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Water Scarcity and Sustainability in the Himalayas

- ✓ Are the sectoral policies on climate change, urban development and water interlinked and do they address urban water issues?
- ✓ How are socio-environmental dynamics shaping groundwater exploitation in peri-urban areas of Kathmandu Valley?
- ✓ What challenges and prospects lie with the institutional landscapes for integrated urban water management in Haldwani city?
- ✓ How do socio-political relations among upstream and downstream actors shape the negotiation process to secure urban water needs?
- ✓ How can the social protection system be made more shock responsive and adaptive to climate-induced disasters?

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Front and Back Cover photo

Front cover photo caption :
Woman using spring water in Dhulikhel, the major water source in mid-hills (2017)

Back cover photo caption:
Boys bathing in Roshi River and clothes dried along the river bank, Kavre (2017)

Photos by: Kaustuv Raj Neupane

Notes to Contributors

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EDITORIAL INTRODUCTION: UNDERSTANDING WATER INSECURITY IN SOUTH ASIA

Chandra L. Pandey[1], Dil Khatri[2], Hemant R. Ojha[3]

South Asia is home to over a fifth of the world's population. This is also the region with the fastest rate of urbanisation, with increasing concentration of poverty in urban and peri-urban areas. Small to medium-sized cities in the lower Himalayan regions of India and Nepal are undergoing rapid expansion, population growth, and economic transformation. Although the Himalayas are considered the 'Water Towers' of South Asia, urban regions downstream are facing increasing water insecurity, due to the domino effects of various drivers such as increasing population, changing lifestyles, rising economic status, and the intensifying impacts of climate change. The round-the-year supply of water is being disrupted in the Himalayan settlements, even in the rural areas due to the impacts of climate change.

The Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) suggests that climate change is going to have widespread impacts on South Asian society and the natural environment. Climate change in this region has wide ranging impacts including flooding of settlements and infrastructure, deterioration of public health, and food and water shortages (Dupar, 2019). Recent research findings suggested that Asia's 'Water Towers' are being threatened by climate change, while seasonal rainfall patterns are changing

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with shorter monsoon period and higher post-monsoon precipitation, leading to extended water scarcity months and extreme rainfall periods (Pranuthi et al., 2014; Singh & Mal, 2014; Immerzeel et al., 2010). These studies also note that combined effects of temperature rise and erratic rainfall would decrease the rate of ground water recharge, leading to water stress in future. The latest report published by NITI Aayog (2017) of India on water security and springs contends that, in the Himalayan region, the springs are drying and discharge rate is gradually declining.

The cumulative effects of changing climate have affected agriculture, forest and bio-diversity, and water resources, creating risks to human wellbeing in the region (Singh et al., 2011; Negi et al., 2012). Studies have also identified that climate change is impacting the water resources, implying that the urban water supply and demand management system would become adversely affected if improved practices are not adopted in a timely manner (Pandey et al., 2019; Dahal et al., 2019; Pandey & Bajracharya, 2017). The existing body of literature on water and climate change suggests that the combined effect of hydrological variability, socio-economic extremes, fragmented water institutions and policies and inadequate infrastructure, inter alia, make water systems particularly vulnerable to climate change at global, regional, national and local scales (Grey and Sadoff, 2007; MacDonald, et al., 2011; Pandey et al., 2019).

Studies undertaken by researchers working with a project called Climate Adaptive Water Management Plans for South Asia (CAMPS) and others (Rai et al., 2019; Raut et al., 2019; Pandey et al., 2019; Pandey and Bajracharya, 2017; Béné et al., 2014; Mitlin and Satterthwaite, 2013; Seto et al., 2012) suggest high degree of vulnerability of marginalised groups, particularly slum residents, women, children, elderly and people with low economic status, to climate change and water scarcity. Besides, despite the proliferation of water policies and laws at national, provincial and local levels, the cities of Nepal and India are facing worsening levels of water deficit and are in need of sustainable and climate adaptive solutions.

In fact, securing water has become a global challenge, given there is very limited freshwater available for human use. Across the planet, only 2.5 percent of all the water is fresh-water and almost 2% of it is frozen. As there is small amount of usable water available, achieving water security has become difficult. Here, by water security, we mean access to enough water for domestic, social, economic, and ecosystem development, together with an institutional capacity to overcome technical and environmental barriers (Pandey, 2020; Ojha et al., 2020; GWP, 2000). The ever-increasing threat to global water security makes it imperative to understand the causes and consequences and to find possible pathways for achieving sustainable management of water resources. Hence, it has been critically important to understand the barriers and prospects of addressing urban water scarcity in the Himalayan cities in the context of rapid urbanisation and climate change.

Against this background, the goal of this special issue entitled, 'Water Scarcity and Sustainability in the Himalayas' is to consolidate emerging yet scattered evidence of water scarcity to contribute to the understanding of the dynamics of water insecurity, with particular focus on policy and institutional responses of the cities in lower Himalayas of Nepal and India. Four key questions investigated in this special issue include: 1) How climate change is impacting water resources, already scarce freshwater and water sustainability? 2) What are the challenges cities are facing for managing water resources in the context of rapid urbanisation and climate change? 3) How are climate, water and urban policies related or unrelated and what are the policy and institutional dimensions of water governance? 4) How are upstream-downstream water conflicts being managed? Considering these questions, the articles included in this special issue capture new research on the crosscutting themes of climate change, urbanisation and water. These papers critically review the existing water scarcity scenarios of cities in the lower Himalayan region, and analyse policies on water (surface water and ground water policies), climate change and urban development, and upstream and downstream water conflicts and institutional responses to manage and to improve water security of the cities. These papers also explore possible pathways for urban water security a move from scarcity to sustainability of water for South Asian region and beyond.

The first paper on *Securing Water in the Rapidly Urbanising Global South: Insights from Critical Analysis of 'Sectoral Policies' in Nepal* (Maskey et al., 2020) investigates whether and how the sectoral policies on climate change, urban development and water address critical urban water issues, and how these policies are linked (or not linked). It presents the plight of cities in the global South highlighting that these cities are facing complex challenges of climate change, unplanned development and ageing water infrastructure. The paper notes that climate change is likely to undermine the ability of urban water supply systems to meet both the present and future needs of the population and there are serious concerns about the existing water management policies failing to address the challenges of climate change and unplanned urban development. Based on the analysis of urban, water and climate policies and drawing insights from water forum meetings organised in Dharan and Dhulikhel, the authors conclude that the existing urban, water and climate related policies have insufficient focus on urban water issues and lack effective interlinkages amongst these sectors. Constraints to policy implementation includes lack of awareness about the policy provisions, challenges and ambiguities in implementing the policy provisions, lack of recognition of the stakeholders' role in policy formulation and its effective implementation, and unclear provisions made in the policies. The authors suggest that a coherent policy framework would help to address the complex issues of urban water, shaped by climate change and urban development.

The second paper on *Groundwater Policy and Ground Water Dependencies: Reflecting on the Evolving Socio-Environmental Dynamics in Peri-Urban Kathmandu Valley* (Shrestha, 2020) highlights the issues related to groundwater use, groundwater policy and sustainability. In peri-urban Kathmandu Valley, the study shows, there is uncontrolled urban expansion, and rapid population growth, resulting into increased water demands with high dependence on groundwater. The paper argues that increasing groundwater exploitation has economically benefited only the influential ones, such as commercial users, but groundwater is degrading, both in quantity and quality, and the cost of groundwater access is increasing. The uncontrolled exploitation of groundwater by these influential people has led to inequalities in socio-environmental benefits and burdens, resulting into water-related conflicts in peri-urban Kathmandu Valley. Existing groundwater management policy, however, lacks attention to peri-urban dynamics of change and growth and does little to address the increasing peri-urban groundwater use. In this context, the author suggests to address the existing macro-micro gaps in groundwater management by improving the understanding of local hydro-geological complexities and paying critical attention to the socio-economic, political and institutional drivers of increasing groundwater use.

The third paper in this issue on *Mapping Institutional Landscape for Integrated Urban Water Management in Haldwani City, Uttarakhand* (Pandey et al., 2020) points out that water resources are expected to affect gross domestic production (GDP) of India, and future climate change projections are far more upsetting for water resources availability. The paper assessed institutional challenges and prospects, mapping the existing institutions and their functions to explore the best possible adaptive strategy for urban water security taking the case of Haldwani city located on the lap of Indian Himalayas. The case study found that the city encounters the evident spells of water scarcity and has the resemblance with institutional arrangements and ecological resources to many other mid-sized cities in India. One of the key findings of the study is that rainwater harvesting system can be easily taken up as a nature-based solution which the institutions promote to meet the city's present and future water needs. In this background, the paper suggests that sustainable and adaptive strategies such as integrated water resources management and nature-based solutions need to be promoted globally for sustainable and integrated urban water management.

The fourth paper on Incentives for *Securing Water in a Himalayan Town: A Case from Dhulikhel, Nepal* (Joshi et al., 2020) 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 of Dhulikhel in order to secure water required for continued urbanisation of the city. The research examined the roles of socio-political relations among upstream-downstream actors in securing water for expanding towns. The authors

reported that during the negotiation process, political leaders from Dhulikhel municipality and upstream communities played key role in the formation and acceptance of the agreement for sharing water. The negotiation process that started during the 1980s culminated in a series of agreements resulting into cash incentives to the upstream community from 2011. The downstream urban community agreed and 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 authors suggest that 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.

The fifth paper on *Cash and Climate: The Potential Role of Cash Transfers in Adaptation to Climate Change* (Rajouria, 2020) focuses on the need to integrate social protection programs with local adaptation plan for action (LAPA), making the social protection programs to be shock-responsive and adaptive. The paper notes while the national and local adaptation plans are already designed strategically aiming to strengthen the livelihoods and resilience of vulnerable households, the cash transfers as a part of the national social protection programs can be effectively employed for poverty reduction and strengthening the resilience of vulnerable groups. While both—the adaptation plans and social protection programs- embody clear and overlapping objectives of reduction of poverty and vulnerability to shocks, they are functioning independently without any coordination. As social protection mechanisms are increasingly integrated with climate change adaptation and disaster risk reduction in other developing and emerging economies, this paper suggests that the concept of adaptive social protection and its relevance to the challenges of climate change in the context of Nepal is also appropriate.

Findings from the papers in this special issue support the arguments about growing challenges of water insecurity in lower Himalayan towns (Maskey, et. al., 2020; Shrestha, 2020; Joshi et al., 2020; Pandey et al., 2020) and the problem is getting escalated by climate change. The policy and institutional responses towards water security remains limited and fragmented across sectors and there is a need for policy coherence and integrated approach for the better response to manage surface water and groundwater. These findings concur with studies conducted by other scholars (Pandey and Bajracharya, 2017; Pandey et al., 2019; Pandey, 2020; Ojha et al., 2020) in the field identifying that sectorial fragmentation and non-coherent policies across water, climate and urban governance are leading to weak governance and institutional system to deal with emerging threats of urban water insecurity. Negotiation with upstream communities has been key challenge for the downstream towns for securing water. It appears that the payment of ecosystem services (PES) based on socio-political relations and understandings

play key role in forging and sustaining agreements between downstream towns and upstream communities for ensuring urban water security (Joshi et al., 2020). Climate change has emerged as a new amplifying challenge for water security and livelihoods in the 21st century, therefore, reducing local vulnerability becomes more prominent and adaptive social protection programs such as cash transfer can be options towards addressing local vulnerability (Rajouria, 2020).

The research on climate change, urbanisation and water strongly suggest that cities of Global South are extremely vulnerable to water scarcity and a range of integrated institutional and policy innovations are needed to address the climate-water-urbanisation vulnerability. The sectorial and fragmented institutions and policies need to be reviewed to develop a holistic, integrated and sustainable approach to deal with tripartite challenges of climate change, unplanned urbanisation and water scarcity. Priorities need to be placed not only on mega water infrastructure to capture water from rivers far away but also on protecting locally available water sources through nature-based solutions. Examples of nature-based solutions[4] could be building climate adaptive recharge ponds in the watershed areas, capturing rainwater for harvest and constructing climate adaptive recharge pits in every house in the city to allow water infiltration to reduced level of water due to ground water extraction (Devkota et al., 2019; Neupane et al., 2019). We believe that the contributions in this special issue suggest that integrated and coherent urban policy in the nexus of climate, unplanned urbanisation and water; nature based solutions, and adaptive social protection to safeguard the losses of climate impacts are immediately needed on the one hand and they also open up space for further policy and scientific inquiries for urban water security.

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ORIGINAL RESEARCH ARTICLES

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SECURING WATER IN THE RAPIDLY URBANISING GLOBAL SOUTH: INSIGHTS FROM CRITICAL ANALYSIS OF 'SECTORAL POLICIES' IN NEPAL

Gyanu Maskey[1], Chandra L. Pandey[2] and Krishna K. Shrestha[3]

ABSTRACT

Cities in the global south are facing complex challenges of climate change, unplanned development and ageing water infrastructure. Climate change is likely to undermine the ability of urban water supply systems to meet both the present and future needs of the population. Concerns have been raised about the existing water management policies inability to address the challenges of climate change and unplanned urban development. The paper investigates whether and how the sectoral policies on climate change, urban development and water address critical urban water issues and; how and in what ways these policies are linked (or not linked). Based on the analysis of urban, water and climate policies and drawing insights from water forum meetings organised in Dharan and Dhulikhel, we demonstrate that the existing urban, water and climate related policies have insufficient focus on urban water and lack effective interlinkages amongst these themes. Lack of awareness about the policy provisions, challenges and ambiguities in implementing the policy provisions, lack of recognition of the stakeholders' role in policy formulation and its effective implementation, unclear provisions made in the policies appear as constraints for implementing the policies. We argue that a coherent policy framework would help to address the complex issues of urban water, shaped by climate change and urban development.

Keywords: Water management, urban planning, climate change adaptation, policy analysis

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INTRODUCTION

The Global South is rapidly urbanising, so are the rising scarcity and issues of water accessibility for these cities. Cities are facing the complex challenges of climate change, population growth, ageing water infrastructure and degrading ecosystem, whilst needing to foster prosperity and economic growth (Dunn et al., 2017). While many countries in the Global North have started to integrate climate change concerns into water management strategies (Subak, 2000; Rosenzweig et al., 2007; Ruth et al., 2007; O'Hara and Georgakakos, 2008), Global South have compromised short-term needs (Ziervogel et al., 2010).

World Resource Institute (WRI)'s updated Aqueduct Water Risk Atlas finds that 17 countries, which are home to a quarter of the world's population, face "extremely high" water stress. Nepal is one of the fastest urbanising countries in South Asia. Nepal ranks 40th in the list of countries facing water stress in the world, and the fourth most water stressed in the South Asia region, behind India, Pakistan and Afghanistan (WRI, 2019).[4] It is considered the 14th most vulnerable country in the world in terms of the climate change vulnerability index (Eckstein et al., 2017)[5] and natural disasters, many of which are water-related (MoPE, 2016). It is anticipated that climate change will critically impact the hydrological system, water sources and water dependent human activities in the coming years (IWMI, 2012; NRC, 2012). Combined with the rapid land-use transformations taking place across many of the mountain landscapes of Nepal, climate change is poised to escalate water insecurity in many water-deficit regions of the country (Dahal et al., 2019).

Nepal has a raft of policies for water management, climate change and urban development. There are 18 Acts, 10 regulations and 3 treaties related to water with mandatory provisions. Similarly, water plan, policy documents, formation orders, strategies and guidelines, bilateral minutes, Memorandum of Understanding facilitate the mandatory activities (WECS, 2019). Nepal has made remarkable progress in terms of policy formulation; and strategies for responding to urbanisation are more or less in place (MoUD, 2016). Moreover, Nepal is also making great efforts to address climate change endorsing climate change policy and adaptation plans at national and local level, and strategy to move towards low carbon climate resilient development (MoPE, 2016; MoFE, 2018). Institutional arrangements and their strengthening, program development and implementation have also been prioritised.

However, the responses have not been enough to offset the challenges created by a dramatic shift in urban driven demands (MoUD, 2016). Despite having a series of water policy reforms in Nepal, and formulation of a raft of urban and climate change policies, the major challenge remains to be their effective and accountable implementation. The

[4] The World Resources Institute's updated Aqueduct Water Risk Atlas 2019

[5] Global Climate Risk Index 2018

effectiveness of implementation often links with the lack of interconnectedness of these policies. Yet, these issues are rarely assessed because of resource limitation, limited institutional capacity to design, deliver effective management functions and lack of accountability/political will. Lack of integrated urban governance in cities is brought about by uncoordinated sectoral policy mechanisms along with fragmented institutional arrangement and lack of technical expertise are major issues of concern (NUDS, 2017). Water issues are critical in urban areas with the specificities of urban areas as high population density, increased economy and built-up structures, surface sealing, land use changes, changing lifestyles of people, complex governance structures and policies. Studies show that existing water and urban development policies and frameworks are fragmented and ineffective to deal with the issues of climate change as they have failed to capture the changing climate to promote climate resilient sustainable cities (Pandey and Bajracharya, 2017; Biggs et al., 2013). On the one hand, climate change policies are being too encompassing, leaving water policies in the shade. These policies seem to be only emphasising the significance of water sector in terms of dealing with climate change. On the other hand, water related policies have not fully integrated climate change (Regmi and Shrestha, 2018). Sectoral policies formulated by the government have inadequate focus in mainstreaming the climate change adaptation issues (Nepal, 2019).

