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# INCENTIVES FOR SECURING WATER IN A HIMALAYAN TOWN: A CASE FROM DHULIKHEL, NEPAL

Tikeshwari Joshi[1], Eszter K. Kovacs[2] and Kaustuv R. Neupane[1]

## Abstract

This paper explores the negotiations and the emerging socio-political relationships and alliances that were formed to reach a series of water-sharing agreements between upstream and downstream communities, in order to secure water required for continued urbanisation of the downstream town. The research focused on the socio-political actors and users of the Dhulikhel drinking water supply system of Nepal. Primary data was collected through key informant interviews, focus group discussions and stakeholder workshops to explore the development of the negotiation process and the agreement, and the role of different actors. The qualitative data was analysed through narrative and discourse analyses. During the negotiation process, political leaders from both communities were involved in the formation and acceptance of the agreement. The long-term negotiation that started during the 1980s culminated in a series of agreements, the last of which formally introduced cash incentives to the upstream community in 2011. The downstream urban community has been paying NPR one million per annum to the upstream community for their continued role in the sustainable management of the water catchment. The paper provides insights into the shifting power relations between local rural and urban socio-political actors who play a vital role in water access negotiations, and

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fundamentally influence the potentials and effectiveness of incentive-based mechanisms to secure water needs.

**Keywords:** Incentives, negotiation, actors, ecosystem services, water security

# INTRODUCTION

Himalayan ecosystems provide a wide range of goods and services to people living in rural and urban regions (MEA, 2005; Rasul et al., 2011; IPBES, 2018). More than half of humankind depends on fresh water that is captured, stored, and purified in the Himalayan regions (Grêt-Regamey et al., 2012). However, the ability of these ecosystems to continue to provide the same quality and quantity of water has been considerably degraded at local and global levels in recent years (MEA, 2005; Wunder et al., 2008; Irena and Meine, 2018). Many Himalayan towns are under severe strain from environmental degradation and a lack of basic services, including water supply systems that are under increasing demand from continuous population growth and urbanisation (Tiwari et al., 2018). Hence, local watershed management can be critical for supplying clean water as large water supply systems are costly to develop and maintain (Rai et al., 2018). The sustainable management of water resources is becoming a challenge especially given a changing and uncertain future climate, a rapidly growing population that is driving increased social and economic development, globalisation, and urbanisation (Cosgrove and Loucks, 2015). At the same time sustainable water resource management is important to meet development and life needs, as captured by the Goal 6 and Goal 15 of sustainable development goals (SDG, 2015) and that sustainable and sufficient water access is widely used as an indicator of the developmental progress of societies (Dore et al., 2010).

Local water management gives rise to potentially novel interlinkages and relationships between upstream and downstream communities, particularly as water supply systems in downstream areas are typically significantly influenced by upstream activities (Thapa and Paudel, 2002; Martinez et al., 2013). Over the past decade, there has been a growing tendency to use Payments for Environmental Services (PES-like) schemes as an innovative tool to secure water to downstream areas and to incentivise 'better' manage local natural resources in the upstream (Wunder, 2005; Pagiola et al., 2005; Pagiola, 2008; Kosoy et al., 2007). In theory, PES approaches can enhance the welfare of transacting communities by creating win-win situations for the parties involved (cash to upstream land managers, guaranteed water supply to downstream users) as well as improving natural resource management (Wunder, 2007). Other scholars have considered PES as an incentive for local communities to secure their efforts for conserving nature through the redistribution of livelihood

resources, through financial recognition of the work behind environmental management (Gutman, 2007; Kumar and Managi, 2009). Chan et al. (2017) characterised PES as a tool for enabling sustainable relationships with nature, conserving and restoring ecosystems and their benefits for people. Securing drinking water through a PES- like scheme can be a cost-effective solution compared to other alternatives (Rai et al., 2017) and hence, such schemes are increasingly being introduced and promulgated worldwide (Rode et al., 2015).

