An Assessment of Potential Synergies and Conflicts in Climate Mitigation and Adaptation Policies of Nepal

by

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ABSTRACT

There are two lines of defense to address the pressing issue of climate change: mitigation (reducing the emission of greenhouse gases and enhancing sequestration) and adaptation (reducing vulnerabilities and increasing resilience). Although there are fundamental differences between these two strategies across spatial, temporal, institutional and administrative scales, they can interact with each other, resulting in synergies or tradeoffs. An integrated approach in which the interactions of adaptation and mitigations strategies is considered important to harness the benefits of the synergies to create win- win situations and avoid conflicts for no- regret decisions. The main aim of this study is to assess the extent and mechanisms of such interactions which exist among the climate change related policies of Nepal, and the opportunities and barriers present to harness the synergies and reduce the conflicts. This study presents a quantitative analysis of the existing national level climate policies of Nepal (in Agriculture, Forestry and Other Land Use, Energy, Urban Systems and Water sectors) for identification of the extent and mechanism of the interactions between them by using a scoring system. Analytical Hierarchical Framework (AHP) has been used to rank and prioritize the opportunities and barriers to harness the synergies and avoid the conflicts. Although all 4 sectors displayed the potential for interactions, with AFOLU sector showing the highest potential for both synergies and conflicts, these interactions have not been considered in policy formulation yet. An institution dedicated to climate change was identified as the most important opportunity, while the lack of adequate institutional co- ordination was identified as the most important barrier in the context of Nepal.

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LIST OF ABBREVIATIONS

AFOLU	Agriculture, Forestry and Other Land Use
AHP	Analytical Hierarchy Process
CIFOR	Center for International Forestry Research
CoP	Conference of Parties
GHG	Greenhouse gas
GLOF	Glacial Lake Outburst Flood
IPCC	Intergovernmental Panel on Climate Change
iNDCs	intended Nationally Determined Contributions
INGO	International Non- Governmental Organization
LAPA	Local Adaptation Program of Action
LDC	Least Developed Countries
NAMA	Nationally Appropriate Mitigation Action
NAPA	National Adaptation Program of Action
NC	National Communication
NDCs	Nationally Determined Contributions
NGO	Non-Governmental Organization
REDD	Reducing Emissions from Deforestation and Forest Degradation
SNC	Second National Communication
UNFCCC	United Nations Framework Convention on Climate Change

CHAPTER 1
INTRODUCTION

1.1 Background

1.1.1 Climate change, mitigation and adaptation

There exists an overwhelming amount of evidence that depicts human- induced climate change is taking place and it will continue to do so at rates unmatched in the recent history (Matocha et al., 2012) and that least developed countries are at the most susceptible to the risks associated with adverse climate change impacts (Parry, 2007). The negative effects of climate change are evident across both natural as well as human systems. Impacts on hydrological cycle, ocean acidification, and ecosystems, as well as on crop production, human health, poverty, etc. are widespread (Metz, 2007). Two lines of defense have been defined to address this issue: mitigation (decreasing the emissions of greenhouse gases and increasing sequestration), and adaptation (decreasing vulnerability and increasing resilience). All communities need to boost their adaptive capacity to face not only present, but also future climate change outside their experienced coping range (Adger et al., 2004). At the same time, mitigation efforts must also be undertaken so as to limit the extent of changes in earth's climate so that adaptation activities can be possible, while vulnerabilities be reduced.

However, there occur fundamental differences between mitigation and adaptation which arise from differences between the two in terms of spatial, temporal, institutional and administrative scales. These differences have led to the two strategies to be complementary to each other, and therefore, to be considered separately (CIRAD, 2015). Developed countries are considered to share the major responsibility of mitigation, while adaptation is focused in the South, where the vulnerability is high, and at the same time, mitigative capacity is low (Ayers & Huq, 2009). This fundamental conceptual divide has hindered progress against overcoming the sustainable development challenges posed by climate change. Moreover, addressing climate change through the silos of either mitigation or adaptation can result in tradeoffs. Emphasis only on mitigation is not desirable, as the climate will still continue to change and will require adaptation efforts. On the contrary, focusing only on adaptation will not reduce all the negative impacts; therefore, mitigation actions are essential to limit the changes in the climate system (Klein et al., 2009; Locatelli et al, 2009). Therefore, it is important to shift the paradigm from an 'either mitigation or adaptation' to 'integrated mitigation and adaptation' concept. Until recently, in international conferences addressing climate change, mitigation had been prioritized over adaptation and had received the greatest attention, often motivated by national as well as international policy commitments to curb emissions of greenhouse gases. The Paris agreement in the conference of parties (COP21), however, put adaptation at par with mitigation (Mogelgaard, 2016).

1.1.2 Interactions between mitigation and adaptation

Climate change mitigation and adaptation policies can interact with one another, resulting in synergy, trade- offs or even conflicts (Bates et al, 2014). According to Intergovernmental Panel

on Climate Change (IPCC), synergy is defined as "the interaction of adaptation and mitigation so that their combined effect is greater than the sum of their effects if implemented separately". Tradeoff is "the balancing of adaptation and mitigation when it is not possible to carry out both activities simultaneously due to some constraints". Conflicts are defined as "where adaptation and mitigation measures in a given sector impact adversely on adaptation and mitigation measures within the same sector or in another sector".

Although adaptation and mitigation can exhibit potential for synergies, however, segregated focus on adaptation and mitigation has hindered this. One way of overcoming this divide between the two strategies is an integrated approach which ensures that trade-offs between the two are lessened and synergies encouraged (Wreford, 2012). Linking mitigation and adaptation can help to channel some financial and institutional support currently provided for mitigation toward adaptation, thus creating a win- win solution. Additionally, in the long term, this integrated approach can overcome the divide between the two and emphasize both the strategies equally, thus making mitigation efforts more relevant for developing countries which are, at present, the most vulnerable.

Viewing adaptation and mitigation through an integrated lens may result in synergies in some sectors, and in others, trade- offs could be unavoidable. However, it is extremely important that at a minimum, the policies do not conflict each other. Therefore, cross- sectoral interactions of adaptation and mitigation measures must also be explicitly recognized.

1.1.3 Nepal's climate change policies

The diverse geographical landscape of Nepal comprising of plains, hills, and mountains, coupled with the propensity of the country to various climate induced disasters including droughts, floods and landslides increases its vulnerability to climate change impacts (Dulal et al., 2010). Studies reveal the change in Nepal's climate in the form of an increase in maximum temperature at an annual rate between 0.04°C and 0.08°C, with an average rate of increase of 0.06°C per year (Shrestha & Aryal, 2011). This change in climate bears significant impacts on agriculture (especially subsistence farming), and water sector, among other sectors, (Shrestha and Aryal, 2011; Karki, 2012).

In an effort to address the pressing issue of climate change, Nepal has developed several climate change related policies and documents. Nepal prepared and submitted its initial national communications in the year 2004, followed by the second national communications in the year 2015. The national communications consist of the greenhouse gas inventory of Nepal, and possible mitigation and adaptation options. The Climate Change Policy of 2011 was formulated with the goal "to improve livelihoods by mitigating and adapting to the adverse impacts of climate change, adopting a low-carbon emissions socio-economic development path and supporting and collaborating in the spirits of country's commitments to national and international agreements related to climate change". As Nepal is a developing country, it has placed a greater emphasis on adaptation and has developed the National Adaptation Program of Action (NAPAs) at the national level which subsequently led to the Local Adaptation Program

of Action (LAPAs) at the local level. Mitigation efforts in the country are evident in the form of efforts to reduce GHGs by the use of renewable energy, and increasing efficiency, as well as carbon sequestration through the Reducing Emissions from Deforestation and Forest Degradation (REDD). Nepal has also developed a draft on Low Carbon Economic Development Strategy (LCEDS) which pursues a low carbon sustainable economic development pathway for the nation.

