HI-AWARE Working Paper 16

Policy Gaps and Institutional Arrangements for Water Resources Management in Nepal

Consortium members

About HI-AWARE Working Papers

This series is based on the work of the Himalayan Adaptation, Water and Resilience (HI-AWARE) consortium under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) with financial support from the UK Government's Department for International Development and the International Development Research Centre, Ottawa, Canada. CARIAA aims to build the resilience of vulnerable populations and their livelihoods in three climate change hot spots in Africa and Asia. The programme supports collaborative research to inform adaptation policy and practice.

HI-AWARE aims to enhance the adaptive capacities and climate resilience of the poor and vulnerable women, men, and children living in the mountains and flood plains of the Indus, Ganges, and Brahmaputra river basins. It seeks to do this through the development of robust evidence to inform people-centred and gender-inclusive climate change adaptation policies and practices for improving livelihoods.

The HI-AWARE consortium is led by the International Centre for Integrated Mountain Development (ICIMOD). The other consortium members are the Bangladesh Centre for Advanced Studies (BCAS), The Energy and Resources Institute (TERI), the Climate Change, Alternative Energy, and Water Resources Institute of the Pakistan Agricultural Research Council (CAEWRI-PARC) and Wageningen Environmental Research (Alterra). For more details see www.hi-aware.org.

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Feedback is welcomed as a means to strengthen these works: some may later be revised for peer-reviewed publication.

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Policy Gaps and Institutional Arrangements for Water Resources Management in Nepal

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Acronyms and Abbreviations

BCAS	Bangladesh Centre for Advance Studies
BCM	Billions per Cubic Meter
CAEWRI-PARC	Climate, Energy & Water Research Institute - Pakistan Agricultural Research Council
CARIAA	Collaborative Adaptation Research Initiative in Africa and Asia
DFID	The Department for International Development
DWRC	Democracy and Workers' Rights Center
ETFC	Electricity Tariff Fixation Commission
FGDs	Focus Group Discussions
GDP	Gross Demestic Product
GLOF	Glacial Lake Outburst Flood
GoN	Government of Nepal
HI-AWARE	Himalayan Adaptation, Water and Resilience
HKH	Hindu Kush Himalaya
ICIMOD	International Centre for Mountain Development
IDRC	International Development Research Centre
LDCO	Least Developed Countries
MOSTE	Ministry of Science Technology and Environment
MW	Megawatt
NAP	National Adaptation Plan
NWP	National Water Plan
NWS	National Water Sector
SDG	Sustainable Development Goal
TERI	The Energy and Resources Institute
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VDC	Village development committee
WECS	Water and Energy Commission Secretariat
WSS	Water Supply and Sanitation
WUA	Water Users Association
WUG	Water User Group

Abstract

Enhancing the capacity to adapt to climate change impacts has become a critical challenge for the developing countries. This article therefore analyzes the legal and policy aspects and institutional structure of water resource management in Nepal. Policy and institutional analysis approach is used in the research as it offers a more comprehensive framework for thinking water governance issues. Data was generated from literature review, consultation with policy makers, and interaction with communities in Nepal. The findings show that inadequate legal and policy focus on emerging issues like climate change has resulted in ineffective response to both development and climate change issues at the local level. The study shows that the current institutional structure, mandate and performances have limitations such as lack of capacity, poor institutional governance and issues around understanding as well as responding to climate change. Due to implementation gaps of policies, poor and marginalized households are more exposed to climate risk and vulnerability. It was also found that poor and marginalized household and communities were deprived from access to water resources due to constraining provisions within policies and practices. The knowledge generated from this research outlined the suggestions on how to effectively respond to climate change in water resources sector and address the risk and vulnerability of communities dependent on water resources.

1. Background

Nepal has abundant water resources, with over 6,000 rivers and streams, and annual surface water availability is around 225 billion m^3 (Billions per cubic meter- BCM) (WECS, 2011). This wealth of water resources provides an extremely large potential resource for hydropower, irrigation, domestic water supply and industrial use, although only around 15 BCM per annum is currently in use (primarily for agricultural). However, there is a degree of temporal and spatial imbalance between demand and supply of water. Yet, the National Water Plan of Nepal (2005) indicates that only 72% of the population has access to safe drinking water, only 562 megawatts (MW) of hydropower capacity are exploited (out of an estimated economically feasible potential of 42,000 MW), and "little consideration is given to environmental requirements" (Vaidya et al., 2014).