It is recognised in the literature that the negotiations to establish PES-like schemes are political (Hope et al., 2007; Kovacs et al., 2016), but there is little detailed exploration of these dynamic politics (Corbera et al., 2009). With this backdrop, this research aims to explore the negotiation dynamics between two communities having diverse interests for reaching an incentive-based water agreement. Our research has explored the following questions:

- How do power relations between two communities influence the development, introduction and establishment of an incentive-based agreement for water?
- Which actors were involved in establishing the incentive-based agreement? What are their characteristics and geography?
- What are the incentive types and mechanisms that have been offered by downstream communities, and how have these been received and mobilised by the upstream community?

With these research questions, we argue that in Himalayan countries like Nepal, incentive-based water agreements are mostly influenced by the bargaining powers and relative socio-political relationships between the communities underpinning PES negotiations. Further, incentives are a direct outcome of negotiations between actors, rather than the 'objective' rationales and processes that underpin the identification and qualification of ecosystem services and their flows, or the reflection of environmental management costs and economic valuations of such services. We examine the role of actors and communities underpinning these processes below.

In this paper, we consider the above questions through the case study town of Dhuilkhel, which has a well-established drinking water supply scheme, with a PES-like water agreement that was the result of protracted negotiations among upstream and downstream actors. The objective of these negotiations was to secure ever-increasing amounts of water to downstream, rapidly urbanising and consolidating urban settlements. During the negotiation process, political leaders from both downstream and upstream communities were involved in the formation

and acceptance of the agreement. The communities referred to in this paper are the Kalanti Bhumidanda village in upstream Dhulikhel, where Dhulikhel town is the downstream community located in the Kavre district of Nepal. Dhulikhel town has had formal long-term water agreements with Kalanti Bhumidanda since 1985 to secure the towns' water supply. The water supply scheme of the town has been considered one of the most successful and well-recognised incentive-based water supply systems in the country (Joshi et al., 2014). Our socio-political analyses in this case looks at the way that local social relations of power have shaped the water agreement. In the following sections of the paper, we present our conceptual framework, our data collection methods and local context, followed by empirical findings, discussion and conclusions respectively.

## CONCEPTUAL FRAMEWORK

Our work focuses on the importance of understanding and paying attention to social and political relationships between actors within any negotiation process, to better account for how these relations influence, in this case, water access and development trajectories. In the present case, the socio-political relationship refers to the systems composed of both social and political elements belonging to the upstream and down-stream community and interaction between them (Alfredson and Cungu, 2008; Mollinga, 2008). These relations are composed of institutions, individuals, and the community as a whole.

The concept of power is central to understanding the processes and structures associated with natural resource governance and policy reform, including management decentralisation, the introduction of markets or market-like institutions and the redefinition of distributive mechanisms and property rights (Raik et al., 2008). Scrutinising power dynamics with regards to PES can help to understand both the huge expansion of PES in the policy arena as well as the grounded impacts of PES schemes on social and economic relationships of communities (de Francisco, 2013). Muradian et al. (2010) considers PES as the outcome of complex power relations, distributional issues and social situatedness. An uncritical embrace of PES that neglects how politics, culture, and economy govern implementation could reinforce existing power structures, inequalities, and vulnerabilities (Corbera et al., 2007; Pascual et al., 2014). Design of PES for watershed services requires negotiation with multiple stakeholders —providers, beneficiaries and intermediaries—who often have varied, sometimes conflicting, positions (Hope et al., 2007; Corbera et al., 2009; Van Hecken et al., 2015). Negotiations over PES schemes to develop a shared understanding of the diverse interests, assets, capacities, and power of players can take significant time, as does the building of trust between stakeholders (Dietz et al., 2003; Meinzen-Dick, 2007; van Noordwijk et al., 2008). As environmental, socio-economic, and

political contexts change, the signals and outcomes created by incentive-based mechanisms can also change (Jack et al., 2008). Indeed, the process of negotiations among actors can play a more important role than the 'scientific' studies that determine and justify Ecosystem Services (ES) and economic valuation approaches to the management of water (de Groot and Hermans, 2009); after all, the introduction of PES approaches find receptivity (or not) in specific contexts.