The latest policy effort by Nepal in the climate change scene appears in the form of submission of its Intended Nationally Determined Contributions (INDCs) in the year 2015, followed by its Nationally Determined Contributions (NDCs) in the year 2016. Both of these emphasize on climate resilient pathways for sustainable development, and focus on adaptation as well as mitigation.

A review of these policies revealed that majority of the climate change policies of Nepal can be categorized under 4 sectors: (a) Agriculture, Forestry and Other Land Use (AFOLU), (b) Energy, (c) Urban Systems, and (d) Water. Majority of the policies are related to AFOLU, in terms of both adaptation and mitigation. Moreover, the Forestry Policy of Nepal has a section dedicated to climate change. Similarly, water sector policies include early warning and disaster risk reduction components in order to address water- induced disasters.

1.2 Rationale of the study

Nepal is an extremely vulnerable country to the impacts of climate change, as well as water-induced disasters and other hydro-meteorological extreme events. The National Adaptation Program of Action (NAPA) of Nepal reveals that "out of 75 districts, 29 districts are highly vulnerable to landslides, 22 districts to drought, 12 districts to GLOFs, and 9 districts to flooding". In the light of these facts, Nepal has ratified and implemented various climate change related policies. The second National Communications (2014), Climate Change Policy (2011), Intended Nationally Determined Contributions (INDC, 2016), Nationally Determined Contributions (NDC, 2016) all have included both adaptation and mitigation; albeit a major emphasis is placed on adaptation. However, it is imperative that Nepal embark on a strong mitigation strategy: firstly, it must reduce its reliance on unsustainable and costly fossil fuels, which costs Nepal a substantial percent of its revenue, and seek self- dependence by promoting encouraging renewable sources of energy for fuel-sustainable development, and secondly, Nepal's mitigation approach can also contribute to the global effort of curbing emissions by promoting renewable sources of energy as well as by reducing emissions from deforestation and degradation (NPC, 2011).

In practice, mitigation and adaptation policy objectives are rarely pursued together (Ayers and Huq, 2008; Daguma et al., 2014). Most of the previous studies on climate policy integration have placed a focus on mainstreaming either adaptation or mitigation (Kok & de Coninck, 2007; Micwitz et al., 2009; Adelle & Russel, 2013). Recent studies, however, suggest that identifying synergies between mitigation and adaptation could help to bridge the gap between adaptation-

centric development and the need to achieve a global involvement in mitigation (Ayers and Huq, 2008).

Integrating adaptation and mitigation, and considering their interactions with each other can help exploit synergies, avoid the two policies undermine each other, and allow for both short as well as long term benefits. Conversely, isolated consideration of the two can miss the potential synergies and conflicts, leading to increased social and mitigation costs due to inappropriate, inadequate or unsustainable policies. Moreover, poor integration of mitigation and adaptation options can also lead to maladaptation, which can not only increase climate vulnerabilities, but also add to the damages and the costs incurred. Pielke et al. (2007) reveal that a focus on mitigation has led to climate change policy agendas which contrast adaptation in milieu of sustainable development. On the contrary, pursuing synergies can contribute to reduce the sustainable development challenges of climate policies by minimizing the costs and increasing the co- benefits.

In addition to this, an integrated consideration of the two options, especially in projects, can help access the climate funds that are rather explicit in nature. A huge portion of the global climate funds is directed towards mitigation. An integrated approach could mean that mitigation funds can be accessed and mobilized for adaptation projects that have synergies with mitigation. Looking for interactions can also put an equal emphasis on both the strategies, thereby increasing the relevance of mitigation in Nepal, which is otherwise believed to be the problem of the North (Ayers and Huq, 2008).

Moreover, linking mitigation with adaptation, especially in developing countries can simultaneously enhance adaptive capacity and reduce vulnerability while promoting socioeconomic development pathways that lessen emissions, as adaptation actions are largely synonymous with development. This can also provide incentives for countries that are vulnerable and have low mitigative capacity to become actively involved in mitigation. This, in turn addresses the adaptation needs of the South as well as the mitigation concerns of the North (Venema and Rehman 2007).

Linking mitigation and adaptation can help to identify and explore a bigger pool of potential ‘win-win’ options and policies (Huq and Grubb 2007) to enhance synergies and avoid conflicts for ‘no- regret’ options, especially in a climate change- vulnerable developing country like Nepal.

1.3 Objective of the Study

1.3.1 General objective

The overall objective of this study is to carry out an overall assessment of the state of interactions between the national level mitigation and adaptation policies to address the climate change.

1.3.2 Specific objectives

- To identify the extent and mechanism of the interactions between adaptation and mitigation policies as synergy or trade-off
- To identify and prioritize the potential opportunities and barriers for harnessing the synergies and managing the trade-offs/ conflicts

1.3.3 Research questions

- What are the various adaptation and mitigation policies in place in Nepal?
- How are they related? Are they in synergy or conflict?
- What is the mechanism of the interaction among them?
- What are the options that can harness synergies and lessen conflict?
- Are there any barriers to pursue synergies?

1.4 Scope and limitations

This study comprises of climate policies as included in the second National Communications, the Climate Change Policy, NAPA, INDCs, NDCs and other sectoral policies relevant to climate change in Nepal. The stakeholders are limited to experts, decision makers and researchers from the government, NGOs, INGOs and academics. In addition to this, this study is limited to four sectors: AFOLU (Agriculture, Forestry and Other Land Use), Energy, Water and Urban Systems.

CHAPTER 2
LITERATURE REVIEW

2.1 Climate change policies

From its beginning, international climate change policies have placed a major emphasis on mitigation. Although ambitious mitigation efforts can lessen the degree of climate change, it cannot prevent future climate change. Steep reductions in emissions of GHGs can stabilize their concentrations at levels lower than the 'business as usual' scenario, but they are still likely to be above the current levels (Metz, 2007). Consequently, increase in temperature and sea level rise, changes in precipitation and extreme weather phenomena will increase. The IPCC reports that "the net damage costs of climate change are likely to surge over time". Future impacts of climate change will have adverse implications for not only natural but also human systems, affecting food and water security, human health, and other sectors necessary for socio- economic wellbeing (McCarthy, 2001). It is therefore, imperative, to enhance the adaptive capacity of both natural and human systems towards the impacts of climate change. Increasing adaptive capacity to the present levels of current climate variability, including the extremes can form the basis for coping with future changes in climate. Therefore, addressing present as well as future impacts of climate change requires a mix of both adaptation and mitigation. Klein et al. (2005) state that a single optimal mix of adaptation and mitigation options is not possible in the face several possible climate scenarios; a socio- economically justifiable mix of these, along with other elements that would comprise the mix require further research.

There is also an increasing advocacy on the need to incorporate impacts of climate change into development agendas and policies. Mainstreaming refers to "the iterative process of integrating climate change considerations into policy making, budgeting, implementation and monitoring process at various levels" (de Coninck, 2009). It contributes to decrease vulnerabilities while increasing the adaptive capacities at local and national level. Moreover, it also ensures sustainable development and prevents maladaptation (Côté & Turner, 2012). Parties to UNFCCC have prepared national climate action plans in the form of National Communications (NCs), National Adaptation Programs of Action (NAPAs) and Nationally Appropriate Mitigation Actions (NAMAs) as a step to mainstream climate change into policies.

The initial national communications (INCs) focus primarily on assessing the impacts of climate change, including an analysis of GHG emissions. The subsequent NCs prepared by the Parties involve a wider range of stakeholders and institutions, explore the relations with national development policies, and address different strategies for mitigation as well as adaptation. The major components of NCs include an inventory of the GHGs, mitigation analysis, and vulnerability and adaptation assessment. It also comprises of approaches for mainstreaming climate change into national planning (Salamat, 2013).