The impacts of climate change on the water sector is already noticeable in Nepal with greater certainty on the impact on the hydrological system. Most of the perennial rivers in Nepal originate in high Himalaya and glaciers and snowpack contributes to these rivers. Similarly, in the middle hills, underground ground water storage such as springs (and collection of springs) and ponds have been widely used. Water related infrastructure is exposed to climate induced disaster such as landslides, floods, Glacier Lake Outburst Flood (GLOF) and flash floods. There are several events where GLOFs have damaged hydropower infrastructure, and human settlement in Nepal (Water Aid, 2015). The estimated total direct annual economic cost of water-induced disasters is US$270 million/year on average, equivalent to 1.5% of current Gross Domestic Product (GDP). However, there is wide variability across years and in exceptional years, the costs of floods can rise to 5 % of GDP equivalent. An analysis of the impact of climate variability on electricity production (and the impact of planned interruptions) indicates that economic costs of loss and damage could be equivalent to 0.1% of GDP per year on average, and 0.3% in very dry years (MoSTE, 2014).

All Hindu Kush Himalayan (HKH) countries have a long history of local leadership in the management of natural resources wherein natural resources were controlled, appropriated and managed through locally evolved norms, indigenous practices and institutions (Fisher, 1989; Allen, 1994). With the increasing involvement of the state in modern times, natural resources are governed though policies and laws made by central governments. Like in many HKH countries, the government of Nepal has formulated several policies and regulations to manage water resources in Nepal. The policies are aimed at regulating the water use, increasing access to water for drinking, irrigation and maximizing the benefits of abundance of water resources for hydro power generation (Pant and Gautam, 2013). As there is already evidence of changes in water resources availability due to climate change and other drivers, it is thus imperative to review the existing policies and institutional mechanism whether or not legal framework are conducive to address the issues (Davis and Li, 2013).

Several measures are dedicated to improving water management by empowering local organizations, such as municipalities, Village development committees, in Nepal (Brunner et al., 2002). The provisions of national water supply policy 1988 related to authority delegation (decentralisation of government functionaries; development of the beneficiaries' organisations; promotion of their active participation in planning, construction, operation and maintenance; water licensing, linkage with the allied agencies and local administration bodies, etc.) are all crucial for creating an enabling environment for the evolution of self-governed beneficiaries' organisations (Freeman et al, 1989; Prasad, 1994). They are also essential for ensuring tripartite accountability among the beneficiaries, related state functionaries, and local government bodies (Shivakoti, 1991; Prasad, 1994; Starkloff et al., 1999). These provisions are also crucial for mobilising local communities and delegating power and resources to deal with issues such as climate change.

Major gaps exist between policy targets and actual implementation of development and adaptation programmes. Inadequate scientific database and knowledge sharing continue to be the major hurdles to evidence-based policy formulation in HKH (IGES and ICIMOD, 2013). The study shows that HKH region's mountainous geography and its institutions are not linked enough spatially, as characterized by the lack of institutions to link upstream and

downstream communities in river basins (Nepal et al., 2015). It is also found that there is a lack of policy and strategy to promote climate resilient water management practice and the distribution of governing power across various levels of governance is also imbalanced and is often incompatible with sustainable management of natural resources (Biggs et al. 2013).

In order to respond to the current and future risk of climate change, policies to have climate change perspective. The policies can either need to be revisited or modified to incorporate climate change concerns. However, it will be only realized when certain policies reach to a specific situation when, due to climate change, the performance of current policies drops below a decisive level and alternative strategies have to be considered. If such a situation is thinkable, there is an imperative to act and climate change becomes particularly relevant. This situation is called 'adaptation turning point' (Werners., 2015). Adaptation turning point will help in realizing the need for better integration and mainstreaming of climate change within development policies and plans.

Countries have started to devise mechanisms of revising the policies in context of climate change. Mainstreaming climate change in the development policies and plan is a prevalent concept to ensure that climate change is better integrated in the planning, budgeting and implementation. Part of the idea is that it is often easier to start with existing policies and practices, rather than creating new ones. Mainstreaming adaptation means acknowledging this insight and capitalising on it. (UNDP-UNEP, 2011) The expected benefits of mainstreaming climate change adaptation into development activities include avoided policy conflicts; reduced risks and vulnerability; greater efficiency compared to managing adaptation separately, and; leveraging the much larger financial flows in sectors affected by climate risks than the amounts available for financing adaptation separately (Agrawala, 2004; Srinivasan and Uchida, 2008).

There is little research to date eliciting how policy framework, and institutional structure influences water resource management in context of climate change in Nepal. The previous research, for e.g. Saito (2013), Regmi and Star (2015) and Agrawala et al. (2003), only looked into the policy dimensions of mainstreaming climate change within the development policies in Nepal. Besides policy, the institutional structure and governance mechanism and its responsiveness in terms of dealing with changes is an important element for water resource management. This paper will fill the gaps in terms of understanding the policy and institutional adequacy in dealing with climate change issues.

The purpose of this paper is finding policy gaps and as well as inadequacy of institutional structure that is responsible for implementing the policy. In this study, we provided explanation on when a policy turning point is reached and why should the existing policy be modified to incorporate climate change concerns? And then assessed existing institutional structure for water management under the changing climate context to identify opportunities and constraints. Since Nepal and other Least Developed Countries (LDCs) in the HKH region are formulating their National Adaptation Plan (NAP) and devising strategies to meet Sustainable Development Goal (SDG) targets, the findings from this study is relevant for shaping the policy making process and governance structure in supporting mainstreaming of climate change in Nepal.