A centralised policy-design process, low awareness among the government officials, lack of development partner's interest, uncertainties about climate change financing, lack of priority of the nation and political commitment have made climate change policies debatable in the higher-level policy arena and has led to inadequate sectoral integration of climate change adaptation in their policy design (Pant and Gautam, 2013; Ojha et al., 2016; Nepal, 2019). Climate change policies have not been able to establish relationship with policy domains of water and urban planning, along with energy, agriculture, and forestry, though relevant (Corbera et al., 2019). Studies have found gaps in knowledge and understanding about the role of urban local government in adapting to the impacts of climate change on water (and vice versa) and the relation of climate change policies to development policies and process are considerably large (Jha and Shrestha, 2012; Corbera et al., 2019). It is not yet known if the policies related to water, urban development and climate change are tuned in a way that these policies work as complementary and not duplication or rival to one another. The question is essentially about the 'policy coherence' in urban, water and climate sectors wherein policy coherence is defined as the systematic promotion of mutually reinforcing policies across the government departments to create synergies towards achieving agreed objectives and to avoid or minimise negative spill-overs in other policy areas (OECD, 2016). There is no systematic mapping of key sectoral urban policies linked to water access and study on whether and how the sectoral policies on urban development, climate change and water are connected and how they address the issues of urban water. This gap has led to the review of existing policies in urban, water and climate sector which is an

opportunity for integration or addressing the issue of disintegration. The paper critically analyses the existing policies of Nepal, focusing on urban development, water resources and climate change to investigate: 1) whether and how the sectoral policies on climate change, urban development and water address critical urban water issues and; 2) how and in what ways these policies are linked (or not linked) and what insights can be obtained about policy cohesion for sustainable urbanisation.

The following section of paper will introduce the urban development, climate change and water. This will be followed by research methods. Furthermore, climate, urban and water policies and their focus on urban water and the interconnectedness of the policies will be discussed. Some constraints and opportunities in this regard will be discussed followed by the conclusion.

URBAN DEVELOPMENT, CLIMATE CHANGE AND WATER

The urban population of the world has grown rapidly since 1950, increasing from 751 million to 4.2 billion in 2018 with 55% of the world's population residing in urban areas in 2018 (UN, 2018). In 1950, 30% of the world's population was urban, and by 2050, 68% of the world's population is projected to be urban. In South Asia, urban population is poised to grow by almost 150 million by 2030 (WB, 2016).[6]

[6] World Bank, 2016

Mekonnen and Hoekstra (2016) estimate that four billion (two-thirds of global population) already face extreme water scarcity when seasonal and inter-annual variations in water availability are taken into account, implying that more than half the world's population may currently face water insecurity driven by resource scarcity (Jensen et al., 2018). World Health Organization (2018) predicts that by the year 2025, half of the world's population will be living in water-stressed areas. The highest water stress levels occur in Northern Africa and Western, Central and Southern Asia (UN Water, 2018). Urban areas of these rapidly urbanising developing countries are facing increasing water scarcity and at the same time, experiencing some of the world's most acute water related problems as flooding, access to potable water and sanitation and pollution of waterways (McFarlance, 2010). The problem is likely to aggravate further due to rapid changes in the hydro-environment, like climate change and land degradation (Vairavamoorthy et al., 2008).

Climate change is likely to increase water demand with reducing supply. The combination of climate variability and uncertainty regarding future changes is argued to make water resources planning very challenging (Bharati et al., 2014). Cities and climate change are closely related (Broto, 2013) and urban centres are vital part of the global response to climate change (UN-Habitat, 2011; World-Bank, 2010; Broto, 2013). Studies showed that almost 40% of the world's population live in river basins that experience severe water scarcity during at least one month of

the year (Hoekstra et al., 2012). The change in intensity and frequency of precipitation will affect stream-flows. Consequently, it will increase the intensity of floods and droughts, with substantial impacts on the water resources at local and regional levels (Barnett et al., 2005; Vicuna et al., 2011 cited in Rochdane et al., 2012).

While climate change brings both positive and negative impacts, scholars have highlighted critical negative impacts on the availability of water resources in municipal areas (Yang and Zhu, 2017). Climate change is likely to worsen current stress on water resources, and one of the challenges is to respond to the uncertainties associated with future climatic conditions and the water need of rapidly growing urban population.

Water is essentially a local issue affecting people's everyday life. Yet, the availability and quality issues have implications beyond the local scale because of the impacts of water on economic development, competitiveness and assets of the location. Adaptation of the water sector, particularly the urban water system, is therefore, important because current water management infrastructures and practices are likely to be inadequate in reducing the impacts of climate change on water resources (OECD, 2011; Pahl-Wostl, 2015; Hoekstra et al., 2018). Shifts in governance and policies are crucial to address these issues (Shrestha et al., 2014; Pandey and Bajracharya, 2017).

Moreover, urbanisation and urban development is shaped by key policies of the State in sectors such as transport, agriculture, tourism, and industry in addition to the policies pursued in the urban sector (NUDS, 2017). The need to support urban water systems with more comprehensive, integrated approaches is well documented in the literature (Brown et al., 2009). For decades, academic debates and international policy forums have repeatedly called for more integration between water and related sectors through various concepts and frameworks such as Integrated Water Resources Management (IWRM) (Rahaman and Varis, 2005), Sustainable Urban Water Management (SUWM) and Water Sensitive Urban Design (WSUD) (Ashley et al., 2013). While the need for policy integration for improved water management is widely acknowledged, it has not been implemented in practice (OECD, 2011). The policies and strategies to promote climate resilient water management practice are lacking in South Asia problematised by the distribution of power and responsibilities across various levels of governance (Biggs et al., 2013). Developing countries, in comparison to the developed countries lag far behind in integrating water policies with development and climate change policies. These challenges have direct implications for sustainable development of cities as poor urban water system makes cities unsustainable.

The gaps identified by OECD Multi-level Governance Framework (OECD, 2011) in water policy design and implementation are linked to, or exacerbated by, key features of the water sector. Of the seven gaps identified, policy gap due to sectoral silos and fragmentation is the first one[7] that is crucial to achieve urban

[7] Other gaps identified are administrative gap, objective gap, information gap, capacity gap, funding gap and accountability gap

water security for sustainable urban development. Promoting urban water resilience involves planning, policy and action to align urban sustainability and sustainable urban livelihoods with the enhancement of the capacities of water users and managers to perceive water relevant risks and effectively respond to them (Romero Lankao and Gnatz, 2016). There is utmost need to devise the strategic vision recognising water as a key factor of sustainable growth in cities and strengthening policy coherence for an integrated urban water management.

RESEARCH METHODS

The methodological approach we have adopted for this research is the analytical reviews of existing policies and secondary literature. Our focus is on the analysis of policies related to urban development, water and climate change, in addition to the analysis of relevant articles and reports. For data collection, we searched the main policy documents on water resource management, climate change and adaptation and urban development of Nepal through Google search engine and visited the websites of respective ministries and departments[8]. We reviewed the fundamental policies in the sectors of urban, water and climate. We also incorporated the policy related insights from 8 water forums organised in Dharan and Dhulikhel, 4 water forums in each city.[9] Water forums[10] are the discussion forums in which diverse water related stakeholders deliberate on water issues and challenges they confront in the city.

For data analysis, we used both textual and contextual dimensions of 'discourse analysis'. We interpreted information and put them together into coherent stories to construct meanings and relationships (Dryzek, 2005). We used a three-dimensional thematic analytical framework to construct meanings and relationship between the urban, water and climate policies (ibid). We employed an open coding[11] system in three themes, which include a) sustainable urban development; b) urban water management; and c) climate change adaptation to analyse the policies on water, climate and urban development (see Figure 1).

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8 Websites (National Planning Commission, Ministry of Urban Development, Department of Urban Development and Building Construction, Ministry of Energy, Water Resource and Irrigation, Ministry of population and environment and others)

9 Dharan Water Forum I (22 Dec 2016), II (32 Mar 2017), III (15 S ep 2017), IV (13 Jan 2018)
Dhulikhel Water Forum I (23 Nov 2016), II (19 Jun 2017), III (15 Sep 2017), IV (8 Feb 2018)

10 Water forums are participatory, collaborative, and collective interdisciplinary engagement between the researchers and local stakeholders for sharing and co-learning on water related issues.

11 Open coding is an important technique for qualitative data analysis in which the researchers go through data line-by-line to investigate the key emerging themes, agree for coding compatibility between the researchers for consistency and start coding theme-based information for the analysis of the data.

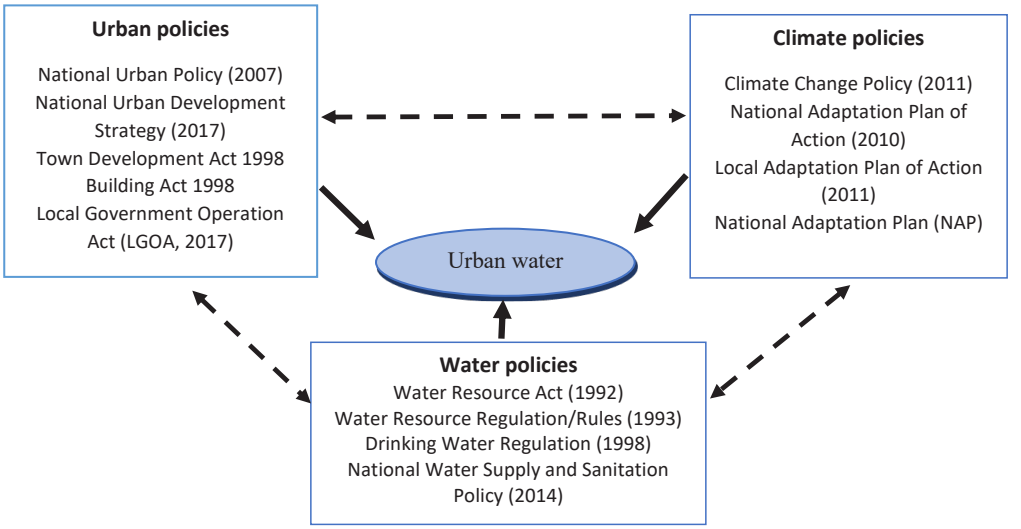

Figure. 1. Analytical framework showing the three sectors, the policies studied in each sector and the year of policy commencement.

URBAN, CLIMATE AND WATER POLICIES FOCUS ON URBAN WATER

In this section, we present our key findings of review of policies and examine how they are interlinked. We also discuss the context in which the urban development, water and climate legislations were formulated and whether or not the legislations address the urban water issues.

Urban development policies and 'urban water'

This section discusses the urban water issues in the urban legislations National Urban Development Strategy (NUDS, 2017), National Urban Policy (NUP, 2007), Local Government Operation Act (LGOA, 2017), Town Development Act (TDA, 1998) and Building Act (BA, 1998), as shown in the table below (Table 1). NUDS (2017) has been prepared in line with the NUP (2007), the Sustainable Development Goals (SDGs) and the New Urban Agenda, to address the critical issues and challenges of urbanisation and unleash the potential it holds in driving forward the national development. While NUP has provided guidance for urban development, NUDS[12] has shaped realising the need of strategic direction that will guide the urban development process. The LGOA (2017), which replaced Local Self Governance Act (LSGA, 1999), and in effect, now capturing the essence of the federal Constitution of Nepal 2015 stipulates the roles and responsibilities of urban and rural municipalities. While the TDA (1998) was

[12] It provides strategies for urban development for the next fifteen years by covering various sectors of urban areas such as infrastructure, environment, system, finance, economy, investment, land and governance.

formulated to provide necessary services and facilities to the residents of the town, Building Act (1998), formulated to regulate the building construction works in order to protect building against earthquake and other natural calamities.

Table 1: 'Urban Water' in urban legislations

Urban Regulations	Urban Water issues
National Urban Development Strategy (NUDS, 2017)	• Guiding principles – 'Green' to save, protect water body, protection and management of fresh water sources • Integration of rainwater harvesting within the building permit system, institutionalising water recharge provisions in public spaces, monitoring, strengthening system to produce and deliver safe water, • internalising regular monitoring system to assure water quality standard; promotion of community water storage facilities; facilitating private sector investment in water supply, and augmenting investment in waste-water treatment systems • Minimum water provisioning, water security, safety and sanitation coverage proposed
National Urban Policy (NUP, 2007)	• Empowers municipalities to plan and implement water supply-related activities • Provisions of subsidy in basic infrastructural services for encouraging private investment in drinking water and canals, conservation of natural resources as rivers and watershed and forest for sustainable use • Aims to contribute to water augmentation necessary for urban activities by implementing appropriate collection techniques for rainwater collection • Mentions 'drinking water and drainage' as pre-requisite for declaration of urban area as municipality
Local Government Operation Act (LGOA, 2017)	• Roles and responsibilities of urban and rural municipalities – about implementation and regulation of policies, laws, plans of local drinking water, drinking water management and tariff fixation at the local level • Has specific provisions of function allocation related to drinking water to the local level committees • Role of data management related to water source, ponds, well taps, stone spouts to the ward committee (clause 12) • Role provisioned to rural/municipality for conservation of assets including the water structures as ponds, canals, taps, wells within its jurisdiction (sub-clause 97).
Town Development Act (TDA, 1998)	• Acknowledges the urbanisation context in preamble • Empowers the Town Development Committee to formulate a town plan for protection of the forest and water areas
Building Act (BA, 1998 & 2007 Amendment)	• Provision to cut off the distribution of water supply with other amenities in case of not abiding by the building code

Climate change policies and 'urban water'

Key climate policies we discuss in this section are Climate Change Policy (CCP, 2011), National Adaptation Plan of Action (NAPA, 2010), Local Adaptation Plan of Action (LAPA, 2011) and National Adaptation Plan (NAP).

Nepal is a party to the United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol and the Paris Agreement, and is active in various UN and other regional organisations linked to climate change issue and has shown greater interest in formulating climate policies (MoE, 2012; Pandey, 2012; Dhungana et al., 2013, Helvetas & RRI, 2011). Since 2000, the government of Nepal implemented various policies and plans to systematically reduce climate impacts (Vij et al., 2017). From 1997 onwards, the policy framing was inclined towards protecting people from natural disasters. From 2003 onwards, Nepal framed strategies on how natural disasters increase vulnerability and risk for the poor. In 2009, climate change adaptation emerged as a new policy paradigm in Nepal. Policy documents such as NAPA (2010), CCP (2011), LAPA framework (2011) focus on the adaptation strategies to reduce the climate change impacts. Further, realising the inadequacy of NAPA, the UNFCCC came with the concept of NAP for a planned adaptation to take actions to address the impacts of anticipated climate in the future. Nepal has already initiated and is in the process of preparing NAP (MoPE, 2017), submitted Nationally Determined Contributions (NDCs) to the UNFCCC secretariat in 2016 (MoPE, 2016).[13] Sectorial policy instruments such as REDD Readiness Preparedness Plan (RPP), National REDD+ Strategy 2018 have been endorsed (MoFE, 2018). The table below highlights the 'urban water issues' in the climate legislations.

[13] Nepal Nationally Determined Contributions (NDCs). Submitted to the UNFCCC Secretariat in October 2016

Table 2: 'Urban Water' in climate legislations

Climate legislations	Water issues
Climate Change Policy (CCP, 2011)	• 'Water resource' identified as one of sectors highly vulnerable to climate change • Discusses climate adaptation, disaster risk reduction, water conservation technologies in ways as forecasting of water induced disasters and risks from climate change, early warning systems • Developing modern water conserving technologies as an alternative to flood irrigation systems • Identifying, developing and utilizing agricultural varieties/ species that can tolerate drought (too little water) and floods (too much water) • Development of drought/flood resistant agricultural varieties • Water conservation through source protection, rainwater harvesting & environmental sanitation under the heading of 'climate friendly natural resource management'.
National Adaptation Plan of Action (NAPA, 2010)	• 'Water resource & energy' and 'climate induced disaster' identified as thematic areas • In Water Resource and Energy theme, effects of climate change on water resources and implication of too much and too little water and its impact on hydropower discussed. • In Climate induced disasters theme, susceptibility to climate induced disasters as floods, landslides and droughts highlighted • Prioritised rainwater harvesting, ground water recharge and promotion, rehabilitation of traditional water sources, recycling & treatment of wastewater
Local Adaptation Plan of Action (LAPA, 2011)	• LAPA framework has identified water and sanitation as crucial along with watersheds and microfinance, education, local infrastructure, disasters and other environment-related issues • LAPA steps recognised vulnerability of women from water scarcity
National Adaptation Plan (NAP)	• Thematic group addressing water issues: 'water resource & energy' and 'climate induced disasters' • In Water resource and energy theme, inadequacy of planning & policy instruments for strengthening community capacity to deal with changing scenarios and climate change induced disasters highlighted • In climate induced disasters, it has been pointed out that the current level of efforts in integrating climate change into disaster risk reduction policies & plans is slow

Water policies and urban water issues

Key water legislations we discuss in this section are Water Resource Act (WRA, 1992), Water Resource Regulation (WRR, 1993) for drinking water purposes and Drinking Water Rules (DWR, 1998). WRA (1992) is an umbrella act governing not only drinking water but also other uses of water and overall water management in Nepal.