According to UNFCCC, NAPAs "provide a process for the Least Developed Countries (LDCs) to identify priority activities that respond to their urgent and immediate needs for adaptation. The priority activities are the ones that cannot withstand delay without increasing vulnerability

and/ or costs at a later stage". NAPAs are action- oriented and tailored to the specific needs of the countries. NAPAs also set clear priorities for the most urgent and immediate adaptation activities that are identified by the respective countries (Larwanou, 2015). NAPA implementation projects integrate adaptation priorities within sectoral planning and policy developments and elaborate the policy instruments for mainstreaming adaptation into development objectives. In addition to this, NAPAs also assess the most appropriate approaches for project interventions, integrating adaptation into development, capacity development as well as undertaking policy reforms (Tunis, 2012).

NAMAs refer to "any action that reduces emissions in developing countries and is prepared under the umbrella of a national governmental initiative. They can be policies directed at transformational change within an economic sector, or actions across sectors for a broader national focus" (UNFCCC). NAMAs aim to identify and consequently implement less GHG intensive actions as opposed to conventional practices, and therefore require technology, financing and capacity- building (Olsen et al., 2015). Therefore, NAMAs need to respond to the respective countries' priorities towards socio- economic development while contributing towards climate change mitigation (Kojwang & Larwanou, 2015).

2.2 Interrelationships among climate change policies

Mitigation and adaptation are regarded as complementary approaches to address the impacts of climate change. These can interact with each other resulting in significant co-benefits, synergies and tradeoffs. Many adaptation options could be pathways for effective and long- term mitigation while mitigation options can facilitate adaptation as well. Such interactions occur both within and across regions (IPCC, 2014). Four distinct types of interactions between adaptation and mitigation have been identified (Illman et al., 2014):

- Adaptation actions that can affect mitigation,
- Mitigation actions that can affect adaptation,
- Decisions that include trade-offs or synergies between adaptation and mitigation,
- Processes that have consequences for both adaptation and mitigation.

Countries typically have separate responses to adaptation and mitigation which could miss important opportunities for synergies and win- wins, and for understanding the tradeoffs. National climate policies that recognize the cross- sectoral interactions of adaptation and mitigation and include a judicious balance between adaptation and mitigation options that harness the potential synergies to maximize the benefits. At the same time, policies should identify and manage, minimize and safeguard from the potential risks of adverse outcomes that could arise from tradeoffs (Berry et al., 2015; Leonard et al., 2016). Such policies could offer greater opportunities for countries to achieve sustainable development (Dang et al., 2003).

Several studies place an emphasis on the importance of pursuing synergies between mitigation and adaptation. Laurikka (2013) states that pursuing synergies offer win- win solutions to formulate more efficient, responsive and comprehensive policies while guiding the economies

towards a low carbon pathway and increasing climate resilience simultaneously. Behnassi et al. (2014) also emphasize that harnessing synergies can facilitate building the necessary knowledge base, institutional capacity as well as the sectoral collaboration, which is the foundation for effective climate policy. A study on the analysis of the synergies and trade-offs between adaptation, mitigation, and sustainability revealed that leading communities integrate both adaptation and mitigation and identify both the challenges and benefits of their interactions which bears repercussions for decision making at different levels (Shaw et al., 2014). Dang et al. (2003) identified the major enabling conditions for synergies between mitigation and adaptation as : "(1) planned and/or existing national laws, policies and strategies; (2) existing and planned financial means and measures; (3) institutional arrangements in the country with specific reference to climate change issues; and (4) planned and/or existing plans, programs and initiatives in the country". This study also revealed that the potential for synergies exist not only in developed countries, but also developing countries, especially middle income countries. Maximizing such synergies can help to create the foundations of the institutional capacity and sectoral collaboration required in formulating effective climate policies (Laurikka, 2013).

However, cases arise where synergies cannot be developed among all the components of a policy due to inadequate conditions, biases and competition among the means for implementation (Moser, 2012) or the fundamental distinctions between adaptation and mitigation. In such circumstances, the most rational compromise has to be considered in the form of tradeoffs (Kengoum & Tiani, 2013). Tradeoffs can be categorized as either direct and immediate with clearly identifiable local consequences, or indirect and delayed with obvious or less- obvious tele- connections. This characteristic of tradeoffs can be attributed to the temporal and spatial disconnects between decision makers (Cash et al, 2006). Regardless of the characteristic, consideration of tradeoffs across multiple scales as well as sectors is crucial so that they can be minimized, and if possible, avoided altogether (Harvey et al., 2014).

2.3 Synergies and tradeoffs across sectors

Synergies and tradeoffs between mitigation and adaptation options can occur within same sector or across several sectors. In one study, the largest category of synergies was observed within the same sector, even though these synergies were not explicit (Stoorvogel et al., 2006; Challinor, 2011). Such mitigation strategies can increase climate resilience by improving the adaptive capacity (Yohe and Tol, 2002). Berry et al. (2015) identified such same- sector interactions in urban water management, where rainwater harvesting and grey- water use can decentralize the water supply, reduce the pressure on potable water and improve water security, thereby increasing resilience to droughts. Another example of synergies that exist within the same sector includes urban greening with urban trees and greenspace for reduction of runoff, which additionally decrease the urban heat island effect.

However, a study by Berry et al. found that in many cases, synergies and tradeoffs both within and between sectors were not mentioned, even though most of the measures affected other sectors resulting in these interactions. Most of the cross- sectoral synergies were related to

biodiversity or water. Laurikka (2013) states that while the most promising potential for synergies have been identified in agriculture, forestry and land use sectors, other sectors including energy, transportation, infrastructure planning and construction and waste treatment also exhibit the potential for synergies. Urban areas also have tremendous potential for synergies, particularly in the building, energy and infrastructure sectors (Landauer et al., 2015).

REDD projects demonstrate a major potential for synergies as they aim not only to sequester a significant amount of GHGs, but the conservation of forest ecosystems could have a positive impact on the local climate, and can consequently increase the adaptive capacity of the forests while reducing their vulnerability (De la Torre et al., 2009). A study by Lotacelli et al. (2015) revealed that ecosystem based conservation and management produce synergistic effects by improving carbon sinks while simultaneously protecting watersheds against climate variations. The strategies include soil management and water infiltration that result in carbon sequestration and improved ecosystem services for adaptation, such as coastal area protection and water regulation (Di Gregorio et al., 2015).

Another study also highlights the synergies from forests, including short term and long term synergies. In the short term, forests contribute to minimize the communities' vulnerability to the present climate variability. In the long term, forest based ecosystem services can assist in regulating hydrological flows and thus reduce the vulnerability of communities to drought, while mitigating climate change (Seymor, 2010).

Likewise, the 'Restoring Peatlands Project' in Belarus also provides opportunities for multiple synergies including biodiversity conservation, regulation of local micro- climate, improved soil quality and water management, improved water regulation and retention, water level stabilization in damns, while reducing GHG emissions at the rate of 2.9 tons CO_2 equivalent ha^{-1} y^{-1}. In addition to this, the avoided peat fires from the project also add to the overall benefits of the project towards addressing climate change.

Agro- forestry also has potential for synergies between adaptation and mitigation as they can improve soil fertility, reduce desertification, diversify farm production and reduce vulnerability while aiding in carbon sequestration and promoting mitigation. Examples include mixed-species forestry that reduce vulnerability as well as sequester carbon and mangrove plantations that reduce the vulnerability of coastal areas while sequestering carbon.

In Northern Tanzania, Ngitili system expansion projects commenced after recognizing the sequestration potential of Ngitili in addition to adaptation benefits of the system. In a case study carried out in the Shinyanga region, Ngitili vegetation resulted in not only catchment conservation, but also subsequently increased the adaptive capacity of the communities (Mlenge, 2004; Daguma et al., 2014), and sequestered approximately 23 million tonnes C by 2000 (Barrow and Shah, 2011).