2. Methodology

There are a number of widely used frameworks and theories of the public policy process. Walt and Gilson (1994) developed a policy analysis framework specifically for health, although its relevance extends beyond this sector. They noted that health policy research focused largely on the content of policy, neglecting actors, context and processes. Their policy triangle framework is grounded in a political economy perspective, and considers how all four of these elements interact to shape policy-making (Gilson and Raphaely 2007).The review uses a policy triangle approach and contextualize in looking into aspects of water governance in Nepal. Policy analysis offers a more comprehensive framework for analyzing the policy and institutional mechanisms. By understanding the content of policies, the institutional designed and policy implementation offers a better understanding on the implication of policies in water governance regime in Nepal. It specifically looks into legal and policy aspects, institutional structure and actors and policy implementation and practices in understanding its responsiveness in dealing with climate change impacts (Figure 1).

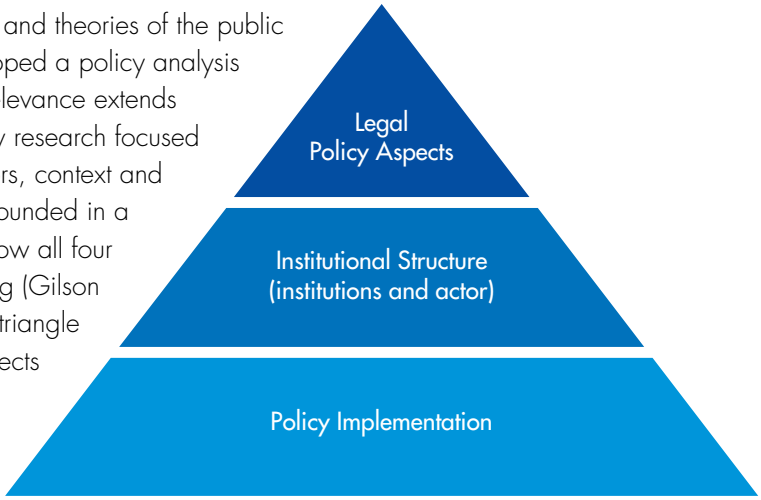

Figure 1: Methodological framework of the study

Review of legal and policy document: It involves review of literature mostly review of legal and policy document. The review of the existing knowledge about laws/acts/regulations related to the issue is important to understand the policy drivers relates to vulnerabilities. It specifically helps in understanding the water resource related policy, law, acts, rules and institutional set up by undertaking exhaustive review of existing literature like government policy, document, articles, books and different journals.

The text-mining method for information retrieval and knowledge mining. It analyses the text according to text characters or sentence structure. It has been applied to literature analysis (Scherf et al., 2005), opinion and sentiment mining and grounded theory (Yu et al., 2011). Ananiadou et al. (2009) and Tomas et al. (2011) used text-mining in systematic reviews in order to reduce the time taken to identify, categorise, and summarise relevant literature. The review material for the policy content analysis are official legal and policy document including reports and other publications.

Key informants interview and focus group discussion with policy makers and practitioners: It involves interview and focus group discussions with relevant stakeholders working on the water resource management sector in order to get their perception on policy-making process, implementation status of policy, institutional structure, and climate change implication in the sector. The interaction with relevant stakeholders at national and local level helped to highlight both opportunities and constraints of water resource management in context of climate change. A total of 12 key policy makers at the national level, 10 practitioners at the district level were interviewed in order to get their views on the policy gaps and implementation bottlenecks. The respondents were selected purposively in order to capture the relevant and experienced people working in the water resource management sector. Various participatory tools such as pairwise ranking and mapping exercises were used involving the policy makers and practitioners to see the inter-linkages within policies and policies extent of contribution to the governance mechanisms. The objective was to observe the extent of contribution of 4 water resources related policies and the climate change policy. The ranking criteria and scale was agreed with the respondents.

Focus group discussions with beneficiaries (communities): The main purpose is to get the perspective of beneficiaries of the policy document and its impact at the local level. This interaction provided information about policy impact at the local level and benefits and constraints of various institutional arrangements in the changing context such as climate change. A total of 6 focus group discussions were carried out involving 50 households at the local level. The discussions were conducted in Lekhnath Municipality of Kaski district, Gaulichaur VDC of Baglung district and Ratnanagar municipality of Chitwan district. These sites were purposively selected to represent the locations within Gandaki river basin and to cover the water management issues such as irrigation, wetlands and micro-hydro. The respondents were selected purposively as to capture the stories of knowledgeable person and individuals affiliated with local institutions and responsible for implementation of policies and programmes.

Data analysis: The analysis of the data mostly used the qualitative and descriptive methods such as use of person and group quotes and perceptions. Qualitative data generated through interviews and Focus group discussions was recorded, transcribed and analysed using NViVO 10 through a thematic hierarchical approach.