The provisions made in the water legislations are discussed in the table (see table 3) which signifies that WRA (1992) has prioritised 'Drinking water and domestic users' while utilising water resources and discusses the formation of Water Users Association. The WRR (1993) provides procedural mechanisms for the implementation of the WRA (1992) and covers the formation of Water User Associations and District Water Resource Committees. The DWR (1998) regulates the use of drinking water, registration and licensing of Drinking Water User Associations. National Water Supply and Sanitation Policy (2014) has the objectives of upgrading the existing basic water supply and sanitation services to medium and high level of services both in rural and urban areas by the year 2027.

Table 3: ''Urban Water' in water legislations

Water legislations	Urban water
Water Resource Act (WRA, 1992) • Prioritised 'Drinking water and domestic users' under priority one • Persons willing to make use of water resources for collective benefits on an institutional basis may form a Water Users Association as prescribed. • Mentions Government of Nepal (GoN) shall pay compensation to the concerned person for the land, building, equipment or structures relating to the utilisation of the water resources.	Not addressed
Water Resource Regulation/ Rules (WRR, 1993) • Formation of Water User Associations and District Water Resource Committees, licensing • Provides a dispute settlement mechanism in relation to water use service charges • Sets out the process to be followed by the State in relation to land acquisition and compensation	Not addressed
Drinking Water Regulation (DWR, 1998) • Regulates the use of drinking water, registration and licensing of Drinking Water of Drinking Water User Associations, control of water pollution • maintenance of quality standards for drinking water and provisions for the acquisition of house and land and compensation.	Not addressed
National Water Supply and Sanitation Policy (NWSSP, 2014) • Considers water supply and sanitation to both urban and rural areas • Sets the objective of drinking water source protection and conservation of the catchment areas of urban and rural water supply sources & creating appropriate environment for the private sector to participate in the urban water supply delivery.	Yes (urban and rural areas)

ANALYSIS AND DISCUSSION

We found that the sectoral policies on urban, water and climate have inadequately focused on urban water and these policies are not effectively interlinked, but fragmented. There have been few attempts, in fact, a few legislations have discussed the interconnected themes of urban-water-climate issues, but they do not effectively link all policies to address urban water issues.

Review analysis showed that few policies are aligned to consider the interlinkages amongst urban, water and climate themes which include NUDS (2017) and LGOA (2017) from urban legislation, and NAPA (2010) and NAP from climate legislations. Although NUP (2007) and NWSSP (2014) relates to urban-water linkages; TDA (1998) urban-climate linkages and CCP (2011), LAPA (2010) climate-urban linkages, these plans fail to connect the urban-water-climate nexus. The legislations BA (1998), WRA (1992), WRR (1993), DWR (1998) are standalone legislations (See figure 2). Regmi and Shrestha (2018) also highlight that the current water related policies in Nepal are almost ineffective to deal with the issues of climate change as the policies have failed to capture the changing climate context.

We also found that the recent policies, particularly developed after 2015 under the federal structure are considered progressive regarding sectoral interlinkages, specifically NUDS (2017), LGOA (2017) and NAP formulation. NAPA (2010) has prioritised several activities as rainwater harvesting, groundwater recharge, rehabilitation of traditional water sources, and waste-water treatment (MoE, 2010), and identified urban sector as a separate theme. However, it lacks detailed analysis of the options proposed to meet the need of safe and adequate drinking water considering the impacts of climate change (Jha and Shrestha, 2013). More recently, the Government of Nepal has revised the Climate Change Policy (2011) and circulated the preliminary draft of Climate Change Policy (2019) in mid-March 2019 (Uprety, 2019). The legislations formulated earlier than 2009 in Nepal deal with disasters and not climate change as the climate change adaptation emerged as a new policy paradigm in Nepal during 2009.

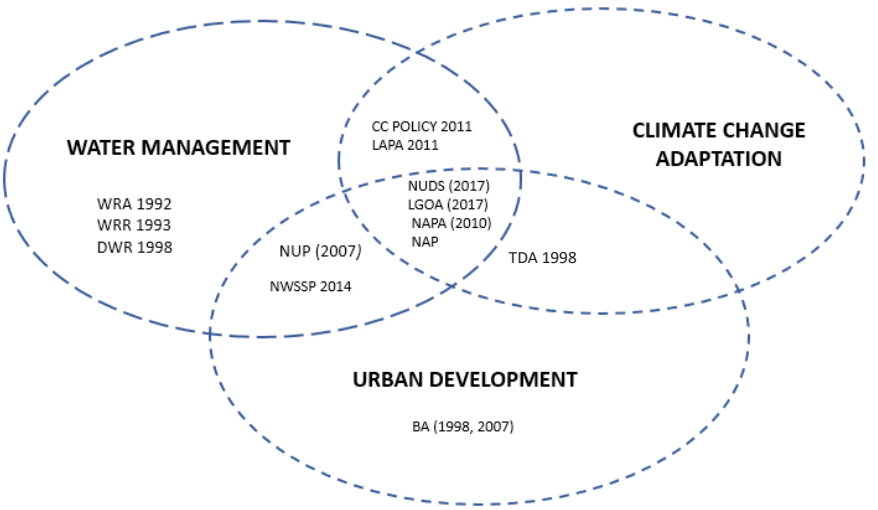

Figure 2. urban, water and climate policies interlinkages

Climate legislation

The analysis of the major climate legislations revealed that mostly water issues have been addressed at national levels while the urban water contexts are considered by only few legislations. NAPA (2010) and NAP have separate theme for addressing the urban and water issues. While CCP (2011) and LAPA (2011) have tried to address the water issue but left the urban one, NAPA and NAP have touched upon urban water issues through identification of urban sector as a separate theme. Adaptation Plans NAPs aims to reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience; and integrate climate change adaptation into existing policies/plans and programmes within all relevant sectors and at different levels (GoN/MoPE, 2017).

In CCP, NAPA and NAP, the issues of water scarcity and impacts due to excess water have been closely linked to climate change. Water has been considered a vulnerable sector to the impacts of climate change and adaptation strategies to deal with water scarcity is also discussed. While LAPA includes water as the entry point, and is designed for the local adaptation, the urban water issues have not been highlighted. In the context of Kathmandu Valley, Jha and Shrestha (2013) highlighted that the CCP (2011) is not explicit on dealing with the water scarcity to meet the increasing water demand and decreasing water supply. However, the revised Climate Change Policy (2019) has expanded the thematic areas addressing the water issue specifically through 'forest, biodiversity and watersheds', 'water resources and energy', 'health, drinking water and sanitation' and 'disaster risk reduction and management'[14].

[14] emphasising the use of water efficient technologies, groundwater recharge, rainwater harvesting and storage, water source conservation and development of Payment for Ecosystem Services (PES) from adaptation programs based on ecosystem

The policy has additional theme 'rural and urban settlements' proposing strategy to implement adaptation programs to minimise the climate change impacts in unmanaged urban and rural settlements. Yet, the revised policy also does not clearly show the relationship between climate change impacts on water resources and management and the context of rapidly urbanising pattern and is silent on how to cope up with the rising demands of urban areas in the era of climate change.

Urban legislations

The focus of urban development policies is sectoral and take a conventional top down development approach. The urban policies excluding NUDS (2017) and LGOA (2017) have not considered the uncertainties of water unavailability due to global changes and what needs to be done to avoid such uncertainties for continuous water supply. NUDS (2017) integrates water in two of its underlying principles and presenting urban focused strategies on management and conservation of water as rainwater harvesting and water recharge. LGOA (2017) covers a range of provisions pertaining to drinking water management at the local level and specific provisions of function allocation related to drinking water to the local level committees. While TDA (1998) empowers Town Development Committee to formulate town plan with role of protecting the forest and water areas, recognising the urbanisation and population growth, BA (1998) simply mentions that the water supply will be cut off if the building code is not followed. It does not deal with urban water issues. As NUP (2007) and NUDS (2017) are urban specific legislations, they have focused on urban water issues.

Climate change issues are not specifically recognised in the BA (1998) and there are no clear components on climate change issues in the TDA (1998). DUDBC & MoSTE (2014) suggests that in future BA amendments, climate change can be specifically incorporated as a threat to the resilience of buildings (DUDBC & MoSTE, 2014). Although the Town Development Committees are provided with authority to establish green zones and protect natural ecosystems in and around urban areas, it will be highly optimistic to expect that town development committees or local bodies will exercise these powers to control town development activities (urbanisation process) or groundwater extraction (DUDBC & MoSTE, 2014).

Although NUP (2007) focuses on urban centered activities with drinking water as central focus by proposing water supply-related activities, it is silent on climate change (MoPE, 2017). It considers that it should have addressed the issue of climate change more robustly as the policy was prepared more than a decade after the ratification of the UNFCCC in 1994. DUDBC and MoSTE (2014) suggested future revision of the NUP should specifically take into account the climate change threats and refer to key climate change adaptation tools such as hazards mapping, land use zoning, and safeguards by-laws for each type of land use zones (DUDBC & MoSTE, 2014).

Water legislations

The review analysis of water legislations found that DWR (1998), WRA (1992) and WRR (1993) have not developed urban focus explicitly while addressing the overall water issues and have not taken urban issues into consideration. While the National Water Supply and Sanitation Policy (2014) considers water supply and sanitation to both urban and rural areas, it has not been able to incorporate the climate issues explicitly and according to WHO (2015), the policy have not covered aspects of potential impacts of climate change factors and necessary adaptation measures for sustainability of the services.

The DWR (1998) does not take into consideration the potential scarcity of water under the aegis of climate change. The WRR (1993) also does not mention about climate change impact to water resources and urban water issues. Water supply rules have not taken stock of the risk of potential climate change and course of actions to be taken (WHO, 2015). WRA does not consider the current and potential future negative impacts of climate change on water resources (HELVETAS, 2011) and has no mention of any management of technical practices for minimising the vulnerability. It has only mentioned that GoN may frame rules on matters in relation to water conservation and flood and soil erosion control. WRA has not addressed the sustainable urban development issues. It has only mentioned that the GoN shall pay compensation as prescribed, to the concerned person for the land, building, equipment or structures relating to the utilisation of the water resources. The Federal government is preparing a bill on "Drinking Water and Sanitation", to come into effect from 2019 challenging the jurisdictions of provincial and local governments.[15] The bill is not clear whether it is prioritising the demand management of drinking water or overall water resources management. It remains incomplete as it mostly focuses on privatisation of water and does not clearly state how the demand management will be achieved including the concerns of inequitable distribution and connection of drinking water to sanitation issues in addition to whether drinking water refers to all types of domestic and household use. The bill also overlooks the emerging threats of climate change and rising demand along with rapid urban population and growth on water resources. The climate water nexus has also been undermined in the bill.

[15] The constitutions of 2015 clearly states that local and provincial governments are entirely responsible for 'Water Supply and Sanitation' issues and this role is also kept in the concurrent power of the provincial and federal governments, however, the bill on 'Drinking Water and Sanitation' is being drafted without consulting the local and provincial governments implicating and challenging the power and authorities of sub-national governments.

CONSTRAINTS AND OPPORTUNITIES

While water, climate and urban policies are in silos and fragmented on the one hand, the existing policies have often been found poorly implemented on the other hand. One of the reasons behind this is the lack of awareness about the policy provisions. For example, NUP (2007) proposes discount or subsidy for private investment in drinking water, canals and encourages implementation of appropriate techniques for rainwater collection, these are not implemented effectively. Dharan sub-metropolitan city-initiated tax abatement provision in which 50% discount in building permit fees is provided to houses adopting any of the three components (sustainable water, maintain greenery, passive solar design) of Green Home Policy[16]. However, only 20 houses have taken this service and most of the adopted component is the sustainable building materials (blocks), and not much for recharge, which is due to limited message flow (Dharan Water Forum IV, 2018).

Next is that the legislations that make good provisions in addressing the issues face challenges and ambiguities in implementing t hem. For instance, some legislations a s N UDS (2017) i s good with proper provisions in the document but are not mandatory to implement as it is only a strategy. Although the Constitution of Nepal 2015 has listed watershed, rivers and water resources under the jurisdiction of federal, provincial and local levels (GoN, 2015) and LGOA (2017) has allocated roles and responsibilities related to water management and conservation to the municipalities and rural municipalities, the delineation of power and jurisdiction still remains unclear and the effective execution of these responsibilities remain challenging. The potential for overlapping and unclear authorities in any system where authority is not concentrated in a single tier of government is also noted by Kyle and Resnick (2016). Pandey and Bajracharya (2017) discuss that conflicting and competing policies, fragmented institutional setup, multiple actors working according to project driven modalities with absence of harmonisation efforts have led to duplication of roles and overlapping responsibilities at both the national and local levels policies.

The salient role of stakeholders' in policy formulation and in its effective implementation have not been often emphasised. Its importance is reflected by the insights of water forum organised in Dharan and Dhulikhel. The stakeholders' participation and discussion in a common platform 'water forums' organised in both cities, along with evidence-based research findings was observed to co-produce knowledge and influence policies contributing to water security in cities. The regular discussion platform, for instance, Dharan Water Forum III and IV organised by the municipality, offered a platform in identifying recharge pit as one of the viable options for ground water recharge

[16] Green Home Policy is implemented for promoting sustainable housing (2013-2015) by UN-Habitat and partners primarily in three cities of Nepal: Lalitpur, Pokhara and Dharan with wider impact to other municipalities.

owing to the high infiltration capacity of the soil.[17]. Based on this, the municipality adopted a policy of making groundwater recharge pit mandatory for new private and public houses. Regarding the role of stakeholders in effective implementation of policies, participants o f t he Dharan water forum IV suggested that executive body and municipal body can play a crucial role in implementation of the policy while the contractors/consultants' influential role in convincing the household head in implementing s hould not b e ignored. The participants o f D hulikhel water forum IV also emphasised on properly crafted policy, p lans a nd motivation with collaboration a nd coordination with relevant stakeholders to achieve vision of 'water self-sufficient Dh ulikhel city'. Representative from Dharan Municipality presenting i n D hulikhel Water Forum IV shared some policies and international practices that could b e well adopted as density bonus, tax credit, soft loan, speedy building permit process, defining sealing percentage, green rating system a nd tax abatement.

Besides, some provisions made in these policies are unclear fuelling confusion in implementation. NUP (2007) sets the provision of 'drinking water and drainage' as the criteria for declaration of municipality but there is no clarity regarding the volume of drinking water to be provided. We observed that most of municipalities declared in Nepal are struggling to meet sustainable urban water management. The case in point is that newly declared municipalities enjoy their municipal status without meeting the criteria related to drinking water facilities and sewerage management system, as in Bhaktapur.[18] The existing municipalities suffer from infrastructure deficit and many of them are not even in a position to be named as municipalities, lacking safe drinking water and sewage among others (Khatiwada, 2015).

Pandey et al. (2019) discuss that various conflicting water related policies including WRA (1992), WRR (1993), DWR (1998) and NWSSP (2014) have led to competing, conflicting and overlapping roles between and among urban water management institutions like Water users Associations, Water Supply Management Boards and municipalities in cities Dharan and Dhulikhel of Nepal. The policy formulation and institutional setup alone does not give much expected output unless complemented by legislations. Devkota (2018) noted lack of policy in Nepal to guide water management and governance at full scale and multiple water related legislations consisting of overlapping, contradictory and uncoordinated provisions to manage water. Further, instances are highlighted where policies to restrict commercial groundwater exploitation and stimulate sustainable use in line with national climate change policies, are not systematically enforced in peri -urban Kathmandu (Roth et al., 2018).

[17] the water forum endorsed promotion of technology with dual function of recharging groundwater and reducing volume of storm water, contributing towards solving the problem of too much and too little water

[18] My Republica, 2016 https://myrepublica.nagariknetwork.com/news/vdcs-turned-into-municipalities-without-meeting-basic-criteria/

Despite of various steps by GoN to respond to drinking water issue, climate change and natural disasters, constantly shifting government regimes have led to disruptions in policy making and implementation processes and undermined attempts to attain positive environmental outcomes. The challenge of water governance is further multiplied in the new Federal Nepal. However, the window of opportunity lies with the authority provided to the local government for developing required act and policies. The constitution of Nepal (2015) has provided the scheme of distribution of power among the centre, state and local levels. Climate Change Policy (2019) also promises to establish institutional frameworks for policy and functional coordination at national, provincial and local levels.[19]

Studies have suggested the integration of climate change in the existing sectoral plan and policies to address the issues of vulnerability and risk in the sectors (Agrawala, 2004; Srinivasan and Uchida, 2008). Regmi et al. (2018) offer a new perspective that the institutional structure needs to be reformed in order to provide opportunities for better integration and mainstreaming of climate change because policy has already reached to a turning point, specifically in the water resource sector. Nepal (2019) draws attention to the inadequacy of proper database with outdated and irrelevant data, lack of separate units of database in each sectoral ministry or department which remain the major constraints of most of the policies in and programs in Nepal. To build water security and equity in water access, water related policy efforts need to widen its avenues beyond the piped water grid (Molden et al., 2018) and take into consideration the uncertainties related to impacts associated with urbanisation and climate change.