Synergies are also evident in agriculture. Rosenzweig and Tubiello (2007) emphasize on the need to recognize the key synergies in agriculture as mitigation practices could contest the

modifications to local agricultural practices that are intended to maintain production as well as income. Also, it could help farmers as well as land managers to select appropriate strategies that simultaneously address food security and climate policy requirements.

Conservation agriculture in the Mediterranean region not only reduced GHG emissions from soil, but also decreased the vulnerability of crops to variable rainfall patterns (Kassam et al., 2012). Similarly, soil management practices in the region contributed to increasing the soil organic carbon which led to building crop resilience, while helping in carbon sequestration (Aguilera et al., 2013). In New Zealand, a study on the plantation of multi- purpose trees identified synergies between adaptation and mitigation (Kenny, 2011). The use of woody biomass for alternative renewable energy in Australia contributed to both emissions reduction and decreasing vulnerability during droughts (Bryan et al., 2010).

Smith (2010) identified adaptation strategies that have positive interrelation with mitigation, including measures that decrease soil erosion, leaching of nitrogen and phosphorous, measures for maintaining soil moisture, growing crop rotation diversity, modifying microclimate as well as land use. These adaptation strategies can reduce GHG emissions from agriculture by improving nitrogen use efficiency as well as soil carbon storage.

Synergies in the form of food security as well as climate mitigation have been identified in Sub-Saharan Africa, particularly in areas where land availability is high, coupled with low population densities. However, in areas with higher population densities and smaller farm sizes, trade- offs exist as yields are not adequate enough for reforestation, and the use of green manure in such areas will lead to net carbon dioxide equivalent emissions because of increase in nitrogen (Palm et al., 2010).

A study by Rahn et al. (2014) on the synergies among climate change mitigation, adaptation and livelihood benefits from coffee production in Central America identified seven adaptation strategies that demonstrated synergies with mitigation. Among these seven, coffee agroforestry systems in degraded areas and boundary tree plantings resulted in the highest synergies.

Tradeoffs also exist between adaptation and mitigation across several sectors. Harvey et al. (2013) state that several tradeoffs can be recognized between mitigation and adaptation when they are approached separately.

Eucalyptus plantation in the highlands of Ethiopia which resulted in carbon sequestration also caused water availability issues due to its intense water consumption. Moreover, the species also competed with adjacent crops resulting in a reduction in yield (Kidanu et al., 2005). Likewise, biofuel production using tree-crop as a renewable energy resulted in competition for agricultural production land despite a significant amount of carbon being sequestered and decrease in the dependency on fossil fuel for energy (Bryan et al., 2010). Similarly, carbon projects can lead to large- scale land use changes, impacting the access to land as well as other resources, as well as biodiversity (Asquith et al., 2002).

Herrero et al. (2009) mentions that livestock, which is a common adaptation mechanism in drought prone areas contributes to approximately 18% of the GHG emissions. Similarly, the use of intermittent irrigation technique in rice paddy cultivation as an adaptation tool leads to higher N_2O emissions.

Sagor (2013)'s study on trade- offs between mitigation and adaptation approaches reveals that maintaining higher stock levels in northern hardwoods systems for enhancing mitigation could bear detrimental impacts on potential adaptation by decreasing the stand- level structural and compositional complexity. Moreover, it led to the decrease in the system's response diversity, subsequently increasing its vulnerability to the changing conditions. Similarly, this approach could be maladaptive in areas that are fire- prone or insect outbreak prone, where it could decrease the system's resilience, and make it more vulnerable.

REDD+ projects can also result in trade-offs. According to a study carried out by CIFOR (2013), trade-offs in REDD+ projects include decrease in the quantity of water available downstream, increased susceptibility of watersheds to climate change, and limited access of local communities to forest resources.

Another case of trade-offs is illustrated in Ngitili restoration in New Zealand. The increasing expansion of such a fodder management approach can compete with land availability for agricultural production. Likewise, there is a possibility of woodland invasion by the Ngitili species which, although can enhance carbon sequestration in the long run, however, can also constrain the production of livestock feed (Daguma et al., 2014).

Trade- offs can also be seen in urban forms. A study by Hamin et al. (2009) on land use plans and policies that address climate change in the United States and Australia revealed that the policies demonstrate potential conflicts to achieve adaptation and mitigation simultaneously. The most significant tradeoff in urban form is the 'density conundrum', where mitigation policies favor a denser urban environment to reduce the GHG emissions, while adaptation policies favor open space for managing storm water in the event of extreme storms, species migration, urban cooling, etc.

A multi criteria assessment of three urban policies, namely; greenbelt, zoning and transportation subsidy policies showed that when treated separately, the policies conflicted with one another. However, under a policy mix, the interactions of these policies were synergistic, particularly for the case of flood zoning and greenbelt policies, which could in fact, be plausible only if they were integrated with transportation policies (Vigue and Hallegatte, 2012).

A number of factors should be considered when considering the interactions between adaptation and mitigation (Berry et al. 2009). As much important it is to identify the interactions among policies, however, it is rather difficult to integrate the two distinct policy options. Institutional complexity is a major challenge, especially because of the number and diversity of the stakeholders involved. The fundamental institutional divergences across various scales for adaptation and mitigation measures could be crucial roadblocks (Klein et al., 2005; Tompkins

and Adger, 2005). Kengoum and Tiani (2013) identify ex- situ precondition to synergy between climate change and development policies, and in –situ challenges within national policies as the major challenges for creating synergies between climate change mitigation and adaptation in milieu of development.

A study by Klein (2005) reveals that institutional complexity, on both national as well as global levels, is a major barrier, given the diversity of sectors as well as stakeholders involved in order to pursue the synergies. Likewise, a study by Suckall (2014) on the barriers to maximize synergies between adaptation and mitigation in communities revealed four categories of barriers: resource, regulatory, learning and governance barriers. Another barrier identified by Somorin et al. (2012) is the different rationales that drive the implementation of projects that have potential for synergies, including cost effectiveness, location of project, and funds for implementation of projects. Moreover, the complexity of interactions itself could be a barrier, particularly for junctions among water, land use, energy and biodiversity, as the appropriate tools to effectively realize and manage such interactions are inadequate.

The interactions between mitigation and adaptation have not been well- explored, and require further research to quantify the extent of these interactions. Smith (2010) states that understanding these interactions, particularly in the context of agriculture, require new production systems that combine bioenergy, food as well as feed production systems. Interactions between mitigation and adaptation, whether synergies or conflicts or trade-offs, across all sectors, should be included in the assessment of the impacts of adaptation and mitigation measures so that the responses to climate change are efficient and the benefits are maximized (Landauer, Juhola and Soederholm, 2015).

2.4 AHP in climate policies

AHP (Analytical Hierarchy Process) is a "decision support tool appropriate to solve complex decision problems taking into account tangible and intangible aspects" (Saaty, 1987). It is a form of multi- criteria analysis, in which pairwise comparisons using expert judgements are carried out to derive priority scales. It is applied by "making comparisons using a scale of absolute judgements that represents how much one element dominates another for a given criteria. The derived priority scales are then synthesized and the weighted scores are then aggregated" (UNEP). One of the major strengths of AHP is its ability to handle both qualitative as well as quantitative judgements (Macharis et al., 2004). A consistency test can be conducted to ensure that no inconsistencies in judgements exist, which adds to the reliability of the results obtained (Kablan, 2004; Pohekar and Ramachandran, 2004).

The approach has high relevance for assessment of decisions regarding climate change, as it is particularly suitable where a wide range of stakeholders are present, and the issues being dealt with comprise uncertainty, risk and some subjectivity (Bharwani et al., 2004).