In PES schemes, buyers and sellers are heterogeneous (e.g. they have a wide array of world views, histories, social status, interests, connections, types of knowledge behind their positions, terms of valuation through which they see nature, economic status and development opportunities) and negotiations may profoundly shape and colour these. De Francisco (2013) suggests that a water-related PES scheme might contribute to changing historical inequities between the upper and lower areas of a catchment, increasing the bargaining power and status of providers of environmental services in upland areas. On the other hand, PES may also legitimise large-scale water consumption downstream. Therefore, a salient issue is who has the power to decide on the criteria relating to distribution of water as ecosystem services in this case.

This research sets out to explore, empirically, how these theoretical forms of power occur in relation to PES-like scheme within a socio-political context comprising many heterogeneous actors. The Nepalese social structure is mostly heterogeneous in nature with key stratifying factors including caste, ethnicity, gender, economic class by wealth (rich, middle and poor), employment (especially within the bureaucratic and political system), and level of education (Uprety, 2006). The heterogeneous nature of Nepalese society quite makes bringing social actors together for building consensus around the management of natural resources complex. The growing demand for resources, widespread poverty, together with inadequate incentives for natural resources management further add conflict (Uprety, 2007).

## STUDY AREA AND METHODS

This research explored the drinking water supply system in Dhulikhel, Nepal. Dhulikhel is a small municipality and the district headquarter of Kavrepalanchok district, about 30 km east of Kathmandu, Nepal. With panoramic views of the Himalayan peaks, it is a tourist destination, as well as an emerging centre for education and health, home to both Kathmandu University and the community managed Dhulikhel Hospital. The town has a population of about 32,162 (CBS, 2017). Situated at 1550 metres, the urban area is only about 4 percent, and it is dominated by rural and agricultural land (73.6 per cent) and forestland (22.4 percent; Dhulikhel Municipality, 2011).

In Dhulikhel, the water supply system is managed by the community via the Dhulikhel Drinking Water Users Committee (DDWUC), which is regarded as an exemplary community-managed water supply system in Nepal. In addition, 27 public taps from nearby sources, which pre-date the main pipeline, provides water for drinking and other uses both to the few households without piped supplies, as well as supplementary support for those with piped supply. The source of the main gravity pipeline's quality drinking water is primarily from Saptakanya fall, from a stream named Kharkhola located in Kharkhola Mahabharat Community Forest, in Kalanti Bhumidanda village, 13.5 km away (DDWSSUC, 2014; MoUD Nepal, 2015). The Kharkhola source is one of the tributaries of the Roshi river, which is a tributary of the Koshi, a transboundary river.

This paper uses the narrative and discourse analysis of qualitative data. Qualitative data was collected through key informant interviews (KIIs), focus group discussions (FGDs), interviews with local users and workshops with stakeholders. KIIs were conducted with 20 key informants including officials and former executive committee members of the Dhulikhel Drinking Water Users Committee (DDWUC), political leaders involved in the negotiation processes with upstream communities in 1985, officials from the Municipality and District soil conservation office, representatives from Kathmandu University (KU) and Kavre Valley Integrated Drinking Water Supply Project (KVIDWSP). Primary foci of the KIIs were on the processes of negotiations and up and downstream relations for the securement of water sources to Dhulikhel, and the management and distribution of water within Dhulikhel. Further, 37 interviews were conducted with local community members who were beneficiaries of the water negotiations within both upstream and downstream communities. Interviews with upstream farmers were focused on the issues related to negotiation with Dhulikhel water users committee, use and management of forest resources, and the use of incentives provided by the downstream community. Interviews with downstream users concerned access to water and the issues related to quantity and quality of water over time.