3. Findings

3.1. Constitutional and Policy Provisions for Tackling Climate Change Issues

This section of the finding analyses the current policy and legal documents and assesses whether or not climate change issues is addressed by the policies or there potential to be addressed in future. It further provides explanation on why should the existing policy be modified to incorporate climate change concerns

The review of policy documents shows that the constitution of the Federal Republic of Nepal, which was promulgated on 20 September 2015, has accorded a high priority to protect, promote and use of water resources. Article 30 of the constitution of Nepal, 2015 state the right regarding clean environment protection of environment. It states that 'Each person shall have the right to live in a healthy and clean environment'. The constitution has made policy provisions to make multi-purpose development of water resources. The constitution envisions policy regarding the conservation, management and use of natural resources which states that the State shall pursue a policy of prioritizing national investment in water resources based on people's participation and making a multi-utility development of water resources. The constitutional policy provisions also envisions developing a sustainable and dependable irrigation system by controlling water-related natural disasters with the management of the river systems (GON, 2015). All these provisions are most relevant to address climate change impact at different level. However, conceptualising the implementation might be challenging due to lack of clear mention and mandate of climate change (Table 1).

The constitution of Nepal (2015) has mandated the federal government to conserve water resources and develop policy and standards for multi water uses. The provincial government are mandated to manage water resources

Table 1: Constitutional provisions related to climate change

Schedule/ Jurisdictions	Climate change relevant
5 / Federal jurisdiction	7. International boundary rivers 11. Policies relating to conservation and multiple use of water resources 27. National and international environment management, national parks, wildlife reserves, and wetland, national forest policies, carbon services 29. Land use policies, human settlement, development policies, tourism policies, environment adaptation
6 / State jurisdiction	7. State level electricity, irrigation, and water supply services and navigation 19. Use of forests and waters and management of environment within the state
7 / Concurrent (Federal & State) jurisdiction	13. State boundary river, waterways, environment protection, biodiversity 23. Utilisation of forests, mountains, and forest conservation
8 / Local jurisdiction	10. Local market management and environment protection 11. Irrigation 19. Water supply, small hydro-power projects, alternative energy 21. Protection of watersheds, wildlife, mines and minerals
9 / Concurrent (Federal, State & Local) jurisdiction	5. Services such as electricity, water-supply and irrigation 6. Service fees, charges, penalties and royalties from natural resources 7. Forests, wildlife, birds, water uses, environment, ecology and biodiversity 14. Royalties from natural resources

within their provincial jurisdiction. Drinking water and watershed management is under the jurisdiction of local government. However, water resource management is also under the concurrent rights of the state, province and local government.

The judicial system of Nepal is also relevant for water governance as it deals with managing the conflict and disputes arising from water management. From the review, it was found that the constitution of 2007 has identified 3 types of judicial system the district court, the courts of appeal and supreme court for dispute settlement. The constitution of Nepal 2015 states of making judicial administration swift, competent, easily available, economical, impartial, effective and accountable to people. It has also provisioned that powers relating to justice in Nepal shall be exercised by courts and other judicial institutions in accordance with the provisions of this Constitution, other laws and recognised principles of justice. The dispute is resolved through supreme court, high court, and district court. Since the decentralisation and devolution of power is recognized by the judicial system, it will address the local issues of water governance in future more effectively.

The review shows that the sectoral development policies in the past 20 years were silent on climate change issues. The pair-wise ranking was carried out as part of the research involving the policy makers and practitioners working in the water resource management sector. The finding shows that water related policies have not fully integrated climate change. Whereas the climate change policy seems to be emphasizing on the sector significance in terms of dealing with climate change (Table 2). Majority of the policy makers and practitioners shared that the current water related policies are almost ineffective to deal with issues such as climate change as policies have not been able to consider the changing context.

The review of water sector policy suggest that the Water Resources Strategy Nepal, 2002 is a cross cutting document which sets out a comprehensive approach to water planning. It covers water supply and sanitation (WSS), irrigation and hydro-power, as well as a range of institutional, legal and environmental issues. The strategy sets out a short (5 year), medium (15 year) and long-term (25 year) vision. Many of the issues addressed and activities proposed are 'climate resilience' relevant, but not explicitly labelled as such. However, there is little discussion of climatic trends or future projections in the existing water resource strategy. In absence of risk assessment and analysis in the sector, it will be challenging to put policies into action.