The initial applications of AHP in climate policy started in the context of global negotiations on climate change (Ramanathan, 1998), which was then followed by applications in mitigation

policy instruments (Konidari and Mavrkis, 2007). It is now a widely used approach in climate policy analysis, mitigation and adaptation alike. It has been used in the assessment of transport policies (Berrittella M., 2008), land use policies (Xu W., 2014), interactions between energy and climate policies (Grafakos S., 2010).

Likewise, AHP has also been used to rank and prioritize adaptation strategies for agriculture in Spain's Guadiana river basin, where the main aim of the study was to identify the cheif impacts of climate change on agriculture sector, and identify the adaptation measures in order to ensure its practicality, such that it maximized potential new opportunities while minimized the negative consequences (Varela-Ortega et al., 2016).

Another case of using AHP for decision making for mitigation includes a study by Toossi et al. (2013) for energy systems policy making in the UK to decide on an effective energy transition pathway that contributes to reduction in emissions as well as the reliance on non- renewable energy sources in the UK.

2.5 Climate change policies of Nepal

The landlocked and mountainous geography of Nepal coupled with its socio- economic condition of widespread poverty places it at a high vulnerability to climate change (Shrestha and Aryal, 2011; Pant and Gautam, 2013). Climate change impacts are being observed and subsequent measures are being undertaken to address this. Various stakeholders at different levels, from local to donors, are actively engaged in effective adaptation measures (Pant and Gautam, 2013).

The Second National Communications (SNC, 2014) of Nepal provides a national level inventory of GHGs with respect to 2000 as the base year. According to the SNC, the total CO_2 emission of Nepal is 24,541 Gg, of which 12,776.38 Gg of Co_2 equivalent is removed from the atmosphere by land use. Agriculture is the biggest contributing sector to GHGs, attributing to 68.9% of the total emissions, followed by energy (27.8%). The waste sector contributes to 2.7% of the total emissions, while industrial processes account for approximately 0.5% of the national GHG emissions. Mitigation as well as adaptation measures to decrease the vulnerability while increasing climate resilience have been developed following the inventory. While mitigation measures are proposed for energy, industrial processes, agriculture, waste and land use sectors only, adaptation measures are extended further to water resources, climate induced disasters, forests and biodiversity, human settlement and infrastructure, public health and gender and social inclusion. However, interactions between mitigation and adaptation are not explored in this document.

A policy review by Pant and Gautam (2013) included the laws and policies on community forestry, water resource strategy and national water plan, NAPA and constitutional provisions of Nepal. NAPA offers a comprehensive vision for adaptation in Nepal, with priorities in agriculture, community based disaster risk management, forest and ecosystem, and a strong governance structure to support it, led by the Ministry of Environment. It is a comprehensive

policy framework that has been developed through extensive stakeholder consultation. Nepal's NAPA places a huge emphasis on the need for and importance of local level decision making as well as control over the use of adaptation funds. Although the immediate concern of NAPA is adaptation, co- benefits can be observed with mitigation, thereby paving paths for synergies. LAPAs (Local Adaptation plans of Action) reinforce this emphasis, providing the local communities to identify their specific needs as well as the necessary adaptation measures.

The Climate Change Policy of Nepal (2011) was formulated with the goal of "enhancing the livelihoods of peoples by mitigating as well as adapting to the adverse impacts of climate change, while adopting a low carbon development pathway that supports the country's commitments to climate related agreements, both national and international". The policy sets specific quantitative targets and objectives, and has adopted the following policies:

- Climate adaptation and disaster risk reduction
- Low Carbon development and climate resilience
- Access to financial resources and utilization
- Capacity building, people's participation and empowerment
- Study and research
- Technology development, transfer and utilization
- Climate friendly natural resources management

Nepal's INDC (2016) has targets for both mitigation and adaptation and has ten targets. , including reduction of Nepal's dependency on fossil fuels by 50%, and aims to decrease the dependency on biomass. A hydro- powered rail network by 2040 is envisioned for a greener transportation in the country, alongside sustainable management of forests for maintaining forest cover. Following the INDCs, Nepal also submitted its Nationally Determined Contributions (NDCs) while ratifying the Paris Agreement in 2016. The NDCs of Nepal comprises of 14 targets, which is an addition of four targets to the INDC. However, it does not contain quantifiable overall impacts of the targets on GHG emissions. The additional four targets are:

- By 2020, Nepal intends to expand its energy mix focusing on renewables by 20% and diversify its energy consumption pattern to more industrial and commercial sectors.
- By 2020, Nepal aims to increase the share of electric vehicle up to 20% from 2010 level.
- By 2050, Nepal will reduce its reliance on fossils in the transport sector by 50% through effective mass public transport means while encouraging energy efficient and electrical vehicles.
- Nepal will pilot a sub-national project on REDD+ to reduce about 14 million tons of CO_2-eq by 2020 by addressing the drivers of deforestation and forest degradation and strengthening governance mechanisms in all types of forests and protected areas.

Despite Nepal's additional targets in the NDCs that reflect Nepal's goal to proceed towards low carbon sustainable development pathway, there are many individual actions with different target years. Moreover, some of actions lack detail and leave room for further elaboration.

Furthermore, the aggregate impact of these targets cannot be quantified (Climate Action Tracker, 2016). Likewise, these targets do not explicitly mention any kind of interactions between mitigation and adaptation.

Climate change related policies of Nepal, thus inlcude both mitigation and adaptation measures. A study by Gopichandran and Behnassi reveals that developing countries can harness synergies from sectors with high mitigation potential that have been focused in national level adaptation plans. Urban areas, in particular, provide abundant opportunities to pursue synergies in infrastructure and building sectors. Other recent studies have identified the potential for synergies in infrastructure planning and construction, energy, transportation and waste treatment sectors. (Kengoum and Tiani, 2013).

Harnessing these synergies can not only move national economies to low/zero-emission pathways, but can simultaneously accelerate the required adaptation and resilience building. However, research on the mitigation adaptation synergies remain rather limited (Dang et al., 2008). Understanding the drivers as well as mechanisms of these interactions to avoid tradeoffs, especially maladaptation is necessary. There is a major gap between mitigation and adaptation policies in the context of Nepal, where emphasis is largely placed on adaptation and mitigation policies are mostly focused on, if not limited, to energy sector. Identification as well as consideration of potential interactions is missing and policies are implemented in silos. Achieving a climate resilient low carbon sustainable economic development requires Nepal to consider the potential interactions between its segregated mitigation and adaptation policies. Therefore, it is high time that Nepal act to bridge the gap between its climate change policies and look at mitigation and adaptation through an integrated lens.

CHAPTER 3
METHODOLOY

3.1 Overall methodology

The overall methodological framework of the study is shown in Fig 3.1. The first step is review of policies which includes INDC, NAPA, national communications, climate change policy, and other policies that are relevant to addressing climate change in Nepal. Policies from four sectors were considered for the purpose of this study: AFOLU, Energy, Water and Urban systems. Following this, the policies were classified as adaptation or mitigation on the basis of literature review, and a list of possible opportunities and barriers to pursue the potential synergies, as well as the criteria to assess the opportunities and barriers were also prepared.