CONCLUSION

The paper investigated whether and how the sectoral policies on climate change, urban development and water have addressed critical urban water issues and; how and in what ways these policies are linked or delinked. Using the analytical reviews of urban, water and climate policies and insights from eight water forum meetings organised in Dharan and Dhulikhel, the paper concludes that the sectoral policies on urban, water and climate have insufficient focus on urban water and these policies lack effective interlinkages. Despite having many urban, water and climate related policies in Nepal, lack of interlinkages among these policies pose challenge to sustainable management of urban water.

Review analysis also found that the recent policies, particularly developed after 2015 under the federal structure are found to be progressive regarding sectoral interlinkages. However, lack of awareness about the policy provisions,

[19] The policy commits to establish a council on climate change for policy coordination at the national level, climate change coordination committee for policy and functional coordination at the provincial level and climate change section or unit at relevant ministries at federal and provincial and local levels.

challenges and ambiguity in implementing the policy provisions, lack of recognition of the stakeholder's role in policy formulation and its effective implementation, unclear provisions made in the policies pose constraints to implementing the policies, among others. Although the delineation of power and jurisdiction remains unclear in new Federal Nepal, the window of opportunities lie within the authority provided to the local governments for formulating required act and policies but these authorities seem to be constrained by the federal government's silo attempts of introducing new policies without consulting the provincial and local government.

The paper shed light upon the interlinkages in policy framework of urban, water and climate themes. Despite of significant policy reforms, the ground scenario is not encouraging i.e. practice faces constraints. The gap between the policy provisions and practice need to be reduced with better monitoring of policy implementation on ground. The review suggests further research to relate the policies in silos for implementation by critically analysing the gaps identified for best practice and integrated policies.

Inadequate integration of urban-water-climate themes in the policies under this study suggest that new policies in these areas need to be connected for efficient, adaptive and equitable water management in cities in the context of climate change and unplanned rapid urbanisation. Therefore, an integrated and coherent policy framework is needed to address the complex issues of urban water, shaped by climate change, and urban development uncertainties. Integration of urban water issues in the climate legislations is very important as water is one of the most vulnerable sectors affected by climate change impacts. Similarly, urban development policies need to envision the uncertainties caused due to climate change on water resources and address effectively through the policies.

Coherent policy framework would help to address the complex issues of urban water, shaped by climate change and urban development. Policy frameworks in water need to encompass the climate change impacts, associated uncertainties and the necessary adaptation measures considering urban issues and efforts towards unified and transparent water resources policy (Biggs et al., 2013). The strategic policies and the institutional mechanisms need to be developed with the capacity of dealing with stress as climate change in more efficient and effective way (Regmi et al., 2018). For addressing water-related issues effectively, proper coordination to develop policies and institutional mechanisms at the local, state and national levels are desired (Bajracharya et al., 2019). Moreover, key policies and institutions at the federal level need to be revised substantively and timely in a way that competent, conflicting and overlapping roles of policies and institutions are reconciled. Further, integrated water resources policy that considers key characteristics of the integrated water resource management (IWRM), sustainable water resource management (SWRM), and adaptive management (AM) approaches need to be developed (Pandey et al., 2019).

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GROUNDWATER POLICY AND GROUNDWATER DEPENDENCIES: REFLECTING ON THE EVOLVING SOCIO-ENVIRONMENTAL DYNAMICS IN PERI-URBAN KATHMANDU VALLEY

Anushiya Shrestha[1]

ABSTRACT

Groundwater is an increasingly important source of water supply in Kathmandu Valley, 'the hub of Nepal's urbanisation'. Past studies have revealed that groundwater extraction in Kathmandu Valley exceeds its recharge, thus having negative consequences like drying of traditional water sources, decreasing yield of wells, and declining groundwater levels. The groundwater policy 2012 was formulated with the aim of managing groundwater use in the valley. Yet, with rapid urban growth, groundwater exploitation has continued increasing in the city and the peri-urban areas in Kathmandu Valley. But little is known regarding how urbanisation shapes increasing groundwater exploitation in the peri-urban settings. This study unfolds the underexplored socio-environmental dynamics underlying groundwater exploitation in peri-urban areas of Kathmandu Valley. The findings from the case study using qualitative research methods, conducted in peri-urban locations of Kathmandu Valley show increasing competition for water and growing use of as well as dependence on groundwater in these rapidly evolving peri-urban spaces, despite growing protests and worries about its consequences. However, the existing groundwater policy lacks attention to peri-urban dynamics of change and growth and does little to address the increasing groundwater use in peri-urban locations in the valley. The polarised views and local conflicts around groundwater exploitation emerging in peri-urban spaces are the outcome of multiple entanglements:

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sectoral divides and overlapping responsibilities in water institutions, weak governance and management, socio-economic transformations in peri-urban spaces, the invisibility of groundwater and ambiguity in the hydrological dynamics of conjunctive water use. Based on my findings, I stress on the need for addressing the existing macro-micro gaps in (ground)water management by improving the understanding of local hydro-geological complexities and paying critical attention to the socio-economic, political and institutional drivers of increasing groundwater use.

Keywords: Groundwater, institutions, peri-urbanisation, policy, Kathmandu Valley, Nepal

INTRODUCTION

Located in central Nepal, Kathmandu Valley has a sub-tropical climate with over 1,500 millimetres average annual rainfall, 80% of which occurs during the monsoon period (UN-Habitat, 2015).[2] With the capital of the country located within it, Kathmandu Valley is rapidly urbanising. Between 1971 and 2011, the population of the valley increased from 0.6 million to over 2.5 million, with an annual growth rate ranging between 2.3% to 5.8% (Rimal et al., 2017). The built-up area in the valley has increased from 5.1% in 1989 to 26.06% in 2016, showing a tremendous increase of 412%, mostly at the expense of agricultural land (Ishtiaque et al., 2017). Urban expansion in the valley is generally spontaneous and haphazard, driven by private sectors than by planning or intervention by the government and its agencies (ICIMOD, 2007; Shrestha, 2011a; Shah, 2013).[3] This trend of unplanned urbanisation has continued deeply transforming the rural agricultural landscape of the valley into peri-urban spaces characterised by a co-existence of agricultural and non-agricultural land and water uses, economic activities and livelihood practices (Allen, 2003; Narain and Nischal, 2007).

In addition to declining agricultural land, urbanisation in the valley has led to significant deterioration of surface water sources while water demand has continued increasing (ICIMOD, 2007). Although water sources in Kathmandu Valley include both groundwater and surface sources, increasing water demand and deteriorating surface water sources has resulted into increasing use of groundwater. The valley has two major aquifers: shallow and deep, separated by an impermeable clay layer that acts as

[2] From June to September. Average annual temperature in Kathmandu Valley is increasing (0.033^{0}C/year), while annual rainfall is decreasing (-5.9 mm/year) (UN-Habitat, 2015).

[3] Implementation of various plans for urban development of Kathmandu Valley formulated at different times has been poor (MoUD/KVDA, 2015).

a barrier for direct recharge of the deep aquifer layer (Pandey and Kazama, 2012; Pradhanang et al., 2012). Total groundwater extraction which was less than 0.04 million m^3/year in the early 1970s, exceeded recharge by mid-1980s and further went over 25.5 million m^3/year by 2009 (Pandey et al., 2012). Over the decades, urban expansion, increasing gaps between water demand and supply, and ineffective rules and regulations have resulted in increasing use of groundwater as for community, public, private and commercial purposes. Yet, with water demand 377 Million Litres per Day (MLD) and supply 120 MLD in wet season and 73 MLD in dry season, the valley is increasingly water deficit (KUKL, 2017). Over 90% of the private water tanker supplies that have emerged as a result of this increasing water demand-supply gap is based on groundwater extracted from peri-urban areas of the valley (Shrestha, 2011b).

In 2006, the government established the Kathmandu Valley Water Supply Management Board (KVWSMB), aiming to improve drinking water supply services in the valley. KVWSMB has the authority for groundwater regulation and management in the entire valley and the Groundwater Policy for Kathmandu Valley has been formulated. Yet, its implementation has remained weak and largely limited to issuing licences and legalising deep groundwater extractors.[4] Due to unclear roles and responsibilities for groundwater regulation and management, this has remained 'nobody's responsibility (Pandey et al., 2012). In addition, as Dhakal (2012) notes, lack of scientific knowledge on groundwater has adversely affected its development, management and protection.

The Melamchi Water Supply Project (MWSP), the first phase of which is underway since the 1990s (Domènech et al., 2013), is expected to improve water supply, thereby decreasing groundwater extraction in Kathmandu Valley (Shrestha, 2012). However, this supply is limited to urban areas (GoN, 2016), while peri-urban areas of Kathmandu Valley are urbanising at rate higher than that in its cities (Muzzini and Gabriela, 2013).5 In the context of increasing peri-urbanisation, this paper aims to unfold the ground realities of evolving socio-environmental dynamics in peri-urban Kathmandu Valley and reflect on how these shape groundwater use and dependencies in the face of existing institutional mechanisms for groundwater management. This study was inspired by the question: How socio-environmental dynamics shape groundwater use and dependencies in peri-urban areas of rapidly urbanising Kathmandu Valley in the face of existing institutional mechanisms for groundwater management?

[4] KVWSMB estimated there are around 1000 deep tube wells, only 414 of which are licensed (interview, 03/02/2016).

[5] Annual population growth rate in urban Kathmandu Valley is 3.9% and that its peri-urban areas is 4.8% (Muzzini and Gabriela, 2013).

It has been increasingly accepted that "environment" is a co-creation of nature and society and that these inextricably co-determine each other through continuous and interconnected social, political, economic, and ecological processes. These relational processes of socio-environmental change are never socially and ecologically neutral and produce differential socio-environmental impacts over time and space (Swyngedouw et al., 2002; Swyngedouw and Heynen, 2003; Budds et al., 2014). This research uses changes in use of and access to groundwater as a lens to understand the processes and implications of socio-environmental changes in an urbanising context where policy interest to regulate groundwater use is growing. In presenting the policy-practice discrepancies around groundwater use, the concept of 'access' as theorized by Ribot and Peluso (2003) as 'the ability to actually derive benefits from resources' forms an overarching framework for analysing my empirical findings. Actors gain, control, maintain, or lose their resource access in many ways, including legal and illegal rights-based mechanisms. Other mechanisms of access are mediated by technology, capital, markets, labour, knowledge, identities, and social relations, or their combinations.

Following this introduction, next section presents research methodology and introduce the case locations: Jhaukhel, Dadhikot and Lamatar. This is followed by short case studies on the changing water use and management practices and challenges in these locations, illustrating how groundwater use continues to increase, despite growing protests and worries about its consequences. This is followed by a discussion on how peri-urban socio-environmental and institutional changes influence water (in)securities, thereby shaping groundwater use, access, management, and related conflicts followed by conclusion.

RESEARCH METHODOLOGY AND RESEARCH LOCATIONS

This research was designed as an ethnographic case study (LeCompte and Schensul, 2010), using qualitative research methods. The fieldwork at the above mentioned three study locations was conducted between 2015 and 2018. The research approach involved identifying the relevant actors around changing water use and interacting with them, often more than once, as well as using snowball sampling technique to interview and meet other relevant contacts/ informants/ actors. The empirical findings presented in this paper are generated from over 70 open and semi-structured interviews and informal talks and interviews with over 90 individuals at the above mentioned three urbanising villages. The informants included farmers, water users (both local and in-migrants), community-level water suppliers, local leaders, water vendors, brick entrepreneurs, sand mine operators, community-based

forest users, CFUG committee members, relevant government and non-government officials, including ward secretary and elected ward chairperson.

Next section presents some main insights emerging from research in peri-urban locations of Kathmandu through short case studies in Jhaukhel, Dadhikot and Lamatar Village Development Committee (VDC).[6] Although administratively these urbanising villages now belong to new municipalities (declared in 2014), agriculture continues to be an important livelihood for the population in these villages.[7] With co-existing agriculture and non-agricultural based population and their diverse and dynamic needs, interests and priorities, competition for water is increasing groundwater dependencies in all these locations. Jhaukhel is known for groundwater based commercial water supply, Dadhikot, is undergoing rapid urbanisation. Although urbanisation has been more gradual in Lamatar, it is increasing here as well. Together, these cases provide important insights into the socio-environmental changes in peri-urban context and how these shape – and are shaped by – groundwater extraction, and related conflicts and management challenges in rapidly urbanising areas such as Kathmandu Valley.

GROUNDWATER USE AND DEPENDENCIES IN A PERI-URBAN CONTEXT

Jhaukhel

Jhaukhel (VDC)[8], situated in the north-eastern part of Kathmandu Valley has an area 5.41 km^2 and its population is increasing by 1.6% annually (CBS, 2012). Built-up area increased by over 80% between 1992 and 2010 and is expected to increase by more than 110% between 2010 and 2030 (Sada et al., 2016). Groundwater has always been a source of water for residents in Jhaukhel, both for domestic and irrigation purposes. Brick factories operating in Jhaukhel since 1990s also depend on groundwater. In addition, mining of sand from terraces started in Jhaukhel in late 1970s and was largely uncontrolled. Rapid urbanisation, increasing water demands and poor water supply services in Bhaktapur Municipality turned to be an incentive for initiation of water vending in Jhaukhel. Commercial

[6] Prior to restructuring of the local government units in 2017, the Village Development Committee was the lowest local government unit.

[7] Between mid-2014 and 2017, the number of municipalities has increased from 5 to 18 in Kathmandu Valley and from 58 to 293 in Nepal. The municipal declaration, as in the past, involved the clubbing of VDCs, rural administrative units, without considering the minimum criterion for designation of an administrative unit as urban centre – as proposed in the national urban policy (MoUD, 2017).

[8] Administratively belongs to Changunarayan Municipality declared in 2014.

extraction of groundwater for urban supply started in Jhaukhel in 2001 to serve residents in Bhaktapur Municipality. Within short time, commercial extraction of groundwater increased profoundly as tanker and bottled water supplies. Over the years, market for commercial groundwater supplies from Jhaukhel has expanded beyond Bhaktapur Municipality. 14 commercial water suppliers have been formally registered at the Department of Cottage and Small Industries (DCSI) to operate water-bottling factories in Jhaukhel. Although registered as water-bottling factories, most of these also supply tanker water. Additionally, there are many unregistered private tanker water suppliers and brick factories extracting groundwater for commercial uses. Over-extraction of groundwater and the mining of sand have led to a rapid decline of the groundwater level, increasing the drying up of traditional[9] water sources and the need for deeper wells to access water. Although groundwater depletion and deterioration of water quality have increased, open opposition has remained rare. This can be related to an earlier event: Jhaukhel residents had encountered violent conflict in 2002, when a campaign against the brick factories, organised by a group of environmentally proactive local residents to sensitise villagers not to lease out their lands, turned violent. Leaving some injured, this conflict made residents avoid open conflicts until today. Other issues play a role as well: protests often create antagonisms with friends and relatives involved in these businesses. Hence, people seldom report or oppose such practices.

Nevertheless, in 2009, Jhaukhel residents had demonstrated at the VDC office, demanding a stop to water sales and to regulate increasing groundwater extraction. Following this demonstration, the village government issued a public notice declaring water tanker operations illegal. As implementation was poor, in 2012, local people demonstrating against water vending blocked the main road. However, except some temporary halting of operations, no major action has been taken to control this. Such commercial users have continued largescale groundwater extraction for commercial uses by investing in accessing (often leasing) land, sinking deeper wells, and the water pumping (generators) and filtration technologies. They also supply water to local people, mainly as a strategy to avoid resistance and secure continued access. Unregistered water vendors from which the municipality collects road tax are commonly said to be illegal. However, with or without an extraction permit, the common perception is that the right to groundwater comes with the right to land, either by permanent or temporary land control. Local residents often complain,

> Accessing water is not a problem for them (commercial users). They invest and easily earn profit by selling resources. The problem is for us. But we cannot raise the

[9] Hitis (stone spouts), kuwa (shallow wells), ponds, spring sources.

voice against these exploitations. They are powerful and consider those who raise voice their enemies.

With such underlying differences, groundwater extraction has continued, and even new water vendors have emerged in Jhaukhel. On the other hand, a community-managed drinking water supply system announced in 2009 under the support from District Water Supply Division is still incomplete. Although a deep bore well has been sunk for this water supply system, water supply has not yet started. According to local people, this delay is driven by power and politics exercised by commercial water users who fear that initiation of this deep groundwater-based public water supply system will result into drying of their commercial wells.