The review of the existing Water Resource Act of 1996 shows that the act aims to make arrangements for the rational utilization, conservation, management and development of the water resources that are available in the Nepal in the form of surface water, underground water or in whatsoever form. From the interaction with policy makers it was revealed that the water resource act does not seem to address the potential negative impacts of climate change on water resources. Nepal is one of the richest countries in water resources and relies on water resources for its economic development. The electricity generation in Nepal is largely from the water resources, which are also used extensively for irrigation, drinking, industrial, sanitation, and fishery purposes. Majority of the

Table 2: Pair-wise ranking to see the linkages with the policies (source: discussion with policy makers)

Policies	**Ranking (1= least reflected in the policy and 10 = highly reflected in the policy)**				
	Climate change policy	National Water Plan	Hydro-power development policy	Water resource strategy	Water resource act
Climate change policy	X	6	5	6	6
National Water Plan	4	X	5	8	8
Hydro power development policy	3	6	x	8	7
Water resource strategy	3	8	5	8	8
Water resource act	3	7	6	8	x
Total scoring	13	27	21	38	29

policy makers (95%) argue that there are already evidences that climate change is having negative impact on the access and use of water resources. Nevertheless, the existing policy is silent on how to prepare the country to mitigate climate change impacts.

It was found from the review that the National Water Plan (NWP) acts as the implementation strategy for the National Water Sector (NWS). The NWP recognises the objectives of the NWS and lays down short, medium- and long-term action plans for the water resources sector, including investments and human resource development. Again, climate resilience related objectives are set out, such as mitigating the impact of water-induced disasters, and improving watershed management. Conversely, the frequency and severity of these disasters are ascribed primarily to zoning and planning issues, and climate change is not explicitly considered within the document (it is only implicitly discussed in relation to promoting research and studies on ecological water requirements, water quality, functioning of glacial lakes and existing dam structure.

According to majority of policy makers interviewed, Hydro-power Development Policy (2001) also lacks any reference to the potential impacts of climate change on hydrological flows or competing water demands, but does make provision that if hydrological conditions are more adverse than anticipated when the license was granted, the license term may be extended by up to 5 years as compensation. The Hydropower Policy has encouraged private sector participation for the hydropower development. The policy has made appropriate provisions for resettlement of the displaced families to mitigate the adverse environmental impacts likely to result from the operation of hydropower plants, but there is lack of clarity on necessary adaptive measures in the sector required to deal with the climate change impacts. As mentioned by one policy maker from private sector "I feel that policy provisions for the design of hydropower considers only the risk from water flow and flooding but does not consider water scarcity in the long run".

It was revealed from the discussion with policy makers that, the periodic plans of Nepal, which are for 5 years and formulated by the executive, has given priority to water resource management. The Ninth Plan had given emphasis on regulating flow of water by building reservoirs so that the damages caused by flooding were minimized and benefits of water resources were maximized. The Tenth plan emphasized on the Water Resources Strategy, and in order to undertake effective implementation of this strategy. The National Water Plan, were formulated during the Tenth Plan period. According to the policy maker from National Planning Commission "The recent approach paper of the 14th plan (2017-2019) emphasizes providing irrigation for agricultural land for the entire year. It also emphasizes a multi-water use system for improving irrigation system in the rural areas. Yet, the plan is not explicit on the issues of dealing with climate change as it does not have activities and budget to address the existing issues of climate change within the sector".

A majority (90%) of the policy makers during the discussion also stated that current development policies reached to a state where it is now inadequate to deal with climate change. According to them, the policy have failed to sustain the policy objectives of reducing the water insecurity and meeting the energy demands. At the community level, majority of the participants during focus group discussion argued that "The policy on water resources in fact has failed to provide services to the communities in an efficient way hence policies to have forward looking approach and consider the additional risk such as climate change and socio-economic changes". There was also suggestions that there is now an urgency to make policies more flexible and responsive to consider changing context and emerging issues and challenges.

3.2. Institutional Structure and Actors

This section of the finding analyses the current institutional structure and actors and assesses whether or not there the structure and capacity is adequate to address climate change issues. It also provides explanation on the types of institutional structure required to deal with climate change more effectively and efficiently.

The recent constitutional changes and institutional reform, such as business allocation rules of the provincial (2018) and local government (2017), government of Nepal work division regulation (2017) has restructured the

government function and functionaries. To some extent, the new restricting at the provincial and local government has decentralised and devolved the functions at the province and local level. It is therefore too early to assess the current structure and functions. The following paragraphs discuss the institutions and actors role and function based on past experiences.

The discussion and interview with policy makers and practitioners indicated that the institutional set up for regulation and implementation of the water related policies and laws are centralized with coordination authorities vested in ministries, commissions and departments. At the national level, water policy is primarily orchestrated through the Water and Energy Commission Secretariat (WECS), which acts as a central clearinghouse for water and energy policy and also wrote Nepal's most current National Water Plan (NWP) published in 2005. As advised in the NWP, WECS was to be given much greater authority in leading the policy formulation, coordination of implementation, interagency planning related to water resources, as well as budgetary oversight; however, this has yet to occur and its mandate remains weak. With no budgetary power, WECS has to go through other ministries to approve projects. The practitioners working in Ministry of Energy said "Moreover, the state of implementation of the NWP remains minimal, and it has received less priority as a result of major changes in the government structure, continuing political uncertainty and a lack of capacity".