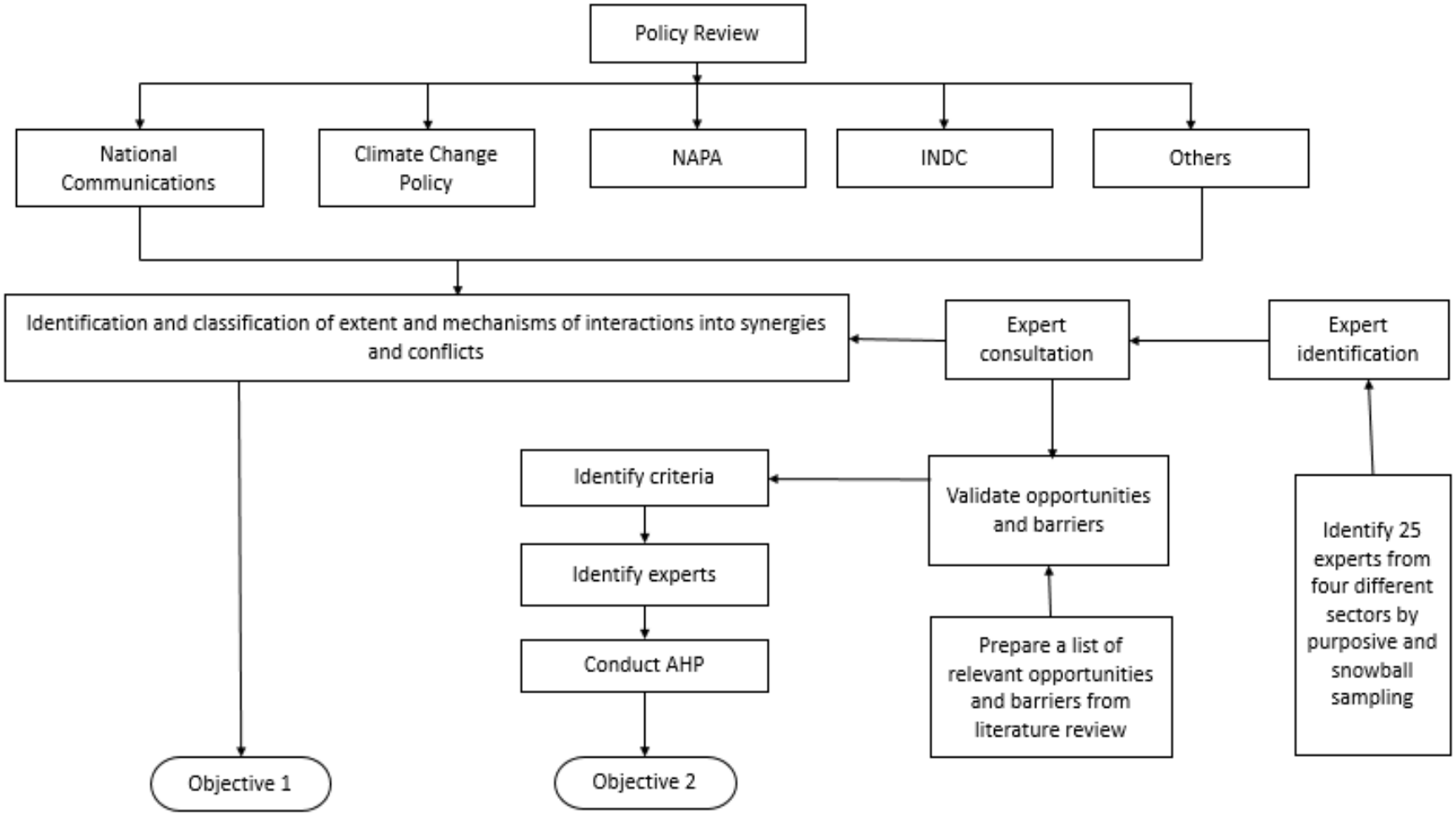

Fig 3.1: Overall methodological framework

Table 3.1: Detailed methodology for objective 1

Step	What to do?	How to do?	Requirement	Expected output
1	Collect mitigation and adaptation policies in Nepal from AFOLU, energy, water and urban systems sector	Review of National Communications, NAPA, Climate Change policy, INDC, NDC and other sectoral policies	Policy documents on NC, NAPA, Climate change policy, INDC, NDC, others	National level policies relevant to climate change mitigation and adaptation for different sectors
2	Conduct one- on- one interviews with experts	-Identify 25 experts by purposive and snowball sampling -Prepare open ended semi-structured questionnaires	Questionnaires	-Classification of interactions into synergy or conflicts -Remarks on the mechanisms for the interactions
3	Identify the interactions as synergy or tradeoffs and their interactions	-Use data from step 2 to classify the interactions	Data from step 1 and step 2	Graphical representation of the interactions
4	Validate the list of opportunities and barriers	Present the list to the experts and ask them to verify and validate the list	Literature on similar studies about identification of opportunities and barriers	A final comprehensive list of opportunities and barriers

Table 3.3: Detailed methodology for objective 2

Step	What to do?	How to do?	Requirement	Expected output
1	Identify criteria	Review previous relevant literatures that carry out AHP using criteria for assessment	Literature on similar studies about identification of criteria	Final list of criteria to assess opportunities and barriers
1	Identify experts	20 experts to be selected from government, NGOs, INGOs, academics and private sector	Contact address of the experts	20 experts as stakeholders for AHP

2	Questionnaire survey for prioritizing opportunities and barriers	Conduct close ended structured questionnaire survey with the experts	Questionnaires	Pairwise comparisons of opportunities and barriers
4	Conduct MCA using AHP	Use a software (SuperDecisions) to conduct AHP	-Input data for AHP -Software	Ranking and prioritizing of the opportunities

3.2 Stakeholder identification and classification

Stakeholder identification was carried out using purposive and snowball sampling. The criteria for expert selection included:

i) Worked in the field of policies relevant to climate change for 3 or more years
ii) In decision making positions
iii) Availability to participate in at least one stage of interview

The stakeholders comprised of experts from the fields of AFOLU, Energy, Urban Systems and Water sectors. The stakeholders were broadly classified into five categories, namely: (a) government sector, (b) INGOs, (c) NGOs, (d) academics/ research, and (e) private sector.

The first round of interviews comprised of a total of 25 experts: 7 from AFOLU, 6 each from Urban Systems, Energy and Water sectors.

For the second round of interviews, the pool of experts also included donor agencies, which comprised of international funding agencies. A total of 20 experts were interviewed altogether, which also comprised of some experts from the previous round.

3.3 Data analysis

The first round of interviews was carried with a total of 25 experts to understand whether or not interactions existed among the policies, using open ended structured questionnaires. The extent of the mechanisms were established using the scoring system (Table 3.1) developed by the International Council for Science (2016).

Table 3.3: Scoring system to determine the interaction between policies

Interaction Score	**Name**	**Explanation**
3	Indivisible	Inextricably linked to the achievement of another policy

2	Reinforcing	Aids to the achievement of another policy
1	Enabling	Creates conditions that furthers another policy
0	Consistent	No significant positive or negative interactions
-1	Constraining	Limits options on another policy
-2	Counteracting	Clashes with another policy
-3	Cancelling	Makes it impossible to reach another policy

To assess the mechanisms of the interactions, in- depth interviews were conducted with the experts. Following this, the experts were asked to verify the list of opportunities and barriers, and to make further additions, if required. This initial list was consolidated to form a shorter list of opportunities and barriers. The experts also validated the list of criteria.

The results obtained were then represented graphically using frequency distribution charts to show the percentage of respondents who gave a particular score, and using perceptual maps to show the extent of synergies and conflicts. The perceptual maps were prepared using the modal score, i.e. the most frequent score.

SuperDecisions software was used to form the hierarchy and subsequent questionnaires to carry out AHP. A second round of interviews using these questionnaires was carried out with 20 stakeholders. The stakeholders included a few experts from the first round, and other experts were also contacted in order to avoid biases in the results. Experts from donor agencies, and freelance consultants were added to the list of the experts, while experts belonging to redundant sectors were avoided. AHP was then carried out to rank and prioritize the opportunities and barriers to pursue the synergies and avoid the conflicts and tradeoffs.