Dadhikot

Dadhikot (VDC)[10], spread over 6.27 km^2 is rapidly urbanising. Its annual population growth rate increased from 1.17 (1981-1991) to 6.05% (2011). The built-up area has increased by over 250% between 1992 and 2010 and is expected to grow by about 110% between 2010 and 2030 (Sada et al., 2016). Nonetheless, agriculture is still a major livelihood for many inhabitants and depends on traditional surface irrigation sources, a stream in Dadhikot VDC. Like in most of the peri-urban areas in Kathmandu Valley, water for drinking and domestic uses is provided by community-managed drinking water supply systems with funding and technical support from the District Water Supply and Sanitation Division (under Department of Water Supply and Sewerage).[11] Initially based on spring water sources, with increasing water demands, these have largely based on groundwater resource. An official from DWSSD explained, "*River water is polluted. Even a bore well we drilled along the Bagmati River showed very poor water quality (with high ammonia concentration). To the extent possible we do not use surface water sources*".

Increasing preferences for groundwater can also be clearly among the community-level water suppliers. The largest of such community-managed water supply systems in Dadhikot is Uttisghari Drinking Water Supply and Sanitation Consumers' Committee (UDDWSCC). Registered at District Water Resources Committee, it started water supply via public taps, and with increasing water demands, soon switched to household-based supply. Driven by the rapidly increasing demand for new tap connection, mainly due to increasing in-migration, in 2006, in co-ordination with the local government and DWSSD, it tried to make a well upstream to the intake

[10] Administratively belongs to Suryabinayak Municipality.

[11] DWSS is the lead agency for the drinking water supply and sanitation sector of Nepal (Rural Water Supply and Sanitation Sector Policy, 2004). www.dwss.gov.np/?lang=en

of the above-mentioned irrigation canal system. But this was strongly opposed by the farmers. After this opposition, UDDWSCC bought a plot of land, added a deep borewell with support from DWSSD, and expanded its services. However, water quality of the borewell dropped within a few years, showing a high sediment load. Aiming to resolve the problem, the committee purchased land and, supported by DWSDD, it added a water treatment plant, but water quality of the borewell continued degrading. Additionally, the yield of its spring water sources and the water level in the well also declined, leading to increasing consumer complaints. While sources were declining, applications for new tap connections increased. By 2014, the committee had bought a plot of land upstream to the canal intake and reattempted to make a well on it. This again led to overt farmer resistance and added water management challenges for the committee. After this resistance, it had the second (deep) borewell drilled and started water supply from this second borewell. However, within a few months the yield of this second borewell also declined.

With declining spring water sources, opposition from rights-holding farmers and need of an additional source to continue supply, it has recently added a third borewell on public land, approved by the newly elected local representative for management of drinking water services and with assurance of technical and financial support from DWSSD. While the drinking water supply committee is struggling to supply water to its current users, the rising number of applicants for tap connections is increasing the pressure for accessing additional groundwater sources. In contrast to expanding drinking-water demand and supply, with poor management and maintenance, the canal irrigation in Dadhikot has become limited to the upper reach. Downstream farmers only have canal water during the monsoon. This unreliability of canal irrigation has made farmers less concerned for the canal and many farmers have switched to the groundwater as a reliable alternative for irrigation.

Lamatar

Lamatar (VDC)[12], covering 13.65 km^2, is urbanising with an annual population growth rate of 0.8%. Nonetheless, conversion of agricultural land into residential plots is widespread. Spring sources originating in its forests feed into traditional water sources like stone spouts, are still the main water sources. Tapping of springs for various local community-managed piped water supply systems in Lamatar started in the 1990s. One of them is the Shashambhu-Thulaghar Drinking Water Supply and Sanitation Consumers' Committee (STDWSSCC). STDWSSCC supplies water via private taps and is trying to improve and expand its

[12] Administratively belongs to Mahalaxmi Municipality.

services by extracting groundwater through a deep borewell.

STDWSSCC started in 2005 by negotiating rights to use a seasonal stream originating in a community forest in Lamatar. Starting with 40 private taps, it currently supplies 109 taps while demands for new connections are increasing. However, flow in the stream source has been declining. Water scarcity peaks during the dry seasons, while discharge is low, this is also used by the upstream farmers, the prior users of the stream for irrigating their crops. In the face of declining water supply, many households served by STDWSSCC have dug private wells and use shallow groundwater. The quality, however, is poor, making the settlement dependent on STDWSS despite the decreasing of the source and supply of its water. The earthquake in 2015 further reduced its water source. This led to the decision by the STDWSSCC to bore a deep borewell and access groundwater to improve and extend service.

Like most other community-managed committees in Lamatar, STDWSSCC is not formally registered. In 2017, STDWSSCC publicly announced its decision to register at the District Water Resource Committee (DWRC) and expand services through sinking of the borewell. However, drilling a deep borewell became a major factor of conflict. The villagers at the source area were unwilling to agree because of the potential impacts on the availability of, and access to, water, and submitted a petition against STDWSSC at the DWRC. This opposition resulted in uncertainty about groundwater access of this supply system and thus also of water access for those who depended on its services.

On the other hand, the commercial housing project in Lamatar sunk a deep bore well in 2016 and used groundwater for its construction and water supply to its customers. In 2017, another group of villagers submitted a petition at the ward office requesting action against this deep borewell. The protesting villagers argue that this drilling resulted in the complete drying up of a spring located uphill. Its flow had been declining over the years, and further declined after the earthquake, to run completely dry by late 2016. The commercial housing had not obtained a KVWSMB licence, nor conducted a public hearing or obtained approval from the ward office, while all are required for licensing. The villagers explain that the political and economic power of the commercial housing owners enabled them to ignore formal requirements of approval, while this power reach compelled villagers to refrain from protesting until local representatives were elected in 2017.

Following the local elections, ward-level meetings were conducted to discuss these issues. The ward chairperson clarified "*Drinking water was one of my priorities in […] the local election. [..] Considering the increasing water needs, our springs and streams are not going to be sufficient.... As the housing already has inhabitants, while we will ask them to obtain the*

required permit, we do not have any plan to restrict it from using its deep borewell. ... With expanding settlement, we have no option but making a deep borewell. The district drinking water division will soon be conducting a study to explore the possible ways to manage the water supply [..]". As these debates continue, it is likely that groundwater extraction in Lamatar will increase.

ANALYSIS AND DISCUSSION

The above cases show how increasing urbanisation is shaping increasing use of, and dependency on groundwater in peri-urban Kathmandu Valley, despite that mechanisms to regulate groundwater exploitation has been formulated and protests and worries about its consequences are increasing. With changing land and water use and management practices, and increasing competition for water, groundwater has emerged as the alternative water source. In addition to the shallow wells used at household level, groundwater extraction from deep aquifers by new and deeper wells has emerged and is still increasing.

Increasing groundwater exploitation and related socio-environmental issues are prevalent in peri-urban areas of rapidly urbanising South Asian cities. In Chennai (India), continuous water transport to supplement the city's drinking water needs, drastically dropped and even dried groundwater table in these villages. These created serious livelihood problems in these villages and resulted into water-related conflicts (Janakarajan et al., 2007). Further, the 'tripartite agreement' in seeking recourse to peri-urban groundwater resource in fulfilling ever increasing urban water demand led not only to changes in land use practices, the resulting perception on the water as private property distorted social relations and reproduced inequities among peri-urban farmers (Ruet et al., 2007). In addition to direct water transfer to cities, increasing appropriation of groundwater for increasing urban-oriented activities within peri-urban areas are also leading to lowering of groundwater table and reproducing social injustice (Narain, 2014). Similar cases have been seen in Goa, where large scale withdrawal of groundwater for tourism-based industries are increasing opportunities for some while same is resulting into loss of livelihood option for many others (Dongre and Poteker, 2008). In an urbanising village in Balochistan province of Pakistan, groundwater use far exceeds recharge and the province government imposed all-out ban on new connections to regulate accelerating intensive use of groundwater. This ban, however, triggered an informal groundwater market rather than the intended regulated use of groundwater (van Steenbergen et al., 2015). Diverse activities and socio-environmental dynamics associated with increasing groundwater exploitation and efforts to regulate these suggest the importance of contextualising the issue and analyses of the macro-micro gaps in the existing water governance

mechanisms. This paper is such an attempt to unfold the socio-environmental and institutional dynamics around increasing groundwater use and dependencies in Kathmandu Valley.

Groundwater extraction in Kathmandu Valley ever more exceeds its recharge, with negative consequences like drying traditional water sources, decreasing yield of wells, and declining groundwater levels (for example, Shrestha et al., 2012; Pandey et al., 2012). The 1992 Water Resources Act (WRA) of Nepal provides water use rights while it vests ownership of water resources in the State. However, in practice, as prominently seen in Jhaukhel, access to land is widely accepted as giving a right to water. In addition to the Groundwater Policy of 2012, KVWSMB has also formulated the guidelines for licensing the extraction and use of groundwater (KVWSMB, 2015). These policy documents state groundwater resource in the valley can be extracted and used only with a permit from the KVWSMB, except for domestic uses of shallow groundwater (within 98 ft [30 m]). The guideline defines five other uses of groundwater which require permit from the KVWSMB for extraction and use of groundwater (i) personal (ii) industrial (iii) commercial (iv) public and (v) others. It specifies the documents required and processes to be followed for applying for such a permit and also includes the conditions to allow or refrain from granting such permit and divides areas in Kathmandu Valley as safe, semi-critical or critical for groundwater extraction, including the maximum volume of water that a given permit allows to extract in the given area (KVWSMB, 2015). Under these specified requirements, a permit from KVWSMB is required for any use of deep aquifers, including commercial as well as community water supplies. In practice, commercial extraction of groundwater in the valley, as seen in Jhaukhel, has been ongoing based on their registration at the DCSI, using the argument that the water factories started operating before KVWSMB was established. KVWSMB, however, has limited its interventions because commercial water suppliers are important in filling the increasing gaps between urban water demand and supplies. Thus, commercial water users gain legal access to water through overlapping and weak government registration. This is one of many examples as I will discuss further below that access to groundwater resources is based on diverse mechanisms, which are not necessarily based on rights.

WRA promotes 'Beneficial Uses'[13] of water, 'within the available means and resources', 'without causing damage to other'. Nonetheless, as the cases show, access to the socio-technical means and resources to access groundwater are largely

[13] Beneficial Uses' means rational uses of the water resources within the available means and resources (WRA, 1992).

unequal in the heterogeneous and fluid peri-urban spaces. Although exploitation of groundwater has economically benefited some, such as commercial users, these are adding water insecurities for larger population. These inequalities in socio-environmental benefits and burdens from uncontrolled exploitation of groundwater and related resources are increasing water insecurities and conflicts in the peri-urban settings.

As seen in peri-urban Kathmandu Valley, such conflicts are less manifested, given the underlying socio-political and economic power differences, indifference of governing bodies. Furthermore, as in Jhaukhel with increasing cost of access to groundwater, increasing is the dependency on those exploiting the resources, irrespective of them being formally legal or illegal. In contrast, local opposition against groundwater exploitation has added challenges in managing basic water needs for the peri-urban population that depends on community water services, as experienced by the Shashambhu-Thulaghar DWSS. Irrespective of resistances and growing awareness of the dark sides of groundwater exploitation, with the diverse and growing urbanisation-driven needs and interests in water (and land) uses, peri-urban groundwater exploitation is likely to continue increasing. This trend is reaffirmed by the increasingly strong social, institutional and political priority-setting for deep borewells to improve drinking water services.

The Government of Nepal has the national target of 'universal access to safe drinking water and sanitation for all'.[14] WRA has prioritised drinking and domestic water uses over other forms of uses, including irrigation. However, as the cases show, with uncontrolled urban expansion, drinking water demand continues to increase rapidly, triggering largescale groundwater extraction for commercial supply as seen in Jhaukhel and competing with prior rights-holders as seen in Dadhikot and Lamatar. These two latter sites drastically differ in terms of their population growth trends. Nonetheless the threat of disturbances to the local hydro-geology and potential loss of water access and rights and water insecurities united the prior rights-holders to contest groundwater exploitation in both sites. On the other hand, decline of traditional water sources, growing opposition from prior rights-holders, and increasing water demands have stimulated drinking water suppliers to take recourse to groundwater, which is perceived to be a reliable water source free from prior rights issues. The Groundwater Policy has also encouraged such community-managed drinking water supply initiatives. However, as illustrated above, use of deep groundwater for such supplies also requires permit from KVWSMB. This implies the borewells made

[14] As per the census data 2011, 85% of the households have access to water supply and 61% of households have sanitation (CBS, 2014).

for the community-managed water supply systems in peri-urban areas of the valley, developed with support of DWSSD, should have been registered, received a permit and regulated under KVWSMB. However, none of these systems in Dadhikot have such a permit. Furthermore, these community-managed drinking water supplies are financially and technically supported by DWSSD, a government body, whose responsibilities overlap with KVWSMB, the formal authority to regulate and manage groundwater use in the entire valley. These overlapping institutional arrangements, together with growing pressure to mobilise new water sources for the rapidly increasing population and to avoid more contestations around declining surface water sources have led to the emergence of water-mining practices that transgress the groundwater management policy. These socio-environmental and institutional dynamics illustrate poor coordination, not only between these government agencies responsible for drinking water supply in the valley, but also between and among different bodies responsible for planned land and water management.

Although the MWSP is expected to reduce pressure on the groundwater resource in Kathmandu Valley, the peri-urban areas of Kathmandu Valley are not included in this long-awaited water supply system. This implies access to water for multiple water needs in peri-urban areas such as Jhaukhel, Dadhikot and Lamatar will continue to depend on the groundwater sources. However, changes in the land and water use in these urban-oriented dynamics, groundwater resource in peri-urban areas have continued degrading and aggravating water insecurity for the larger group of peri-urban population, contrary to the national policy aim of ensuring access to water for all. Furthermore, the groundwater management policy is silent about the increasing groundwater-based irrigation as the best alternative to the unreliable stream-fed canal irrigation systems. This again raises questions on the effectiveness of groundwater policy in addressing the complex realities of groundwater uses, particularly in the peri-urban areas of Kathmandu Valley.

Although the guidelines for licensing groundwater extraction and use aims at imposing volumetric restrictions on groundwater extraction and has categorised areas within Kathmandu Valley as safe, semi-critical and critical areas for groundwater exploitation from deep aquifers, little is known about the local hydro-geology and its relation to changing land and water uses. For instance, the borewells in Dadhikot although considered feasible, these failed to provide the expected water services, leading to additional borewells, and private household wells, to deal with the poor water quantity and quality services. These examples highlight existing knowledge gaps on hydro-geological complexities and related socio-institutional processes that justify and compel continued extraction of

a resource that has already been pointed as over-exploited.

The groundwater policy promotes groundwater recharge in the valley. Although the shallow aquifer is characterised by a high recharge rate, the high rate of urbanisation has increased the area of impervious surface and radically reduced groundwater recharge (Shrestha et al., 2012).[15] The potential for recharge into the deep aquifer is already low because of the widespread impervious clay layer in Kathmandu Valley (Pathak et al., 2009; Pandey and Kazama, 2012), which further decreases with urbanisation. The project piloted to artificially recharge the deep aquifer pointed such an alternative is not only costly and technically complicated, but also are not encouraging either (Dixit & Upadhya, 2005). Opportunities for using groundwater in Kathmandu Valley depend heavily on the ability to regulate haphazardly changing land uses and prevent pollution in key recharge areas (Shrestha et al., 2012; Pathak et al., 2011). Considering that the priority of the GoN in recent times has invariably been urban development (MoUD, 2016), with urban expansion in Kathmandu Valley, 'the hub of Nepal's urbanisation' (MoUD, 2017), these processes are likely to continue in the future. Consequently, existing open spaces potential for groundwater recharge can be expected to get converted into built-up areas (Thapa and Murayama, 2012).[16] In this context, despite the initiatives to improve urban water supply services and the formulation of groundwater policy guidelines, groundwater governance in Kathmandu Valley is likely to remain a major challenge.

CONCLUSION

In this paper, I presented the increasing, yet underexplored, complex realities of increasing groundwater use, exploitation and governance in the peri-urban Kathmandu Valley. I admit these findings are context specific. Nevertheless, the macro-micro view of the situation presented in this paper provide important insights about how and why groundwater exploitation and related disputes are increasing despite policy documents to regulate groundwater exploitation. These insights can be useful in understanding and addressing the complex issues that need consideration in (ground) water management.

With rapid urbanisation, public water demand and supply gap is increasing every year and groundwater pumping wells from shallow or deep aquifers continues to play an important role in managing

[15] Furthermore, climate change is noted to have adverse impacts on water resources in Nepal (WECS, 2011).