Three FGDs were held: one amongst downstream community members and two in upstream communities. The downstream FGD was with officials, executive members and users of Dhulikhel DWUC, and officials of the municipality. The FGDs conducted in the upstream included key stakeholders such as VDC[3] officials, representatives of the community forest user group (CFUG) and local farmers. The FGDs with the downstream community

[3] A Village Development Committee (VDC) in Nepal was the lowest administrative unit of the Government (1990-2017) which was dissolved according to New Constitution of Nepal 2015.

concerned access to water and the issues related to quantity and quality of water over time. Similarly, FGDs with the upstream community were focused on the issues related to negotiation with the Dhulikhel water user's committee, use and management of forest resources, and the use of incentives provided by the downstream community. Two stakeholder workshops were held with officials from the municipality, District Development Committee, District Soil Conservation Office, District Forest Office, Department of Environment, Dhulikhel Drinking Water Users' Committee, Kavre Valley Drinking Water Supply project, and upstream VDCs officials. Interviews were conducted in Nepali and recorded and transcribed into English. Field diaries and field reflection notes were also considered within the analysis and for the data validation.

## The development of the Water Agreement

In this section, we provide detail on the process of negotiation and the involvement of socio-political actors within the negotiation process for the water agreement. Negotiations between the two communities started while the downstream community faced acute shortages of water in the 1980s. The then influential political leaders of the downstream community started a dialogue with upstream political leaders, mainly with those who belonged to the Panchayat system, and those who were in a formal position e.g. chair of Village Panchayat[4]. We recount how long-term negotiations between these socio-political actors concluded with an agreement with cash incentives in 2011.

Dhulikhel town entered into the first formal agreement with Kalanti Bhumidanda in 1985 for the supply of water to its inhabitants and for the management of water source at the upstream. In the 1980s, Dhulikhel was suffering from water scarcity and started looking for support to construct a water facility for its inhabitants. As a part of their exploration, they approached the then German development agency, GTZ, that was working in the water sector in Nepal, at Bhaktapur. Responding to local demands and needs, the GTZ accepted the request of Dhulikhel, and started working with the Dhulikhel Development Board (DDB). Initially, GTZ explored different water for Dhulikhel jointly with the DDB. The DDB approached the community of Kalanti Bhumidanda, which sits alongside the Roshi source and started a dialogue with the community about the possibility of piping water to Dhulikhel from the Roshi, through their community and land. Responding to the appeal of DDB, the then Bhumidanda village panchayat discussed the issues within a wider citizen forum and

[4] A Village Panchayat in Nepal was the lowest administrative unit of the country during the panchayat regime (1960-1990) in the country.

agreed to provide water to DDB, recognising the water needs of Dhulikhel. The upstream community placed a single condition on this request at that time: they asked Dhulikhel to contribute towards the construction of a school building that had been damaged by a great flood. The condition was agreed by the DDB, and accordingly an agreement was made on July 27, 1985. During this time a single party-political system functioned under the direct rule of the Monarch in Nepal, where the head of the village was led by the Pradhan Pancha (elected Chairperson of the Village Panchayat). To come to this agreement, the role of the then political leaders of the communities and the local government remained significant to foster the negotiation process, and the negotiations themselves were formal and largely confined to these leaders, although the upstream did hold village meetings to discuss the proposals. The then Pradhan Pancha of the Kalanti Bhumidanda Village Panchayat - a signatory of the 1985 agreement on behalf of the upstream community explained how the socio-political relationship was at that time:

> Pradhan Pancha from Dhulikhel Nagar Panchayat - the district head quarter (who is my friend too) requested us to provide water for the Dhulikhel people who were suffering from water scarcity. In response, we requested them to construct our local school building as it was damaged by the then huge flood of the Roshi river in 1981. The Pradhan Pancha agreed to the conditions we put forward, and accordingly, as per the decision of the Village Council, we decided to allow them to take water.