3.4 Pairwise comparisons using AHP

AHP is a multiple-criteria decision analysis tool that is combines practical and theoretical considerations to make pairwise compromises (Ahmad &Tahar, 2014).In AHP, a pairwise comparison of criteria converts them qualitative data into a numerical format (Darshini et al., 2013) using weights. In this study, the weights ranged from 1 to 9 and were displayed as ordinal scale of importance in questionnaires (1=Equal importance; 3=Moderate importance; 5= Demonstrated importance; 7=Essential importance; 9= Extreme importance).

Table 3.4: The fundamental scale of importance

Intensity of Importance	Definition	Explanation
1	Equal importance of both options	Two activities contribute equally to the objective
3	Moderate importance of one option	Judgement slightly favors one criteria over another

5	Strong importance for one option	Judgement strongly favors one criteria over another
7	Very strong importance for one option	A criteria is favored very strongly over another
9	Extreme importance for one option	Judgement favoring a criteria is of the highest possible order of affirmation

The resulting ranking can be shown in the form of a matrix of weights, where the designated relative weight is keyed into the matrix as an element a_{ij} (element of row i column j) and its reciprocal value ($1/a_{ij}$) is then designated to element a_{ji} (Ahmad &Tahar, 2014; Catron et al., 2013; Darshini et al., 2013; Dwivedi & Alavalapati, 2009). All values for a_{ij} where i=j is 1,as shown in equation 1:

$$A = (a_{ij}) = \begin{bmatrix} 1 & w1/w2 & \cdots & w1/wn \\ w2/w1 & 1 & \cdots & w2/wn \\ \vdots & \vdots & & \vdots \\ wn/w1 & wn/w2 & \cdots & 1 \end{bmatrix} \quad (1)$$

Here, rows specify weight ratios of individual factors, and all the values of aij>0. Multiplying matrix A by the transpose of the vector of weights (say matrix W) leads to Equation 2:

$$AW = N.W = \lambda_{max} W, \quad (2)$$

Where, N is the number of rows and columns, W = (W1, W2,…, WN), and λ_{max} is the largest Eigen factor. Consistency test is then conducted, whereby if the matrix is consistent, then $\lambda_{max} = N$. However, if the responses are inconsistent, then $\lambda_{max} \neq N$. Thus, matrix A must be examined for consistency using equations 3 and 4:

$$CI = (\lambda_{max} - N)/ (N-1), \quad (3)$$

$$CR = CI/RI, \quad (4)$$

Where, CI is the Consistency Index, RI is the Random Index produced for a random matrix of order N, and CR is the Consistency Ratio. A rule of thumb is that the CR ≤ 0.1 (Darshini et al., 2013).

CHAPTER 4
RESULTS AND DISCUSSIONS

4.1 Identification of the extent and mechanisms of interactions between mitigation and adaptation policies

Majority of the policies prepared in the context of Nepal is emphasized on adaptation, as it is viewed as the urgent need of the country. Although most of the policies (with the exception of energy sector) were formulated with the notion of adaptation, they also exhibit potential for mitigation. The dual adaptation mitigation nature of these policies were verified from the survey. The extent of interactions range from -2 to 3 (fig 4.1), revealing that there are both potential conflicts and synergies in the policies. Conflicts have been identified in AFOLU and water sectors, while in case of energy and urban systems sectors synergies and no- interactions were identified. The following table gives an overview of the distribution of synergies, conflicts and non- interaction among the four sectors.

Table 4.1: Distribution of interaction scores among different policies

Interaction/Policy	AFOLU	Energy	Urban systems	Water	Total
Synergy	75	31	35	21	162
Non- interactions	16	4	7	19	56
Conflicts	7	0	0	2	7

Note: The distribution of the scores are based on frequency, and do not represent the extent of interactions.

The maximum number of synergies were identified in AFOLU policies followed by urban systems, energy and water sector policies: AFOLU> Urban systems> Energy> Water

The degree of non- interactions in the policies were in the order of: Water>AFOLU >Energy> Urban systems. The non- interactions in water and energy sector were observed due to the policies being directed more towards adaptation in water sector and mitigation in energy sector. Water sector policies are directed towards disaster risk reduction from water- induced disasters, whereas energy sector policies are focused towards renewable sources of energy that reduce emissions.

AFOLU sector was observed to have a higher number of potential conflicts in the policies than water sector. The conflicts in policies in both these sectors in the context of Nepal were identified due to lack of appropriate measures and mechanisms to further the possible synergies that might be present in the respective sectors.

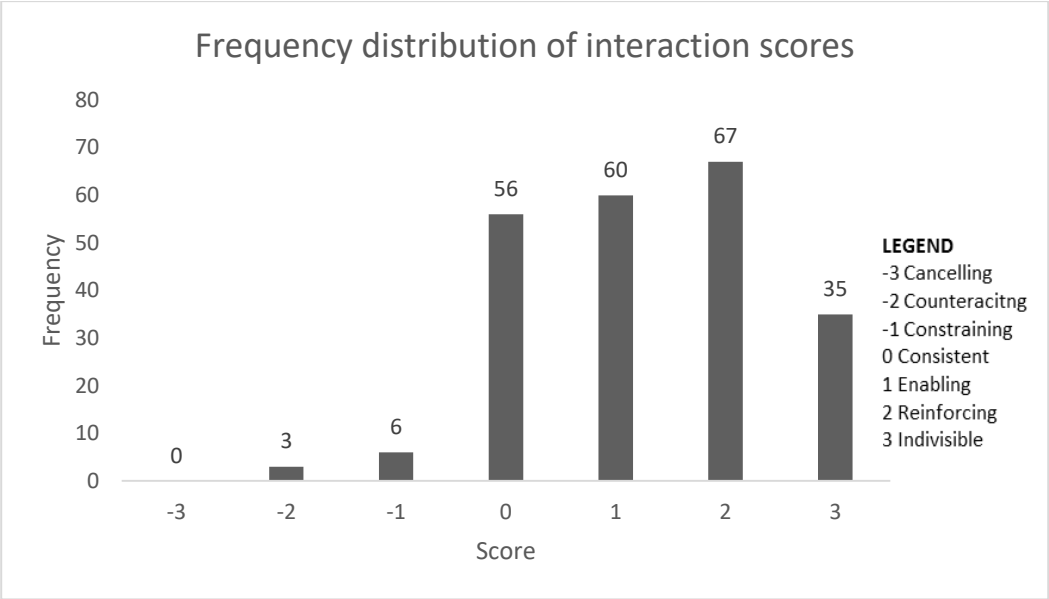

Fig 4.1: Graph showing the frequency distribution of interaction scores

The nature of the interactions is not only limited to same sector: cross- sector interactions are also present. Synergies across water, energy (particularly hydropower) and land use policies are evident, particularly in the case of large- scale projects such as water- diversion (inter- basin) and reservoir construction. Likewise, trade- offs have to be considered between water and energy and forest related policies in the context of hydropower development and forest cover expansion. Urban systems policies have to take land use planning and energy as well as water sector policies into account for climate resilience.

The extent and mechanisms of these interactions are discussed for four sectors: Agriculture, Forestry and Other Land Use (AFOLU), Energy, Water and Urban systems in the following section. The extent of the interactions have been analyzed from box plots and frequency distribution of the % of responses. Perception mapping of the interaction scores has also been done on the basis of the modal score to identify the interactions most agreed upon by the experts.

I. Agriculture, Forestry and Other Land Use (AFOLU)

The interaction scores for AFOLU policies ranges from -2 to 3, revealing that these policies have potential for both conflicts as well as synergies. 4 (A7, A11, A12 and A14) of the 14 policies have the potential for conflicts between mitigation and adaptation goals, while the rest have potential for synergies. Experts identified the maximum number of interactions in AFOLU policies as enabling (score=1), followed by reinforcing (score=2). The extent of conflicts was identified as constraining (score=-1).