The analysis of policies shows that the promulgation of the Local Self Governance Act 1999 (2055 BS) and the Local Self Governance Regulation 1999 (2056 BS) built on, and improved, the existing legislative framework for effective decentralisation of government. The Local Self Governance Act devolves wider powers to local bodies at the village, municipality and district level to plan and manage services including services relating to drinking water, irrigation, sanitation and conservation of water resources. There are regional and district offices of the government to look into water resource management issues. At the level of regulation, which is an important function of the government, there aren't any permanent and full-time organizations in place. There are, however, committees and commission such as the District Water Resources Committee (DWRC), Water Resources Utilization Investigation Committee and Electricity Tariff Fixation Commission (ETFC), established under different Acts, to regulate tariff fixation and to resolve disputes in the water sector.

At the national level, there is conflicting role and responsibilities among the institutions working on water sector. It was revealed from the discussion with policy makers that there are three major actors and institutors that deal water; these are (i) Ministry of Energy, (ii) Ministry of Irrigation, and (iii) Ministry of Water and Sanitation. More than two third of the policy maker respondents said "Though there is Water and Energy Commission Secretariat (WECS), there is an institutional gap to deal the overall water issues". In the absence of an institute that deals on overall water issues in Nepal, the issues dealt by individual ministry may not cover the entire water issues relating to the climate change because individual ministries deal only the sectoral issues. It was also revealed from the discussion with policy makers and practitioners that the Issues relating to the impact of climate change are diverse in nature, and hence need to be dealt by one institution. Ministry of Energy has different functional structures to deal different functional areas, but seems lacking a section/department/unit that addresses the climate change issues.

There are issues of collaboration between and among institutions and lack of coordination in terms of policy implementation. The policy makers particularly pointed out the overlapping institutional responsibilities and lack of clarity in role within the central water resource management ministry, department and offices often lead to ineffective translation of policies. One of the respondent from ministry of energy said 'The WRS, for example, calls for supporting the District Water Resources Committees (DWRCs) for their active role in planning and regulating the water resources in the districts, and provisions for adequate human resources and necessary budgets. However, the irrigation regulations do not grant any authority to the DWRCs. District boundaries form the main basis for decentralised administration and governance, and the hydrological boundary of the river basin may pass over two or more administrative districts'.

The discussions with the practitioners revealed that the formal institutions in the water resource sector in the study sites are the official, governmental, or bureaucratic formalities and are usually legally defined. One of the practitioners explained the institutional structure at local level saying that "institutions include both formal which are formally registered water users group and those based on social norms and rules that are informal. The informal groups

include traditional authorities, indigenous groups (chiefs, clan heads etc.), and organisations such as Mukhiya". However, it was found that mostly formal water user groups are operating mostly in the study sites.

According to majority of the policy makers interviewed, the water resource policies deliberately undermine the traditional water management institutions and actors. It is evident that the informal and traditional institutions are being replaced and traditional rights are taken over by formal institutions. The policy review shows that the Water Resource Act 1992 (2049 BS) provides for the formation of Water User Associations when a group of individuals wish to make use of a water resource for their collective benefit. Water User Associations must be registered which provides the government with a mechanism to regulate the collective use of drinking water. The practitioners during focus group discussion revealed that the traditional water management institutional structure such as farmer managed irrigation system in different parts of Nepal was later forced by the policies and act to become formal institutions.

The outcome of the focus group discussion with the 3 water user groups, as outlined in table 3, revealed that there

Table 3: Comparative analysis of the institutional governance structure within the local institutions.

Groups name	Participation status	Decision-making status	Benefit sharing status
Panchakanya Water User Group	Only the Executive committee participates in the institutional events	Dominated by male and executive committee members	Upstream and mid-stream users benefit more than the end users
Micro-hydro user group in Dagatungdanda	Only the Executive committee participates in the institutional events	Dominated by male and executive committee members	The energy is just used in limited purpose and diversifying energy use is a problem
Rupataal fisheries cooperatives	All the members participate well	Executive committee makes the decision	Upstream users are not satisfied with the benefits

Source: Focus group discussions with the user group

are comparative difference in terms of institutional governance mostly the participation, decision-making and benefit sharing status among the group. Panchakanya water user group and Micro-hydro user group of Dagatungdanda seems to have major issues in terms of institutional governance. According to the users, this happened because there was lack of leadership, conflict among users and political influence. Whereas, the Rupataal fisheries cooperatives had strong institutional set up, well defined roles and norms and more collaboration among users. According to the users of the cooperative, the institutional functioned well because there is good leadership and transparency in benefit sharing mechanisms.

The discussion with communities in Dagatungdanda VDC, also pointed out the complexity of working and functioning at the local level. Most of them complained that the institutional structure is too hierarchical and rigid. Another challenge they pointed out is the lack of institutional support provided by the government to make the community based institution functional. For example, during the discussion with communities in Panchakanya water user group, many participants said "in absence of the government support, the local level institutional structure has been passive and ineffective. They further argued that in dealing with complex issues of climate change in future, the institutional structure is not in position to functional well and effectively".