The struggle of Dhulikhel town for accessing water did not end with the agreement made in 1985. The shifting political paradigm in the country from a single party political system contributed to local-level upheaval: from 1990, the multi-party democratic system was introduced, only to be usurped by the Maoist people's war between 1996-2006, and the establishment of the republic with the abolishment of the monarchy in 2006. The 1990 constitution of Nepal provided the freedom to citizens to raise their voices and concern through multiple ways and means that were locally novel. As a result, local people became empowered to raise their voices and concerns through different forums. In line with these changes, the upstream community at Bhumidanda demanded more and more from the downstream, despite the fact that the downstream community provided multiple forms of support (the details of the support are recounted in the section below). Regarding the increasingly frequent demands originating from the upstream community, the Dhulikhel DWUC chair stated that *"The demands were also fuelled in later stages by the fact that there was no responsive elected government at the then-VDC since 2000."*[5]

[5] The local-level government was established in 2017 through election as per the Constitution of Nepal (2015) but there was no local-level government for close to twenty years prior to this.

Responding to demands from the upstream community as well as increasing water needs of the downstream, after 25 years, the Dhulikhel DWUC made another agreement with the then Bhumidanda VDC on May 8, 2011. This added more provisions to provide economic benefits to the upstream communities. For the second agreement, the negotiation process was started since 2000. Responding to the request of the Dhulikhel DWUC to forge consensus on the demand and supply of water, the then mayor of the Dhulikhel Municipality and the then DDC chair started dialogue with the then VDC chair of Kalanti Bhumidanda.

The chairperson of Dhulikhel DWUC himself played an active role in the negotiation process to bring the actors into a constructive dialogue. Members of all-party mechanism (APM)[6] from upstream played a crucial role as during the negotiation process, facilitation of local institutions and their representation was a prominent need and had to incorporate the help (and interests) of non-traditionally political actors. The manager of the Dhulikhel DWUC opined,

> In the negotiation process, Kathmandu University (KU) and Dhulikhel Hospital acted as a facilitator or mediator between the communities in bringing the negotiation to a conclusive end. The Vice Chancellor of KU himself was involved in the negotiation process.

In the negotiation process the downstream community was thus more powerful than the upstream due to its administrative offices, representations from influential political leaders, and possessing the elected local institution, the Dhulikhel DWUC, which by the 2000s was a well-established local institution. During the absence of formally elected local representatives, such local institutions were *de facto* responsible for meeting the demands of the local people. In addition to this, well-established educational institutions like Kathmandu University and Dhulikhel Hospital located at Dhulikhel represent powerful stakeholder interests (and are significant water consumers) in their own right, where both lobbied for the increased water take sought by Dhulikhel town.

As per the agreement, additional facilities were agreed to be financed by downstream Dhulikhel. These included an NPR[7] 800,000 annual payment to the upstream VDC, as well as additional support (NPR 200,000) for two schools (NPR 100,000 per annum for each school), a university scholarship established for upstream residents at the Kathmandu University, and discounts for poor and marginalised people in Dhulikhel

[6] Provision of All-Party Mechanism (APM) was formally introduced in 2009 to fill the vacuum of elected government at the local level which was later dissolved in 2012. The APM members comprised the representatives of the major political parties based on the vote that they received in the national election.

[7] NPR is the Nepalese Currency. 1 USD ~NPR 111 in April 2019.

Hospital. The agreement further provisioned to increase the transferred sum (NPR 800,000 agreed) by NPR 100,000 every five years. In addition to these, the downstream community agreed to increase the annual payment for the guarding of the forest with an area of about 200 hectares (Kharkhola Mahabharat Community Forest), where the water source is located. The downstream community also demanded an increase in the volume of water from a 6- inch (agreed in 1985) to a 10-inch pipe supply.

