in water infrastructure project is quite important and it should not be understated, particularly considering the scale of long term negative disruption associated with the intersectoral water transfer decision. In fact, the success of the implementation of the project compensation schemes would basically determine the actual scale of project related adverse effects in the water supplying basin.

In addition, in the literature on intersectoral reallocation, it is commonly perceived that fixing the water rights would resolve the problem on intersectoral reallocation of water and compensation. But, how to implant the effective water rights and their enforcements are some of the difficulty in this respect. In the case of the Melamchi project, the existing formal and informal institutions for water management in the Melamchi River basin are adequate to cope with local canal water management. Local institutions have evolved over the years mostly to manage water allocation and resolve conflicts and disputes mostly within a canal

system, or at most nearby of the 2-3 canal systems. There have been limited examples of resolving problems of neighboring canal systems. But these same institutions have not been put to the test of negotiating formal water rights along rivers and large-scale water transfers with a powerful neighbor like the city of Kathmandu (or the central water transfer authority). These local water management institutions (FMIS) are likely to be adequate to help buffer additional water allocation and competition problems brought about by such a scale of reduced supply within a short period of time. There seems to be an opportunity to use these existing institutional structures to develop better arrangements to manage water resources in the Melamchi River. The project could be a good catalyzing event to bring stakeholders together in the area to improve their water management arrangements to better deal with less resource, and to better negotiate with Kathmandu for reasonable scale of benefit-sharing, and equitable use of resources across the regions.

In our view, though more could be done to use the situation to stimulate institutional development for water management, than just paying one time compensation package. Rather than negotiating with entities set up by the project authority, it would perhaps be better in the long run to negotiate through upgraded institutions, may be between the two basin communities of water exporting and recipient basins. The basin community's interest can be represented by existing local elected authority like District Development Committee, the concerned municipal authority, and the other governmental line agencies (VDCs), functioning as facilitators in the negotiation process. This will be more in the line with the decentralized decision making and local stakeholders' participation in the decision-making process, and utilization of water resources considering the wider scale needs of the basins' community.

Intersectoral water transfer projects produce differential level of impacts across the sectors, and in the case of the Melamchi project, the effectiveness of Melamchi water transfer

decision is assessed here by considering the additional value generated by the project, the process adopted for project management and benefit-sharing, and the nature and level of compensations provided to the adversely affected households in the basin of water origin. From the Melamchi water transfer project, Kathmandu city residents would capture most of the project benefits, in terms of better availability of drinking water and sanitation services and increased property value; while the opportunity costs of the water transfer decision have to be borne by the upper catchment basin community. Therefore, due compensation and benefit-sharing issues are important in assessing the socio-economic implications and effectiveness of the project in totality. Considering the scale of aggregate level of benefits generated by the water transfer decision, it is fair to demand that the project compensation package should be able to compensate for all the direct and indirect looser in the Melamchi basin, including a due compensation to all the minority water users and the third party adverse effects of the water transfer. If properly implemented and provision of long term benefits sharing arrangement based on the volume of water transfer, a properly designed compensation scheme could be a catalytic force to upliftment of the rural community in the Melamchi basin. Otherwise, the urban residents are going to get additional benefits on the expense of already a resource poor Melamchi basin community which may be bearing all the opportunity costs of the Melamchi project.

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Appendix Table 1 The Physical Characteristics of Melamchi River Basin.

SN	Description	Unit	Quantity
1	Total Length of River: Main stream	km	41
2	Tributaries	No	14
3	Catchment area of MDS intake	km^2	157
4	Catchment area of River	km^2	330
5	Catchment area of the nearest River gauge	km^2	122
6	Elevation at Intake from Mean Sea level (msl)	m	1445
7	Elevation at tunnel end from msl	m	1410
8	Elevation at confluence with Indrawati river from msl.	m	820
9	Elevation of the river origin from msl	m	5863
11	Average monthly max flow at Intake	m^3/s	10.92
12	Average monthly min. flow at Intake (March)	m^3/s	2.55
13	Average monthly max. flow at confluence	m^3/s	76.00
14	Average monthly min. flow at confluence	m^3/s	5.62
15	Slope of the river	%	12
16	Distance at Intake from Confluence	km	20
17	Average annual rainfall in intake of catchment	mm	3212
18	Average Annual rainfall in the Melamchi basin	mm	3050

Source: HMGN/NWSDB, 2000; and Mishra, 2000