3.3. Effectiveness of Policy and Institutional Structure in Dealing with Climate Change Issues

Policies and institutions are closely linked to implementation and practices. This section of the findings analyses the effectives of policy and institutional structure in dealing with climate change issues particularly looking at whether or not policies and institutions are flexible and responsive enough to address the issues of risk and vulnerability at the local level.

The policy review shows that the current institutional structure for water governance is based on the previous constitution of Nepal (2007). The recent constitution of Nepal (2015) has provided a general outline of the structure of governance in Nepal, that is, the scheme of distribution of powers between the centre, state and local levels. It has envisioned federal structure and mentioned to devolve power and resources to the federal level and give autonomy for the local institutions. However, it is yet to see how the state restructuring will take place in future and its implication to the governance of water resources.

Looking at the current policy and institutional structure, the water related policies and plans shows that most of the policies have emphasized on decentralisation and sharing of power and resources to local level thus making the implementation. The policies have also recognized the importance of stakeholder participation and inclusion of communities. The respondent from private sector in an interview said that the hydro-power policy has recognised the role of private sector in investment in hydro-power sector. According to the respondent, recent developments in water resource law are focused towards creating an enabling environment. Irrigation Policy 1997, encompasses mechanisms for maintaining coordination between agriculture and irrigation related entities at various levels. Similarly, National Water Supply Sector Policy of 1998 visualises a shift for the state organ responsible for water supplies from the traditional role of service provider to that of a facilitator owing to eventual handover of drinking water supply schemes to the users' committees and/or private sector management.

The majority of the practitioners (85%) during the discussion stated that "we feel that the creation of water user associations is supporting in implementation of policies and plans with regards to management of water resources in the context of climate change". Most WUAs face severe challenges of adopting to the change context and dealing with complex issues such as climate change. Communities argue that traditional institutional set up has a critical gap for dealing with climate change issues. For example, one of the female respond from Panchakanya water user group in the discussion said "as the environment and context changes, every one of us should change and it is important for the old institutions to adjust to the new situation and have that capacity to adapt"

It was found from the field study that the extreme weather and climatic conditions have made the farming system more complex and challenging. The sources of water is being depleted and diminished due to various factors including climate change. These has negative impact on the production system and the well-being of farmers and communities dependent on water resources. Field evidences in Panchakanya water user group of Chitwan district clear show that availability and access of water resources is a major concern at the community level which has not only impacted the farming system but forced people to abandon the farming and in worst case migrate to other areas. Although the trend of migration is relatively low in the study sites (<10%), majority of the consulted respondents in the study indicated that it will increase in future.

Nevertheless, as climate change impact is clearly felt by local communities, there has been relatively no proper support from the government to deal with the issues. The increased disasters such as flood, landslide and drought has damaged the water management related infrastructures such as irrigation system and micro-hydro plants. The extreme variability in the rainfall has also posed serious challenges to availability of water. Communities strongly perceive that the water flow in the river has decreased over the last 10 years. For example, the irrigation system, in Gaulichaur VDCs of Baglung, covers 21 hectares and is connected to micro-hydro plant. The field canal constructed for bringing water up to the electricity turbine is also used for irrigation. Irrigation systems are usually located upstream, whereas micro hydro-plants (with turbines) are operated at the tail end of the canal. According to the users, the situation is different now: the water volume has declined by about 15%, reducing water availability for the turbine. This has created conflict among the water user group and micro-hydro plant user groups in sharing of water resources. The local people said "they are not aware about any policy provisions that can address the recent challenges of water scarcity and its implication in irrigation and electricity use".

Table 4 below provides overview of the additional stresses faced by water user group and existing knowledge gaps and its implications for the livelihoods. The information in the table revealed that climate change is bringing additional stresses and impact on water resource management. In response, the existing institutional structure and capacity is inadequate due to lack of knowledge, skills and internal governance issues such as issues of access and benefit sharing. The additional stresses and lack of institutional capacity to respond to the additional stresses

are having impact on the level of socio-economic losses and creating social conflicts in the resource management. In contrary, majority of the local communities argue that the current policies and practices failed to address those stresses and hence the alternative policy strategies is needed.