During the first agreement process, negotiations may be regarded as relatively smooth and simple, where the time required to forge a consensus and an agreement was short in comparison to the second agreement. During the first agreement, the public participation norms of the single party-political system were dominant, where local people were minimally involved in formal decision-making. These dynamics have greatly changed since the introduction of the multi-party democratic system after 1990, wherein people's rights are guaranteed by law. This is likely one reason why the bargaining power of the upstream community increased and several contentious meetings were required through nearly 11 years to come to the second agreement. Continuous political engagement and negotiation among upstream and downstream communities played a vital role for a cash-based agreement to supply water to the downstream community.

## Incentives to upstream community

As an incentive to the upstream community for their efforts at resource management in the upstream, the downstream community has paid a total of NPR 9,536,000 from the first agreement in 1985 till 2014. While 55% of the payment provided from the downstream community was for community infrastructure, 8% was for education, while 34% was granted to the VDC, only 3% was allocated directly for forest management, which is closely linked to water source conservation. There was no formally stipulated allocation of funds for different purposes within the 1985 agreement document.

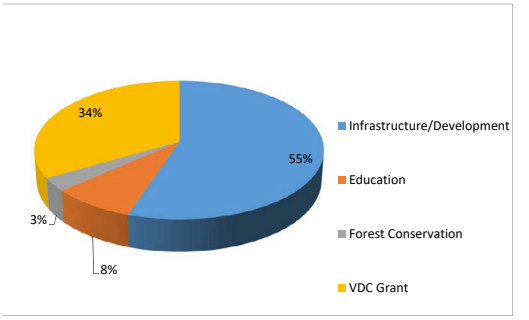



*Fig 1: Incentives provided and distribution in different sectors (Source: Field Data, 2014).*

After the second agreement, the upstream community started to receive NPR 1,000,000 per annum from the DDWUC on behalf of the downstream community. In addition to the amount mentioned in the agreement, the upstream community

successfully negotiated an additional NPR 36,000 per annum for the salary of a forest guard. A forest guard attempts to prevent illegal extraction of forest products, controls grazing and other aspects of forest management. Figure 1 gives the incentive provided and its distribution in different sectors of the upstream community

## DISCUSSION

The review of the agreements made for the water security of Dhulikhel township and discussions with different stakeholders shows that several rounds of social interactions between community members enabled the agreement to take shape. It is important to understand the social networks and linkages that reinforce the need for embedded social negotiation of PES-like contracts, as in this case, rather than the introduction of standardised templates developed elsewhere (Kolinjivadi et al., 2014). As elaborated in the result section, wider socio-political changes greatly influenced water negotiations. Being a single party-political system, the consensus process of the first agreement was smooth and less hectic, with a single condition imposed on water take by Dhulikhel: construction of a school building. However, the second agreement took several years and several rounds of negotiation meetings to come to an agreement in the multiparty political system. Here, the bargaining power of the water provider, the upstream community, increased with socio-political change in the country and with establishing the culture of payment, though Dhulikhel remained more powerful. The upstream community seemed to also be more active in negotiations to receive more incentives, which led to the emergence of a strongly cash-based agreement in 2011. Provision of cash incentives of one million per annum to the upstream in the second agreement reflects that political change over time can change the interests of people, reflected in the incentive-based mechanisms (Jack et al., 2008).

Prominently, Dhulikhel, which is the district headquarter of Kavre, is politically more powerful than the upstream rural community. This is also reflected by one of our key informants from the upstream community, who told us,

> Dhulikhel is the centre of power, where institutions linked with authority like the police, administrations and other institutions are clustered. We must go to Dhulikhel to get state services like citizenship, land ownership registration and electricity access and so on. If we don't allow them water access, we have a fear of being deprived, or of experiencing difficulties in accessing such state facilities.

The centre of power was also reflected in the agreement dated 1985, which clearly mentioned that Dhulikhel – as the district headquarter, where government offices were located – faced water scarcity. Communities' relative standing and bargaining power also depended on the types of available water sources, such as river or spring sources (Joshi et al., 2018).