[16] The Kathmandu Valley Development Authority (KVDA), the urban planning authority for Kathmandu Valley, aims to develop infrastructure to accommodate a population of 10 million in the valley (Interview, KVDA, 21/11/2016; Abhiyan National Daily, 07/11/2016).

water needs of Kathmandu Valley. Under the current socio-institutional conditions, groundwater in Kathmandu Valley, is still largely an 'open-access' resource (Pandey and Kazama, 2014), at least for those who can mobilise the required capital, social relations and technology to get access. Although those able to invest the increasing cost of accessing water are able to gain and maintain their water access and thereby overcome increasing water scarcity through increasing groundwater exploitation, this practice is leading to water insecurity for many others in this rapidly urbanising valley. In line with the government's priority for urbanisation as "the best way to sustainable development" (MoUD, 2016: 3), Kathmandu Valley has been made a rural area-free municipal zone. However, as the case studies in peri-urban villages, located in three of the newly declared municipalities, show these areas lack basic water services while water demand is increasing. With the focus of municipalities on promoting non-agricultural economic activities for 'development', water demand is likely to increase faster, adding dual pressure on groundwater: increasing exploitation while recharge area is declining with rapidly increasing urban expansion. While their population is rapidly growing, peri-urban areas remain excluded from surface water-based urban water service improvement initiatives, the (first phase of) Melamchi water supply project.

In the current national context increasing priority for urbanisation and on-going efforts to formulate a national water policy, it is important to acknowledge competition for water in peri-urban areas is likely to increase with urbanisation and the adverse impacts from climate change (WECS, 2011; UN-Habitat, 2015). In such a context, rather than mere focus on groundwater exploitation or regulation, the need is addressing the existing macro-micro gaps in (ground)water management by improving the understanding of local hydro-geological complexities and paying critical attention to the socio-economic, political and institutional drivers of increasing groundwater use. More clearly, studies for advancing knowledge on the micro-level hydro-geological compositions are crucial for improving the understanding of the groundwater dynamics in Kathmandu Valley. Equally important are better coordinated initiatives and incentives for conserving existing surface water sources, promoting groundwater recharge and controlling pollution of the water sources. These could re-create opportunities for conjunctive use of groundwater and surface water in dealing with the severe groundwater management and water provision problems experienced in Kathmandu Valley. Furthermore, as this study has shown, groundwater exploitation in Kathmandu Valley is largely driven by urbanisation-induced increasing population and their water demands. It is, therefore, important, that governing bodies at all levels acknowledge the inter-linkages between different resources, their uses, users and related policies. This can be a starting point to overcome the sectoral focus-driven

working practices and to set, and act upon, clear and coordinated long-term priorities to regulate uncontrolled urban expansion and improve the current quantity and quality conditions of surface water bodies, as a necessary condition for improving (ground) water management.

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MAPPING INSTITUTIONAL LANDSCAPE FOR INTEGRATED URBAN WATER MANAGEMENT IN HALDWANI CITY, UTTARAKHAND

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Abstract

According to the latest government reports, India is facing evident shortfall of water in various parts of the country, and Himalayan states are likely to suffer the impacts of climate change related to water more than non-Himalayan states. Water resources are expected to affect Gross Domestic Product (GDP) of the country, and future projections are far more upsetting. In this light, sustainable and adaptive strategies such as integrated water resources management, nature-based solutions have been promoted globally for sustainable and integrated urban water management. The paper inquires into functions of respective institutions and their possibilities to adopt possible nature-based solutions such as rain water harvesting in response to water insecurity and adaptation in times of climate change. Taking case of Haldwani city, the paper assesses water demand and supply gaps, the existing water institutions, their scope of work and water management mechanism. Further, the scope of adoption of possible nature-based solution is explored by the purview of their work in water management. This was derived through an in-depth literature review, stakeholder consultations as key informant interviews, and participatory mapping. Haldwani has experienced severe water scarcity due to depletion of groundwater, decline in the discharge rate of river Gaula, and drying of springs in and around the city. Various agencies manage the existing water resources in isolation and mismanagement of water is one of the prominent problems in the city. The paper delves into the nuances of

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various strategic interventions, and the respective institutional capability to undertake the same. While most of the strategies prevalent at international level are yet to be adopted in context of Himalayan cities, a key finding is that rain water harvesting system can be easily taken up as a nature based solution by each of the institutions since it also falls in their scope of work as well as to meet the city's present and future water challenges.

Keywords: Water use, developing countries, efficient water demand and supply, strategies of water resource management, rainwater harvesting

INTRODUCTION

Global water use has increased by a factor of six over the past hundred years and continues to grow steadily at the rate of 1% per year (WWAP, 2018). The United Nations in 2018 has reported the world population is expected to grow to 10.2 billion by 2050 with two-third of the people living in cities. This puts high pressure on existing water resources in the city. Along with the issues of water quantity, people are also facing quality issues with water as it has been degrading manifolds with growing agriculture and other economic activities. While many developed nations continue to manage the resources judiciously or can arrange alternatives, the developing countries with underdeveloped infrastructure and unscientific planning grapple with uncertain water insecurity. In this paper, we assess institutional dynamics surrounding water supply management taking case of a city in Indian Himalaya. The case study city is 'Haldwani', which faces evident spells of water scarcity. The case study is used to theoretically establish the relation of different components of water management approaches and how it can be made suitable for an Indian Himalayan City. The case study of Haldwani has semblance with institutional arrangements and ecological resources to many other mid-sized cities in India. For the study, we have tried to map the existing institutions and their related functions to explore the best possible adaptive strategy for urban water security.

National context of water scarcity in India

During the past century, the global population has tripled, but our use of water has increased six-fold (WWAP, 2018). The global population is growing at an unprecedented rate for which global water demand will continue to grow significantly over the next two decades. It has been argued that much of this urban growth is taking place in developing countries and the pattern of growth is uncoordinated and fragmented (Du et al., 2004; Carruthers and Ulfarsson, 2002). It has put extreme pressure on natural resources. Increasing concerns for social wellbeing and environmental degradation has been the locus of various scientific and social scientific studies for the past decade. Cities are thriving for a sustainable living standard while struggling to maintain the ecosystem and natural resources. Developing countries have been quite unfortunate in the planning and governance of its natural resources. In these times, the most debated segment is 'water resource sector'.

Water security is emerging as an increasingly important issue of sustainable development for the Asia-Pacific region particularly for India. As per the UN World Water Report 2018, most of India has shown appalling results. The change in water scarcity from 2010 to 2050 projection shows that India has gone from 'water scarcity to 'severe water scarcity' column. India is at the top of the list in terms of groundwater abstraction, mainly for agriculture purposes. In addition, the problem has proliferated more because of the unplanned and rapid urbanisation. Domestic uses of an urban dweller are more water-intensive than a rural dweller because of the advanced technologies and lifestyle choices. According to Census of India 2011, urbanisation has escalated faster than expected at the rate of 2.76%. This has enormous implications for providing infrastructure and other civic amenities in urban areas (Bhagat, 2011). India is facing its worst water crisis in history and can lose 6% GDP due to water scarcity (Niti Aayog, 2018).

India has 16% of the global population and only 4% of the world's water resources (Government of India (MoWR, 2002). Country's water availability per capita is 1,170 m3 per person per year which is just marginally above the water-stressed criteria given by the World Resource Institute, i.e., 1000 m^3 per person. 90% of the urban population has access to drinking water, and more than 60% has access to basic sanitation, but the country is lagging in terms of access to reliable, sustainable and affordable water supply and sanitation (Bapna, 2011). The household supplies have limited hours per day for the water supply, and less than 50% urban population have access to piped water. The estimated amount of Non-Revenue Water lies between 40-70% of the total distributed water and, operation and maintenance cost recovery through water user charges is hardly 30-40% (Bapna, 2011). The practical and efficient water demand and supply management are 'limited by inadequate institutional reforms' (Saleth, 2011), poor managerial and financial autonomy, limited accountability, weak cost recovery and limited capacity (Bapna, 2011) and poor implementation of existing provisions.

While many challenges can be expected from the water stress scenario, equity in distribution and integrated water management remain a significant one in the city. In cities, there are demographically sensitive groups regarding population, workforce, literacy and water supply system (Habeeb et al., 2019). Prevalent managers are strained to meet demands of drinking water, sanitation, wastewater treatment, and other water-related services which has resulted in acute water shortages and lousy quality water service in many areas. Shortfall of water resources create competition and conflict over water. Economic development sectors have large water demand and are getting the water supply, but there are economically fragile groups and communities which are facing threats inflicted by water scarcity (Bahri, 2012). Equity issues are not adequately addressed by administrative institutions. Such issues could be a result of socio-spatial representation (Larson and Lach, 2010)

of wards regarding their geographical position and the socio-economic profile of scarce water wards.

MATERIAL & METHODS

Study Area

Haldwani comes under Haldwani-Kathgodam Municipal Corporation (Nagar Nigam). It is also known as 'Gateway to Kumaon.' It is one of the most populous towns in Uttarakhand with a total population of 156078 (Census of India, 2011). It has historically been a trading post and a hub between the hilly regions of Kumaon and the Indo-Gangetic Plain. The climate is mild, warm and temperate. The annual rainfall is recorded approximately 1,505 mm and high rainfall is recorded more in winter than summer. It is the last outpost of plains, and from here, temperature and wind change at every meter.

Haldwani is divided into 25 wards, falling under administrative boundary of Nagar Nigam. Water supply is operated and maintained by Uttarakhand Jal Sansthan (UJS) while Jal Nigam is responsible for building and executing water related projects such as overhead water-storage tanks, laying of water supply and sewerage works across the city.

The research has adopted mixed method including in-depth review and analysis of secondary sources such as peer-reviewed academic articles, secondary data, and grey literature (reports from national and international agencies). It was then substantiated by qualitative data collected from stakeholder analysis. Stakeholder analysis was conducted by mapping of important stakeholders - Urban Water Management Authority (Jal Sansthan), Forest Department, Irrigation Department, Ground Water Board (Bhujal Nigam), Haldwani-Kathgodam Municipal Corporation (HNN), related to water resource. Data was collected with the help of a water forum meeting (as focus groups discussions) and key informant interviews (KII). Sustainable strategies for urban water management were identified through literature survey and mapped with purview of respective institution to derive the most suitable approaches of water management.

Haldwani-Kathgodam Water Supply

At present, there are three primary sources of water for Haldwani-Kathgodam Township including the surface water from Gaula River, groundwater from Sheetlahat Gadhera and sub-surface water from tube wells. River Gaula is adopted as a source of drinking water for Haldwani town, and about 15.83 MLD water from the river is diverted towards Sheeshmahal Water Treatment Plant passing through Gaula Barrage. Water at this treatment plant gets filtered in four filtration units with capacities of 6.75 5.25, 15, and 7.5 MLD respectively. Similarly, about 2 MLD water from Sheetlahat Gadhera is diverted towards Sheetlahat Water Treatment Plant. The designed capacity of both the

treatment plants, i.e. Sheeshmahal Water Treatment Plant (constructed in the year 1975) and Sheetlahat Water Treatment Plant (built in the year 1962) is 34.5 and 3.5 MLD respectively. In addition to the other 2 sources mentioned above, 17.28 MLD water is drawn through a total number of 20 tube wells located in different wards of the city. After considering 10% intake losses at both the treatment plants and 20% distribution losses, net availability of water in the town is 26.67 MLD. Treated water from both the treatment plants together with water from tube wells through piped water supply caters to the water demand of Haldwani-Kathgodam Township as well as the surrounding peri-urban areas. All the water supply to the town is lifted and stored in reservoirs with the storage capacity of 18.61 MLD (SLIP-water, AMRUT, 2016-17).

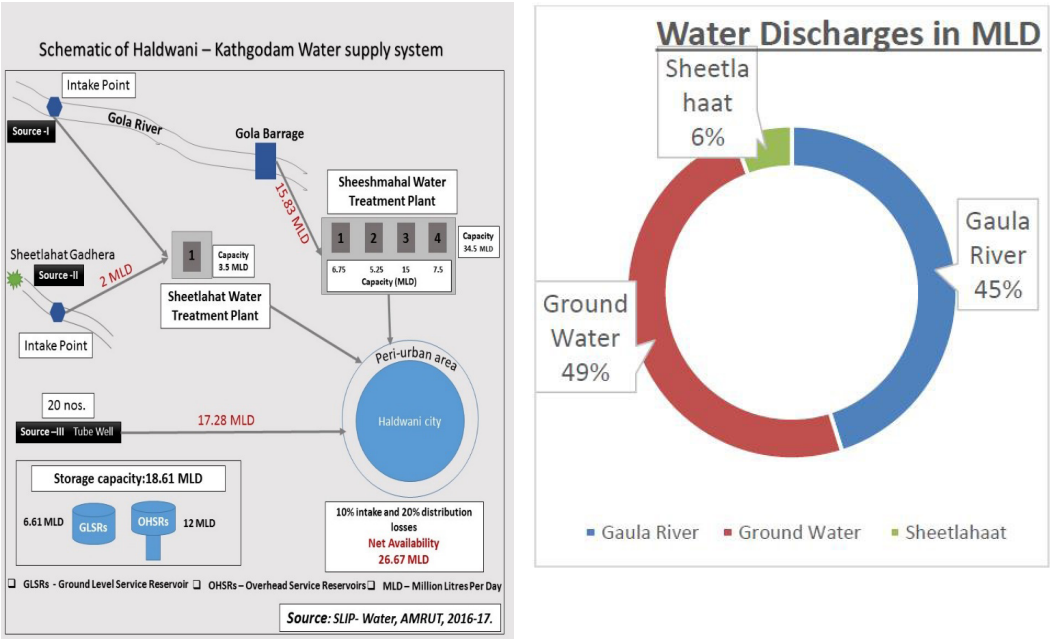


Figure 1. Halwani water systems

FINDINGS AND DISCUSSION

Institutions for Water Management

Water cycle of urban catchments is complicated, and involves water supply, wastewater disposal, and storm water drainage. For urban water supply, high quality water is harvested from different catchments, treated and then supplied. The supply mechanism involves various institutional elements that are included in the total upkeep and distribution of water resource. In Haldwani, the institutions pertaining to water management and development issues are Water Management Authority, Irrigation Department, Forest Department, Bhujal Nigam, Haldwani-Kathgodam Municipal Corporation (refer table-1).

Table 1. Functions of different institutions for water management (as per the stakeholder analysis and focus group discussions)

INSTITUTIONS	SCOPE OF WORK
Water Management Authority	Uttarakhand Jal Sansthan and Jal Nigam, are the two institutions responsible for water management in the city. While Jal Nigam is mostly responsible for planning and execution of projects, Jal Sansthan is responsible for the operation and maintenance. JS SLIP document claims to have 80% of tapped water supply to all the households at 133 LPCD. In addition, with respect to other water supply services, there is 40% non-revenue water, with 70% quality water supply, 0% metering, and 55% cost recovery in water supply services and 70% in the collection of water supply related charges. Thus, to meet these challenges, augmentation, up-gradation, and addition through new projects are required for universal coverage.
Irrigation Department	Uttarakhand Irrigation Department is also responsible for Water Management of Gaula River and oversees Gaula Barrage which channels the river water. It governs and regulates water from the river and its distribution for urban, rural and agricultural purposes. It provides 28 MLD of water withdrawal for urban drinking.
Forest Department	Forest Department is responsible for the maintenance and conservation of various categories of forest in and around the city. Their roles and responsibilities involve checking the catchments and watershed in the forest areas as well as plantation drive to restore groundwater.
Haldwani-Kathgodam Municipal Corporation	Haldwani-Kathgodam is governed by Haldwani Nagar Nigam (HNN), the Urban Local Body. The city is divided into 25 administrative wards. HNN is responsible for implementation of various government missions such as Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and Housing for All (HFA), upkeep and management of the city; it is also responsible for regulation of buildings and construction activities as well as local bye-laws in accordance with state level policies.

From the functional point of view with respect to water resources, Forest Department is responsible for conservation and preservation of natural water bodies and majority of water from Gaula river is allocated by the irrigation department for urban and rural purposes. The urban water is then stored, purified and managed by Jal Sansthan across the city to meet potable urban water demand. This is facilitated by Municipal Corporation with number of households. Earlier before 2015, Jal Sansthan was the major decision maker in water supply, treatment and discharge but with launch of AMRUT mission municipal corporations have been the nodal agency to manage urban water with technical support from Jal Sansthan. This paradigm shift has vested more powers to ULBs in allocation of water with respect to household demands. Due to the deficit in water supply, private tankers also play a key role to meet the demands during water scarce months, however, they may not be viewed as formally recognised institutions but a private entity.