Table 4: The relevance of policy and institutional adequacy to deal with climate change impacts

Groups	Additional stresses and impacts	Existing policy and institutional gaps	What are the implications?
Panchakanya Water User Group	Depletion of water resources and drying of water sources impacting the agriculture production system	Policy silent on addressing climate related risk. There is also lack of knowledge on optimizing water management; Lack of skill to deal with water governance issues (access and benefit sharing).	Conflict within users, the agriculture system is now less productive and farmers have to leave their land fallow
Rupataal Cooperatives	Degradation of wetland and lake due to over siltation and extreme flash floods and landslides	Policies and plans have inadequate focus on managing emerging extreme events such flooding, prolonged draught. There is also lack of skills and knowledge on dealing with extreme events such as floods and landslides. Mostly lack of human and financial resources.	The lake size is decreasing, wetlands are degraded and there is conflict between upstream and downstream users
Micro-Hydro User Group	Massive flooding, landslide and decreasing water availability	The government policies and plans are silent about dealing with issues of climate risk (e.g. heavy landslide). There is also lack of skills in disaster response planning, weak institutional governance.	Massive economic losses due to destruction of floods and landslide

Source: Focus group discussions with communities

It was found from the discussion that at the local level communities face limitations in terms of information and knowledge, technology and finance in dealing with loss and damage from disasters. The respondents from local government in Baglung said that due to lack of extent on the availability of necessary information available in dealing with climate change, they were unable to revive the damaged hydropower system in Burtibang VDCs and other areas of the district. In one of the national consultations held in Kathmandu on February 2017, the stakeholders indicated that government policies in silent on facilitating exchange of information and knowledge mostly the interface between scientific and traditional knowledge. The discussion with users of Panchkanya revealed that due to lack of technological knowhow, there failed to optimize the water use during winter season. In addition, the Rupataal fisheries cooperative members also said "we due to lack of skills and knowledge on dealing with extreme events are not been able to provide adequate support to the poor and marginalized household dependent on the water resource for their livelihood".

4. Discussions

The findings indicated that besides policy integration, implementation arrangement is a major challenges in addressing climate risk and impact. Despite significant policy reforms in water sector, issues of institutional effectiveness and implementation gap persist with inadequate attention to issues like climate change. The research found that current sectoral environment policies have inadequate focus on climate change. The lack of discussion about climate change within the development policies, such as water resource policies, in the past were due to a centralised policy-design process, a lack of political interest, low government awareness about climate change, a lack of development partners' interest, and uncertainties about climate change financing both at the national and international levels (Pant and Gautam, 2013; Ojha et al., 2016). Another reason for exclusion of climate change in the policy arena, as cited by Ojha et al. (2016), is due to a lack of political commitment and priority of the nation.

It was found that institutions for water management lack capacity to design and deliver effective management functions. It happened largely because government tried to replace the traditional institutions, knowledge and practices and did not provide space for knowledge sharing and learning. Research already shows that traditional institutions possess unique time- and space-specific information that may help solve complex environmental problems, which distant state agencies often do not possess (Ostrom, 2010).The findings imply that in the changing socio-economic and environment context, a robust, flexible and inclusive institutional structure is very important in order to address the root cause of poverty and vulnerability. A governance structure that is inclusive and multi-stakeholder owned at the local and national levels has the potential to overcome institutional, technological, and financial barriers (Regmi et al., 2016).

The research indicate that the current level of policy and institutional mechanisms are inadequate to address the vulnerability of households and communities. It entails the a situation of adaptation policy turning points where climate change has undermined the current water management practices and hence alternative strategies should be considered. This can be achieved by major policy reforms and particularly mainstreaming climate change in water resource management policies and plans.

Although several authors have argued that integration of climate change with the existing sectoral plan and policies will address the issues of vulnerability and risk in the sectors (Agrawala, 2004; Srinivasan and Uchida, 2008), the findings from this paper provide a different perspective on how climate change should be mainstreamed. As argued in this paper mainstreaming should not be limited to policy level but rather it has to cover revisiting the institutional structure and governance mechanism. The research findings confirm that in this water resources sector, policy has already reached to a turning point so the policy, institutional structure has to be reformed in order to provide opportunities for better integration and mainstreaming of climate change.

5. Conclusion

The study shows that while policy visions and frameworks for water resource management have aimed at sustainably managing water resources, there is lack of effective implementation. This is because developing new policy visions are not concurrently linked to the new and emerging issues. Climate change issues are less covered, and objectives and actions are not often framed in the context of climate change (though more recent strategy documents tried to consider and address climate change impacts). The government policies and regulations that is more biased towards formal institutions have also been barriers to the functioning of local institutions more effectively and efficiently.

The study suggests that the existing institutional capacity at the local level is not yet ready to respond to climate change and address the local vulnerabilities. Due to issues with the current institutional structure, many of the groups are not functioning well and have failed to address the risk and impact of climate change. The lack of functioning of local institutions has triggered increased in vulnerability of communities. It was revealed that water related policies have already reached to a specific situation when, due to climate change, the performance of current policies is underperforming. Hence, alternative strategies has to be explored. Mainstreaming climate change within the water related policies can fill the gap and revive the current policies.

As Nepal is now implementing the federal governance system, the issues of decentralisation and devolution of power and resources becomes critical. This means more intricate integration of climate change in planning, budgeting and governance system of the government activities will support effective climate change mainstreaming at both central and local level policies. This entails a need for forward looking and strategic policies and institutional mechanisms that can deal with additional stresses such as climate change in more efficient and effective way so that the action will reduce climate related risk and enhance the resilience of sector and communities.

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