One of the key informants from Dhulikhel, who also played a crucial role in the negotiations said, "*We had no other options than to make negotiation with upstream community because they owned water sources, as the water source lies in the forest they have been managing".*

This denotes a recognition of the frequently unseen work behind maintaining environmental resources, which in this context gave rise to claims for compensation for continued support. From the perspective of Dhulikhel town, increased demand of water was a critical issue in 2011 because of the expansion of water users in the peri-urban area of Dhulikhel. From the perspective of the upstream community, these increased demands needed to be matched with higher compensation. As a water provider, the upstream community were continuously applying greater pressure for more benefits from the downstream community in order to develop their community in terms of education and road access. As a water recipient, the downstream community wanted to come up with a stable long-term agreement with their upstream community to secure growing water demands of the community. Accordingly, through a series of meetings, the two communities came to an agreement where downstream community incentivised the upstream community with cash support worth NPR one million per-year in recognition of management efforts of the water source. As claimed by one of the officials of the Dhulikhel DWUC, to conclude for the second agreement, *"There were a series of interactions up to 18 times among the actors of both communities".*

One of limitations of the 2011 agreement was the recognition of the Community Forestry User Groups (CFUGs) who were playing a prominent role in the protection of the water source. Agreements must consider historical costs and duties for the management of the same resource (Kovacs et al., 2016). The water source area in the upstream community is managed by the Kharkhola Mahabharat CFUGs under the Forest Act 1993 of Nepal and related regulations, which empowers CFUG members to manage their forest resources as common-pool resources and consider CFUGs as independent entities. The CFUG is the actual manager of the upstream forest resource and its associated ecosystem services, but the executives of CFUG are not among the negotiators and decision-makers in the agreement process. In the whole negotiation process, the then VDC authority, together with the then APM, was signatory of the agreement on behalf of the upstream community. Hence, CFUG was excluded as an institution and did not receive direct funding. A similar exclusion was found by Khatri (2009) in the case of Kulekhani hydropower, where similarly the PES mechanism did not provide economic incentives to the CFUGs and other local organisations looking after watershed management activities. Other studies have highlighted how even non-participant households within targeted communities are

considered potential recipients of incentives within PES schemes (e.g. Huang et al., 2009), which is also evident from the case of Costa Rica, where to get a better outcome from the payment for watershed services, the national programme introduced a series of modifications to promote participation of small farmers and indigenous peoples in order to be more inclusive of all potential stakeholders (Porras et al., 2008).

In the case of Dhulikhel, the practice of incentives started in 1985, a product of the first period of negotiations between the up and downstream. The downstream community paid a total of NPR 9,536,000 between 1985 and 2014. However, the mode of payment was determined without any consideration given to any measurement or evaluation of the relevant ecosystem services. There are well-established methods and approaches that have been applied in a Himalayan context (de Groot and Hermans, 2009; Rasul et al., 2011). On the other hand, existing literature suggests that environmental service buyers do not always have a clear definition of what environmental services they are paying for as there may be problems of high complexity, uncertainty, and imperfect and asymmetric information in the linkages between desired environmental services and ecosystem management practices (Muradian et al., 2010; Muradian and Rival, 2012). Therefore, a fully developed market approach, in which PES would function precisely according to economic theory, remains more a theoretical abstraction than an empirical possibility. In addition, it seems that the payment made by downstream settlements are essentially compensation for water diversion, as there is (currently) enough water flowing from the source. Downstream areas are not currently planning or concerned with future water scarcity scenarios.