Water Stress Scenario in Haldwani, Uttarakhand

The Himalayas are known as water tower of the world, and most of the rivers in North India originates from these mountain ranges and glaciers. The water resources regime is changing differently in the Himalayan states, such as changes in the discharge rates, volumes, and availability due to overutilisation and changing climate (Erikson et. al., 2009). The Himalayas contribute to water interests

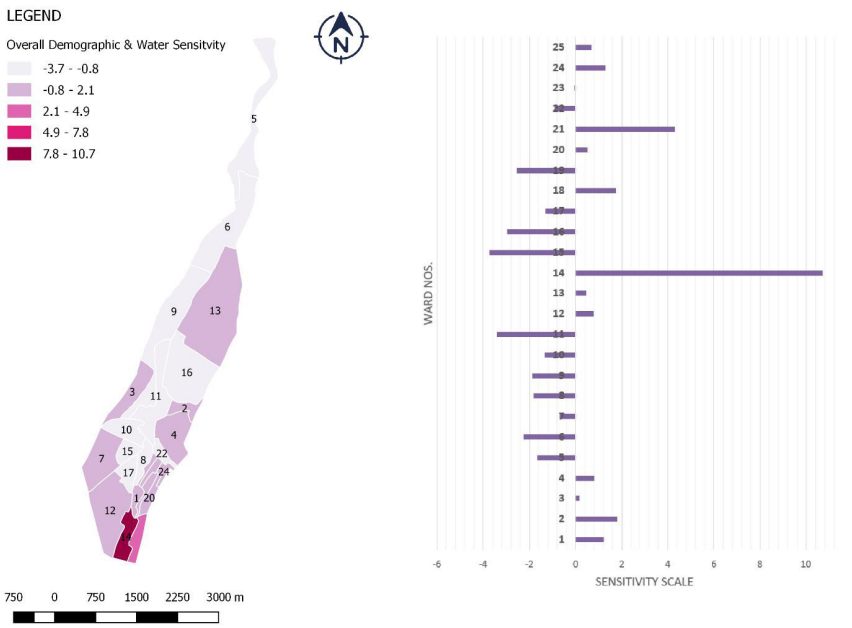


Figure 2. Population trends in Haldwani, source: Habeeb et al., 2019

of lowland and urban regions (Tiwari, 2010). Uttarakhand, an Indian state in the western Himalayas is facing evident spells of water scarcity. In a recent Composite Water Management Index report by the National Institute for Transforming India (NITI) Ayog, Uttarakhand has been listed at the bottom of the performance index. The state has been lagging in innovative and effective water management practices. It has a dismal performance under various indicators such as surface and groundwater restoration; it has restored less than 10% of water bodies and not created or mapped any infrastructure for the same. The network of its water distribution coverage has been at a low of 60% both for urban and rural access.

Haldwani has a complicated physio-geographical set up as well as a unique water system. It is a city in the plain part of Kumaon region of Uttarakhand. Haldwani is known for its in-migration flux and urban sprawl that has taken place in recent decades. There has been an increase in Built-up sparse from 4.4 sq. km to 6.3 sq. km (Bora et al., 2018). This has escalated stress on natural resources, mainly water. Water insecurity is assessed in a recent paper for Haldwani taking demographic sensitivity and water scarcity data sets. The figure below shows the most vulnerable wards regarding water insecurity in the city (Habeeb et al., 2019).

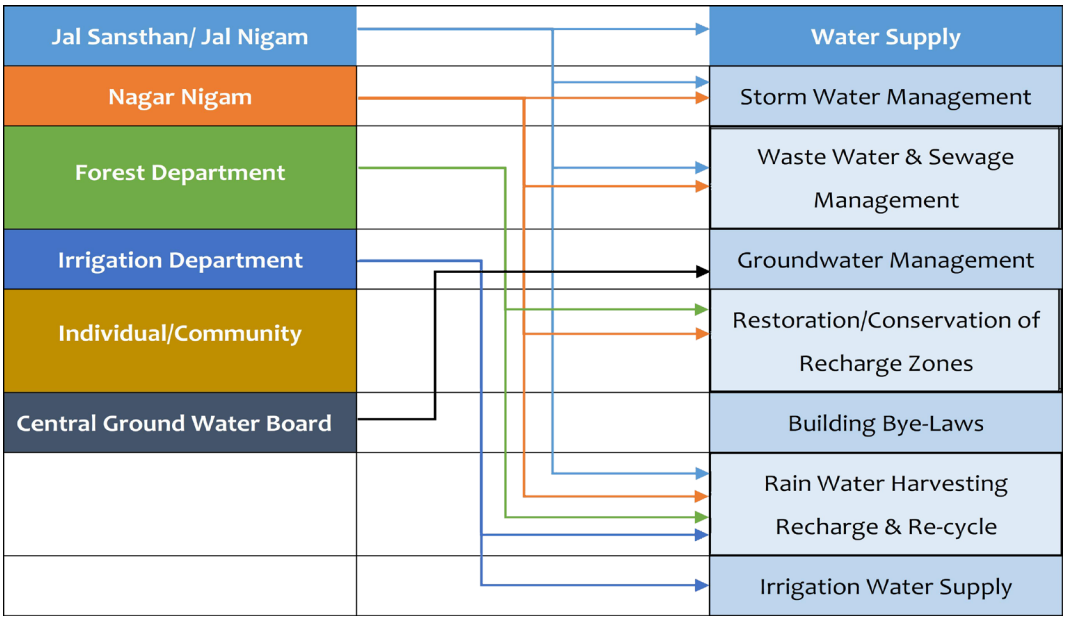
This sets the premises for the need of institutional reform and a better model to govern the water resources as well as to augment the existing resources via different approaches. Besides being a plain city, which caters all the essential amenities, facilities, job and education opportunities, the research on the planning and governance of the town has remained sparse.

Institutional Mapping with Implementation Strategies

Institutions and devolved functions

Under the legal provision, each institution is vested with responsibilities for water management. To introduce a strategic intervention, one shall understand what actors do and roles they play in the urban water system. Various institutional bodies take care of different utilities of water, from conservation of water bodies to water supply, storm water, and waste water management. Figure-3 shows the mapping of different institutions to their functions. Jal Sansthan and Jal Nigam collectively look after water supply, waste water and storm water management, and are also expected to evolve measures for rainwater harvesting, recharge and recycle. Similarly, as per the new shift in Government of India's programs (AMRUT) ULBs have been made administratively accountable to all the functions as Jal Sansthan except technical appraisal of the projects. This puts HNN in same accordance with Jal Sansthan in addition to compliance with building-bylaws to prevent unregulated construction of critical urban water zones. Water resources conservation and restoration of recharge zones lie with Forest department if they fall in protected forest zones. Irrigation department taps the water from Gaula river and is responsible for allocation of water for urban and rural areas, mainly agriculture. In addition to this, they are also responsible for harvesting

rain water and recharge and recycling of the same. Central/ State Ground Water Board is mainly the monitoring agency for underground water with no executive power. Lastly, under fundamental duties of the Constitution of India, every citizen is supposed to conserve and protect natural resources, encouraging citizens towards recharging ground water and reuse of water. While these institutions have different scope of work, most of them as per government directives are required to promote and incorporate provisions of water harvesting, recharge and recycling.



Plausible Strategies for Water Management

Various literature proposes different strategies to achieve sustainable urban water resource management, such as Integrated Water Resource Management, Water Sensitive Urban Design, Integrated Urban Water Management, and Nature-Based Solutions. At a global level in 2002 Johannesburg World Summit on Sustainable Development Implementation Plan, Integrated Water Resource Management (IWRM) was proposed. In IWRM, principles like fresh water as finite and vulnerable resource has an economic value. Its development and management require a participatory approach in which women play a central role for provisioning, management, and safeguarding. It requires robust coordination among all the actors such as individuals, companies, organisations, and governments; in all sectors such as irrigation, domestic water supply, and industry (Moriarty, 2005; Butterworth et al., 2010). A related approach known as Integrated Urban Water Management (IUWM) entails alignment of urban development and basin management for sustainable use of water resource. It has encapsulated the urban water parameters such as water supply,

sanitation, storm water, and wastewater management and integrated land use planning and economic development (GWP, 2012). Both the strategies necessitate cross-sector relationships and negotiation between different socio-economic groups or informal sectors to achieve a fair and equitable distribution of water resources. For urban water planning and design, Water Sensitive Urban Design occupies an important space because of the mismanagement of urban water cycle and catchments. The neglect for the stormwater and wastewater discharge has been distinguished. It is explained as "a philosophical approach to urban planning and design that aims to minimise the hydrological impacts of urban development on the surrounding environment. Stormwater management is a subset of WSUD directed at providing flood control, flow management, water quality improvements, and opportunities to harvest stormwater to supplement mains water for non-potable uses (that is, toilet flushing, garden irrigation, etc.)" (Lloyd et al., 2001; 2002). In 2018, the recent World Water Development report stressed upon more "Nature-Based Solutions" for improved management of water. It relies on outcomes such as ecosystem services through conserving and rehabilitating natural ecosystems or restoring natural processes in modified systems (WWAP, 2018). These approaches have evolved throughout two decades for managing single resource in different aspects. Refer figure-4 for detailed aspects of each strategy and its components.

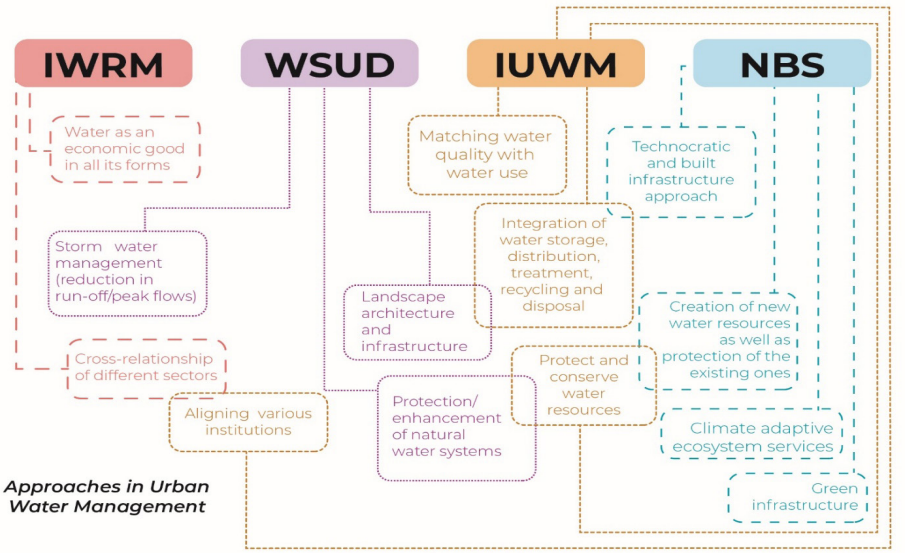


Figure 4. Systems and approaches in urban water management

Recent advent and advocacy on Nature based solutions (NBS) encompasses most of the above discussed strategic interventions and their functions in conservation, recharge and reuse of water among different institutions and respective stakeholders. In Indian context of water management, a comprehensive

water management framework is yet to evolve (McKenzie & Ray, 2009; Bharti et al., 2019), hence application of contemporary practices such as IUWM, IWRM, WSUD or NBS is still a far-fetched goal. If one examines these strategic interventions and NBS through the lens of RWH, it presents a more adoptable feature.

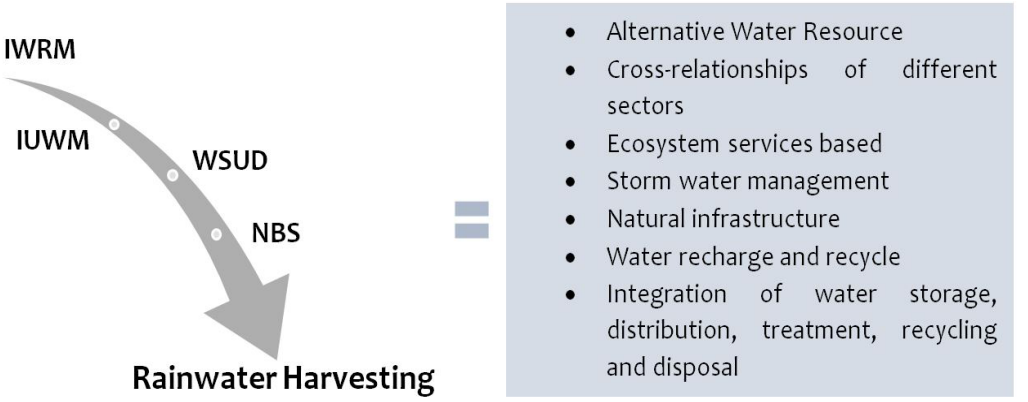


Figure 5. Rainwater harvesting as a viable intervention

With devolved functions to almost every institution for recharge and recycling as discussed in previous section, it is a more viable strategy that can be easily taken up by each of these institutions and executed at various scales. RWH also becomes an alternative water resource for various strategic framework encompassing cross-relationships of different sectors, ecosystem-based services, storm water management, natural infrastructure, water recharge and recycle, integration of water storage, distribution, treatment, recycling and disposal. Hence, to address the water demand and supply challenges, RWH can be placed in systems to recycle and reuse water as a direct substitute in stressed areas and for storage and as a conservation measure to augment the ground water resources to improved ecosystem services. Following are the suggestive interventions at different level of Institution that can be adopted:

- Promotion and adoption of RWH as NBS in stormwater management and water scarce zones for recharge and recycle by Jal Sansthan/ Jal Nigam in accordance with State/Central Ground Water Board.
- Installation of large RWH systems at identification of Critical Urban Water Zones by Jal Sansthan/ Jal Nigam in accordance with State/Central Ground Water Board.
- Haldwani Nagar Nigam as the chief administrative and governing body can intervene at regulating buildings and incorporating RWH provisions in public space such as parks and communities as well as public toilets.
- Promotion of small scale RWH systems at the level of household and neighborhood by creating incentives for the same. Before exhorting RWH structures to citizens, the institutions can set up a working example with

proper administrative framework and can then seek participation from individuals and community. Individual institutions and households can adopt RWH, with technical and financial assistance from various sources. Emphasis can also be laid upon community RWH provisions through registered societies and public bodies involved in the water sector such as SULABH (toilet scheme in India).

CONCLUSION

The findings of the paper result in the mapping of various roles and responsibilities, by different institutions and implementing agency managing a shared resource, i.e., Water. Since different agencies are provided with varying tasks for governing the water resource, the hydrologic unit is inter-related. Different management techniques discussed internationally for efficient and sustainable water governance have also been charted to equate a case-specific strategy for water scarcity. While multiple stakeholders remain to govern and manage different aspects of water in the city, it is a requisite to call for dialogue and sharing of water resources and management. In this regard, various strategic interventions can be planned at the city level with distribution of responsibilities. The paper strongly recommends nature-based solutions with easily adaptable methods to manage the resource extracted from the above discussed techniques and analysis. It further emphasises the creation of alternative water resources supported by a cross-sectoral relationship. It indicates the conception of natural infrastructure to deal with stormwater, recharge techniques and recycle — the paper stresses upon Rainwater Harvesting (RWH) technique that involves natural water collection through precipitation.

"Conflict of Interest- None"

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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

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[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.

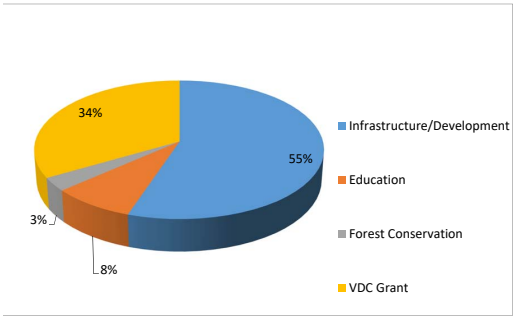

Fig 1: Incentives provided and distribution in different sectors (Source: Field Data, 2014).

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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CASH AND CLIMATE: THE POTENTIAL ROLE OF CASH TRANSFERS IN ADAPTATION TO CLIMATE CHANGE

Alok Rajouria[1]

ABSTRACT

It is now evident that the consequences of climate change falls disproportionately upon the poor and vulnerable populations. With increasingly unpredictable and erratic rainfall, droughts, floods, and the consequent crop failures, the lives and livelihoods of low-income groups are in constant and increased threat. The national and local adaptation plans, on one hand, strategically aim to strengthen the livelihoods and resilience of vulnerable households, cash transfers as a part of the national social protection program, on the oth-er hand, are effectively employed for poverty reduction and strengthening the resilience of vulnerable groups. While both embody clear and overlapping objective of reduction of poverty and vulnerability to shocks, they are functioning independently, sans coordination. As social protection mechanisms are increasingly integrated with climate change adapta-tion and disaster risk reduction in other developing and emerging economies, this article introduces the concept of adaptive social protection and its relevance to the challenges of climate change in the context of Nepal. This policy-relevant paper is based on literature review and secondary sources. Literature gathered and reviewed for this paper include publications derived through online searches using carefully selected keywords. Nepal's national social protection system is analysed for its potential in managing climate risks, when it is interfaced with the Local Adaption Plan of Actions (LAPA). This article pursues the research question: how can the social protection system be made more shock respon-sive and adaptive to climate-induced disasters? It concludes with the call for innovative

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cash-based policy mechanisms that utilise vulnerability mapping of LAPAs, and proactively address poverty, vulnerability and other constraints to human development while being responsive to climate-induced disasters.