Similarly, the increment of NPR 100,000 payments every five years now received by the upstream community was not clearly linked to value determination, nor to how long the downstream community retained their willingness-to-pay to the upstream. The question is now being reformulated to how the Dhulikhel DWUC will manage to meet the growing demands of the upstream community, and the expected periodic growth of the sum by NPR 100,000 every 5 years. The increased amount implies an increase to downstream users' water bills. In the long run, downstream users may question the utility of the current arrangement, and the entitlement of upstream communities to demand payment. From the perspective of upstream community, they acknowledge an ongoing challenge to justify their incremental monetary demands. One of the key informants from the upstream community expressed his dissatisfaction towards the 2011 agreement as:

> The calculation of an increment of NPR 100,000 every 5 years without proper valuation of water is not appropriate and cannot do justice to the upstream community who protect upstream resources

> by providing water to the downstream. The downstream community are paying us only because they are in acute water need.

Such dissatisfaction from the upstream community with the process of the negotiation and the lack of grounding in payments' size relative to work or economic service valuation may lead to conflict in the near future. Bhatta et al. (2014) has suggested that a standardised method to determine the flow of services and the realistic price for the use of such services needs to be well- supported and tested before being adopted. Such an approach may not only minimise the potential for disagreement and conflict but will also give a scientific and standardised basis for negotiations.

Analysis of economic incentives to the upstream shows that only 3% of the total amount is allocated to forest management. This is a voluntary contribution by the community for forest management as per the community forestry approach, which has been ongoing for the last twenty years. In contrast, more than 55% of the total incentive has been invested in infrastructure development. One of the key informants from the upstream community argued:

> The development process in Bhumidanda was initiated only after Dhulikhel diverted water for its inhabitants, and basic infrastructure was essential for us during those days. Nowadays, large part of the money that we receive from the downstream has been used in development activities as our community is still underdeveloped. In addition to this, little portion of the money is used in school education for local children as we need to pay salary of school teacher from our own contribution.

Incentive-based ecosystem service management can contribute towards building consensus between communities and is thereby instrumental for facilitating downstream–upstream problem-solving (Kosoy et al., 2007). The analysis reveals that incentive-based mechanisms with long-term interactions among the actors play a crucial role for negotiation which ultimately sustains water security in the downstream (Dore et al., 2010; Joshi et al., 2014; Bhatta et al., 2014 and Joshi et al., 2018).

Mechanisms of incentive-based ecosystem services management not only require a payment culture (Wunder, 2013) but also need to consider clear mechanisms for benefit- sharing amongst communities (Bhatta et al., 2014). Our analyses show that the annual payment made from the downstream community was primarily compensation for securing access to water. As water demand increases, the downstream community's willingness to pay to the upstream service providers become greater to ensure a greater supply of water.

## CONCLUSION

This paper analysed the negotiation dynamics between two communities' intent on establishing a water-sharing agreement. These agreement approaches

have a long history in the Himalayas and in Nepal. We have drawn attention to the changing dynamics between actors over the past 30 years, as the involvement of local communities become more possible and more politicised through the past decades of political development in Nepal. These power relations, the degree of resource scarcity and urbanisation, the urgency of demand have all played an important role in Dhulikhel for determining the terms of negotiations, the sought incentives by upstream communities, and their ability to realise an agreement, over and above scientific approaches to ES. The outcome of long-term negotiations between up and downstream stakeholders have achieved not only a joint agreement to protect and supply water resources, but at the same time now provide support to the community forest user group and several community development initiatives in the upstream. Power relations between local rural and urban socio-political actors play a vital role in water access negotiations, and fundamentally influence the potentials and effectiveness of incentive-based mechanisms to secure water needs. Such power relationship in negotiation can be a new knowledge in PES or PES like agreement.

Furthermore, Dhulikhel drinking water users committee, Kathmandu University, and Dhulikhel Hospital still need to be linked within new federal institutions such as the Municipality (Dhulikhel) and Rural Municipality (Bhumidanda) for long- term sustainability. New mechanisms for linking up- and down- stream may also give rise to new governance considerations around how federal institutions can upscale and recognise existing water agreements, and how future negotiation dynamics to ensure sustainable water supply in the years to come will be affected.

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