Keywords: Climate change adaptation, adaptation plans, cash transfer, social protection programs

INTRODUCTION

Cash transfers, one of the social protection measures employed in Nepal since the mid-1990s, has largely been used as a livelihoods and anti-poverty measure, driven by the objectives of equity and resilience (ILO, 2017; WB, 2019). Annually, more than four billion rupees disbursed in monthly cash allowance to senior citizens, persons with disabilities, single women, children under five in certain categories and indigenous ethnic groups is tax-financed (Khanal, 2014). The beneficiaries of cash transfer programs largely represent poor and vulnerable groups with limited livelihood options (Samson, 2015). As the impacts of climate change become more apparent and extreme climate-induced disasters increase in frequency and intensity, the population living under or just above poverty line is the hardest hit. According to the World Bank, 26 million people worldwide are forced to remain in poverty as a result of extreme disasters (Hallegatte et al., 2017).

Nepal is a disaster-prone country exposed particularly to hazards such as landslide, floods, earthquake, fire, droughts, avalanche, and glacier lake outburst floods (GoN, 2019). The National Adaptation Program of Action (NAPA) to Climate Change, as a means of prioritising urgent and immediate adaptation actions, rates 17 districts including Kathmandu and Bhaktapur in very high-risk ranking category (MoE, 2010). Managing climate change through strengthening of household resilience has been one of the primary strategies of both the government and non-government agencies (MoE, 2010; Oxfam, 2006).

Reducing poverty and disaster risks are complementary actions as poverty correlates with vulnerability to disasters (Lao et al., 2009). The National and Local Climate Change Adaptation Plans have identified vulnerable households and wards within municipalities and rural municipalities, to invest resources in building livelihoods and resilience of people vulnerable and exposed to natural disasters (MoSTE, 2011). The national cash transfer programs are also designed to achieve similar results. A clear overlap in policies and programs exist with both, social protection and local adaptation plans, targeting poor and vulnerable groups. However, cash transfer programs are managed by the Department of National ID and Civil Registration, under the Ministry

of Home Affairs, while the Local Adaptation Plan of Actions are under the jurisdiction of the Municipalities. Coordination between the two government agencies would help to eliminate duplications and make social protection more adaptive to climate-induced impacts.

This paper investigates the current status of both cash transfer programs and local adaptation plans of actions and argues for the need of a framework to make social protection adaptive and shock-responsive, based on successful examples from other countries. The literature reviewed has largely been selected through online key words search and Nepal government documents. LAPA documents of two Village Development Committees (VDCs) of Kailali district and two of Dadeldhura district were reviewed, as current round of LAPAs at the municipality level were not yet ready. Similarly, documents and reports on social protection such as the draft National Social Protection Framework, and Emergency Cash Transfer Programs were also reviewed. Web search through the use of key words that included cash transfer and climate change, social protection, natural resource management, shock-responsive social protection, adaptation and adaptive social protection.

VULNERABILITY

In broad terms, vulnerability is the potential for loss or harm inherent in a person or a thing; as a social construct, vulnerability is a condition 'rooted in historical, cultural, social and economic processes that impinge on the individual's or society's ability to cope with disasters and adequately respond to them' (Weichselgartner, 2001). Vulnerability in the context of climate change and its impacts is generally understood as the potential loss to people when they are hit with natural disasters, and other social and natural risks related to climate change. For example, it is estimated that poor peoples' share of wealth lost in a natural disaster situation is two to three times relative to that of the non-poor (Hallegatte et al., 2017). In addition, it is twice likely that poor people live in fragile dwellings compared to the non-poor. It is also evident that poor people are less likely to ask for and receive external support. For example, following the floods and landslides of 2011 in Nepal, 90 percent of the well-off sought and accessed government support, while only six percent of the very poor did the same (Gentle et al., 2014).

By affecting global and regional climate patterns, climate change is adding to economic, environmental, social and personal vulnerabilities of people in developing countries (CIRDAP, 2016; ADB, 2009; NG, 2018). Changing precipitation and temperature have direct implications on crop yield and quality (MoE, 2010). By 2080, climate models estimate average crop yield to decrease in Asia by as much as 23 percent, impacting farming communities and low-income groups (Havlik et al., 2015). In Nepal,

climate change is aggravating already fragile situation, particularly in agriculture and food security, water resource and energy, and infrastructure UNHSP, 2015; Hallegatte et al., 2016). Government interventions, therefore, becomes essential to reduce poverty and consequent vulnerability, particularly of the poorest quintile of the population living under poverty line.

LOCAL ADAPTION PLAN OF ACTION (LAPA)

The LAPA framework is designed to integrate climate change resilience and disaster risk management into the local development planning process and outcomes (MoSTE, 2011). The first round of LAPAs developed by LAPA committees of Village Development Committees (VDCs) with support from development organizations, contains vulnerability ranking at ward and household levels. Social groups likely to be affected by climate change impacts have also been identified. The current round of LAPAs, developed at the municipality level following the restructuring of the state into a federal system, are combined with local disaster risk management plan. Due to the overlaps in the two plan documents, the harmonised LAPA documents address vulnerability to climate-induced disaster risk and climate change adaptation. Vulnerability ranking continues to be an integral part of the harmonised LAPAs. Besides the harmonisation approach, other experimental approaches are also being piloted in different parts of the country. The harmonisation approach is promoted by the BRACED *Anukulan* program in six districts of western Nepal.

The Ministry of Forest and Environment Adaptation for Smallholders in Hilly Areas (ASHA) project seeks to enhance the livelihoods and resilience of smallholders by enhancing their capacity to withstand the consequences of climate change (MoFE, 2018). The enhanced approach to LAPA integrates scientific methods such as Geographic Information System (GIS) with local perceptions to develop the adaptation plans in Dailekh and Salyan districts through the ASHA project. This ecosystem -based approach recognises sub-watershed as it boundaries with upstream-downstream linkages of a river basin and takes into consideration the dependence of smallholders on natural environment for their livelihoods. One of the unique features of the enhanced approach is scenario development on future socio-economic conditions based on projected climate variability. This approach is being implemented in seven districts of provinces 5 and 6 – Kalikot, Dailekh, Jajarkot, Salyan, East and West Rukum, and Rolpa (MoFE, 2018).

While different approaches are being tested in developing and implementing the local adaptation plans, their common features include building livelihoods and resilience of local population to face the consequences of climate change. The household vulnerability

ranking of the LAPAs has the potential to be utilised by social protection programs to be make social transfers more shock responsive.

SOCIAL PROTECTION AND CASH TRANSFER

Social protection, as one of the fundamental human rights, is defined by the Asian Development Bank as the set of policies and programs designed to reduce poverty and vulnerability by promoting efficient labor markets, diminishing peoples' exposure to risks, and enhancing their capacity to protect themselves against hazards and interruption/loss of income (ADB, 2003). Cash transfers, generally a part of social transfers, represent periodic and predictable cash payment to certain vulnerable groups to help them protect themselves against poverty and inequality, and build their livelihoods (ADB, 2003; WB, 2018). Social assistance as cash is also often used on a one-time or short-term basis for specific purposes such as in response to natural shocks and disasters, refugee crises or other humanitarian situations (OPM, 2016).

Cash is increasingly becoming one of the popular tools in social protection. According to the World Social Protection Report 2017- 19, as many as 142 countries are now using some form of cash intervention (ILO, 2017). This increasing preference to cash against other means of support is based on the premise that cash brings to its beneficiaries more choices and dignity, empowerment, and reduce negative coping mechanisms during emergencies (CaLP, 2019; Oxfam, 2006; Peish, 2018). Due to low transaction cost of cash vis-à-vis in-kind support, its use is growing among donors and development organisations.

Cash transfers are most often unconditional, where the beneficiaries are free to use as per their needs. It is based on the premise that the recipient, as a rational being, will be inclined to spend the cash allowance on the most pressing need of self or family. Most of the cash transfer programs in Nepal are unconditional (Khanal, 2014). Conditional cash transfers, however, attach conditions that eligible recipients are expected to adhere to. Such conditions are usually in children education or health - maintaining school attendance or ensuring the children get vaccinated on time (Saavedra & Garcia, 2012). Conditions, punitive or facilitative, are closely monitored for compliance. Nepal employs unconditional cash transfers in the form of monthly allowance to categorically targeted groups like senior citizens, persons with disabilities, single women over 60 years of age, children under five in certain categories and locations, and some indigenous tribes and groups (DoCR, 2019).

Unconditional cash transfers are often criticised for creating dependency and being prone to misuse. However, studies have demonstrated that utilisation of the cash allowance is usually around basic necessities like food, medicine, and clothing. The evaluation study of the Karnali Child Grant

Program where all children under the age of five receive a monthly cash payment of Rs. 400 per month found that 66 percent of the additional income was spent on nutritious food, 59 percent on children's clothing, 49 percent on household items, and 37 percent on medicine (UNICEF, EU, VaRG, 2019). The study also indicates that recipients of other cash allowance besides the child grant had utilised the additional cash as follows: purchase food (76 percent), clothing (57 percent) and household items (49 percent). There was no report of misuse of the cash benefits. In another case, a comprehensive analysis as part of Transfer Project evaluation that covered six countries in Africa – Ghana, Kenya, Lesotho, Malawi, Zambia, Zimbabwe - specifically focusing on the potential misuse of cash transfer fund on cigarette and alcohol found no significant impact of transfers on cigarette or alcohol expenditure (Handa et al., 2017). The same study also found no systematic evidence that cash transfer discouraged work.

Other cash-based interventions in Nepal include scholarships and maternity incentives. Cash plus programs combine cash with one or more type of complementary benefits or supports such as in-kind transfers, behavior change communication material, or psychosocial support (Roeleni et al., 2018; Khanal, 2014). Long-term cash plus programs have not yet been initiated in Nepal but it is being successfully utilised in other countries. Cash plus programs link cash transfers to complementary services and inputs such as behavior-change messaging, psychosocial support or additional transfers such as supplement infant feeding with the premise that cash alone may not engender the behavioral change required to achieve sustainable results. For example, the Chile Solidario / Programa Puenta programme, a conditional cash transfer is based on a form of social contract for each eligible family, with psycho-social support placed at the centre of the model. Cash Plus approaches are experimented within African countries - Mali, Niger, Burkina Faso and Chad where cash transfers are accompanied by information and awareness-raising seminars for female beneficiaries on family care practices including nutrition, health and hygiene (Watson, 2016). In Pakistan, the Benazir Income Support Program (BISP) with more than five million beneficiaries offers direct cash transfer with complimentary services like education, health, nutrition, skills development and financial inclusion to help members 'graduate' out of poverty (BISP, 2019; Cheema et al., 2016).

Most of the cash transfer programs in general are designed to sustain and enhance livelihoods and reduce poverty. Lately, the potential role of cash in emergencies and reducing vulnerability to the impacts of climate change is emerging as a new frontier in social protection (Fisher et al., 2017; Peish, 2018). This has given rise to the concepts of shock responsive social protection and adaptive social protection (Bastagli & Rebecca, 2014; WB, 2019; Watson, 2016). Options of scaling up of social protection programs in case

of a natural disaster include: vertical or horizontal expansion or piggybacking on existing system and refocusing (OPM, 2015).

CASH AND CLIMATE

Strong evidences suggest that social protection can play an important role in mitigating the effects of climate-induced shocks and disasters, given that social cash transfers serve the lowest 20 percent of population in terms of consumption, food security, and building livelihoods (Davies et al., 2013; Asfaw et al., 2017). A study that analysed the resilience of beneficiaries of Oportunidades, a conditional cash transfer in Mexico, in terms of absorptive and adaptive capacities indicated that the program, by increasing the safety net of beneficiary households, thus increased their absorptive capacity (Solórzano Sánchez, 2015). Similarly, the learnings from the Adaptive Social Protection Program in Sahel which was designed to be scaled up to respond to climate-induced and other kinds of shocks include five principles: promote institutional coordination; ensure scalability of programs; target households that are most vulnerable; design programs that enhance adaptive capacities of households; and ensure swiftness of programs like piggybacking on existing programs (ITAD, 2019; WB, 2019). In Zambia, the From Protection to Production Project (PtoP) of the Food and Agriculture Organisation (FAO) showed that households that received cash support suffered much less from weather-induced shocks with poorest population making the biggest gains (Asfaw et al., 2017).

Another study on the role of social protection programs in its contribution to strengthening the absorptive and adoptive capacities to climate-induced shocks in three countries Ethiopia, Kenya and Uganda found that the programs contribute substantially to the capacity of people to absorb negative impacts of climate-related shocks and stresses on their livelihoods (Ulrichs & Slater, 2016). This result, the study reveals, is achieved by regular cash transfer programs without having explicit aims of addressing climate-related shocks and stresses. Another similar study on the livelihood impacts of cash transfer in African countries found that regular and predictable cash flow improves strategic livelihood choices and stimulates productive investments (Fisher et al., 2017).

According to the World Bank, Social protection systems help individuals and families, especially the poor and vulnerable to cope with crises and shocks, find jobs, improve productivity, invest in the health and education of their children, and protect the aging population (WB, 2018). Social protection is featured highly among the Sustainable Development Goals (SDGs) with target 1.3 explicitly calling to countries to 'implement nationally appropriate social protection systems and measures for all, including social protection floors, and by 2030 achieve substantial coverage of the poor and the vulnerable.'

Adaptive social protection refers to the integration of social protection, climate change adaptation and disaster risk reduction, whereby safety net programs are designed to be readily scaled up in case of climate-induced and other kinds of shocks. An adaptive social protection system can quickly expand horizontally, increasing its coverage in the advent of a disaster. Three policy features are highlighted as essential for an adaptive social protection that can be deployed at times of emergency: timeliness, adaptability and adequacy (Bastagli & Rebecca, 2014). An adaptive social protection program embodies in its design the ability to swiftly scale both horizontally and vertically (Barca, 2017). While horizontal expansion refers to quickly adding new beneficiaries to existing system, vertical expansion calls for increasing the value of the existing benefit or length of time.

In response to the 2015 earthquake, the Ministry of Federal Affairs and Local Development (now Ministry of Federal Affairs and General Administration) implemented a top-up cash transfer program in 19 earthquake-affected districts with support from the United Nations Children's Fund (UNICEF) and other organisations. All existing monthly cash allowance beneficiaries in the earthquake-affected districts were provided with an additional Rs. 3,000 to their usual monthly allowance. The program used the existing government social protection mechanism to reach as many as 430,000 people or 93 percent of beneficiaries with the top-up cash benefit (Merttens et al., 2017). While cash is often used as part of a response mechanism to assist those affected by disasters or shocks, this program was also intended to complement other response initiatives by government and on-government initiatives. The evaluation of the top-up cash transfer program indicated that overall, the beneficiaries were pleased with the extra cash they received doing a difficult time, which they used for basic essentials as the local markets were functioning (Merttens et al., 2017). Cash transfers generally offer an opportunity for quick and efficient response, relative to in-kind aid. The evaluation study of the emergency cash transfer found that 77 percent of the beneficiaries spent the cash on food, 45 percent on medicine, 35 percent on household essentials, 30 percent on clothes (Merttens et al., 2017). Where misuse of cash is concerned, the report states that 'Perceptions that certain groups, Dalits, are more likely to misuse the funds […] is not evidenced in the data, and we found that all beneficiaries (both Dalits and non-Dalits) reported spending the cash for similar purposes' (Merttens et al., 2017).

The 2015 earthquake emergency cash transfer program has proven that using the existing social protection mechanism to reach vulnerable people in times of shocks and stresses, both natural and man-made, is viable. However, while the emergency cash transfer program successfully reached the majority of the target beneficiaries, the use of the existing list of beneficiaries

of monthly cash transfer meant that those people who were specifically affected by the earthquakes could not be included. This proves that Nepal's social protection system is not yet shock responsive or adaptive.

An adaptive social protection system is based on the maintenance of an updated digital vital registration system allowing the existing social protection mechanism to be scaled up or down in an efficient and timely manner. This can also be achieved by locating, identifying and pre-registering vulnerable households that the system can quickly reach with support in case of a shock.

CONCLUSION

To conclude, the experience of the emergency cash transfer program in response to the earthquakes of 2015 showed that Nepal's social protection program is not yet adaptive or shock responsive. As the intensity and frequency of climate-induced disasters increase, there is a need to make the social protection system adaptive, enabling it to provide immediate support to affected people. One way of achieving this is to integrate social protection programs with Local Adaption Plan of Actions (LAPA), given that both aim to strengthen the resilience of the people, particularly the poor and the most vulnerable. A shock responsible social protection system embodies the capacity to instantly identify households in need of support and extend the same in case of a disaster.

The LAPAs contain vulnerability ranking at both ward and household levels. Enhanced LAPAs incorporate GIS maps in assessing vulnerability. To make the existing social protection system shock responsive, the system has to incorporate in its data base available information on vulnerability in terms of geographic locations and households so it can swiftly expand coverage in case of an emergency. This requires a digitised social protection system with a central registry. The Department of ID and Vital Registration is in the process of digitising its social protection database. In addition to the infrastructure, institutional coordination is also required which may be more challenging. While the national social protection is managed by the Ministry of Home, the LAPAs are developed and implemented by the municipalities at the local level. A coordination mechanism between local government entities and Ministry of Home needs to be developed specifically to first devise a shock-responsive social protection system, and then to administer the system effectively.

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