(Note: Refer to Table 4.1.1 for the detailed version of policies A1- A14.)

Fig4.2: Graph showing range of interaction scores in AFOLU policies

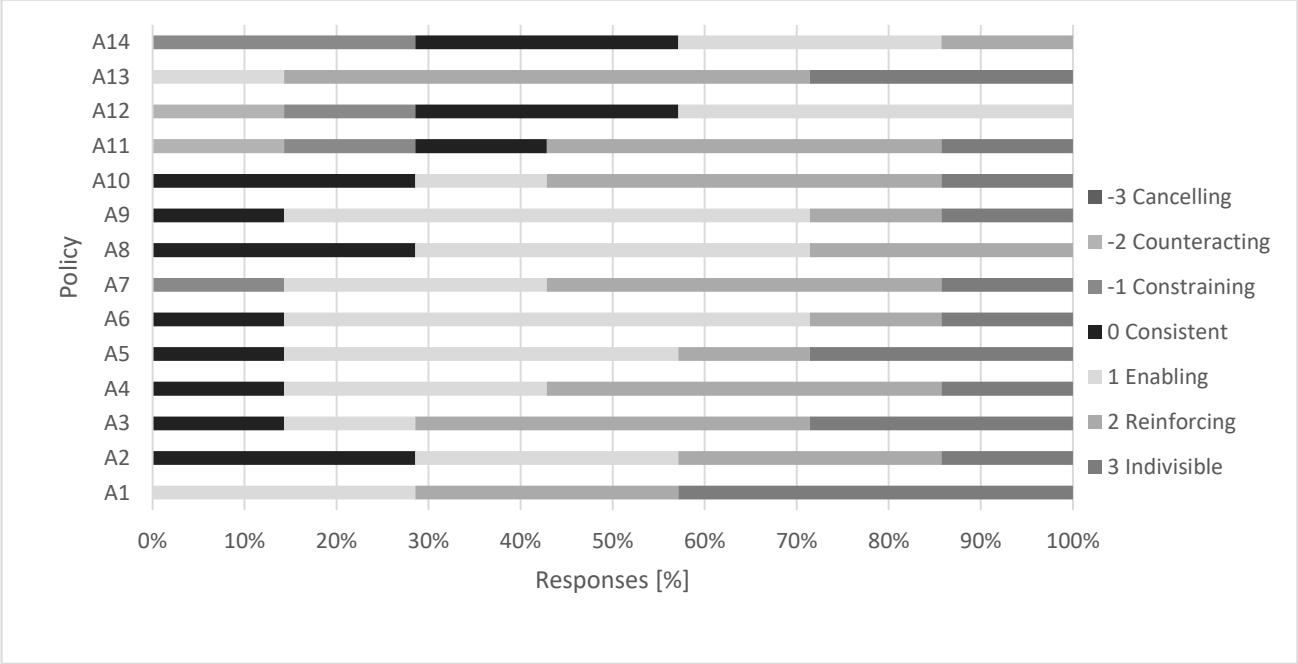

Fig 4.3: Frequency distribution for interaction scores in AFOLU policies

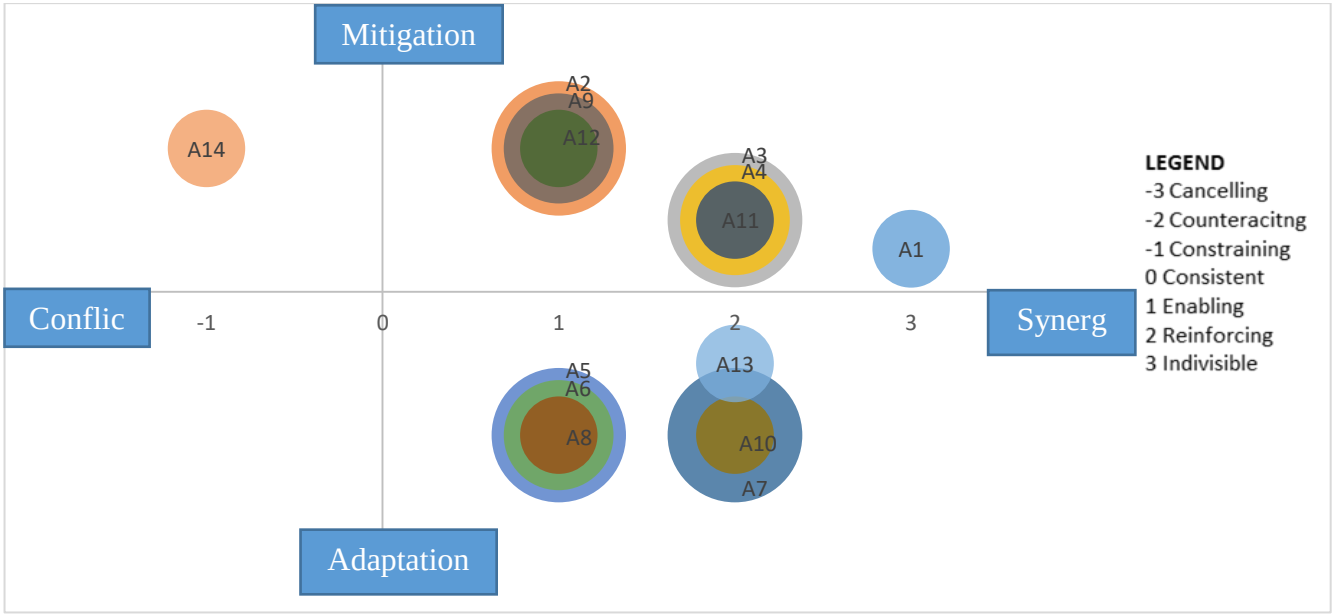

Fig 4.4: Perception mapping for AFOLU scores (Note: The extent of synergies are independent of the size of the bubbles)

As can be seen in Fig 4.4, the modal scores of 13 of the 14 policies in ALOFU depict synergies, ranging from 1 to 3, 12 of which have the scores 1 and 2, implying that the adaptation policies can enable and/ or reinforce mitigation co- benefits and vice- versa. The modal score of A14 is -1, implying that this mitigation policy is constrains the achievement of adaptation objectives. Mechanisms of these interactions are described in Table 4.1.1.

Table 4.1.1: Table showing the mechanism of interactions in AFOLU policies

Policy	Policy Description	Mechanism of interaction
A1	Maintain at least 40% forest area (Forest policy **pg 5**, 2015)	These policies, although primarily formulated as mitigation policies, also bear adaptation co-benefits, thereby presenting the potential for synergies in AFOLU sector. Maintaining of forest cover, enhancing forest carbon stock and expanding the scope of carbon sequestration are inter- related policies that not only aid to mitigating the impacts of climate change, but also provide opportunities for alternative livelihoods as well as livelihood diversification for forest users. This in turn increases the adaptive capacity of the users, making them more resilient to the impacts of climate change. Moreover, there exist strong linkages with agricultural production and ecological balance. The growth of biomass outside of forest can contribute to local economy. Likewise, the formulation and implementation of land use plans that integrate Sustainable forest management can contribute to
A2	Enhance forest carbon stock by at least 5% by 2025 compared to 2015 level (Forestry Sector Strategy 2016-2025 in INDC **pg 3**, 2016)	
A3	Expanding the scope of carbon sequestration through sustainable management of forests, formulating and implementing land use plans and controlling deforestation (Climate Change policy **8.2.3**, 2011)	

A4	Encouraging carbon sequestration and investing some of the benefits from the use of forest products for controlling forest fires and conserving forests (Climate Change Policy **8.7.6**, 2011 & Forest policy 2015)	adaptation by supplying forest products and increasing benefits of livelihoods, thereby enhancing the local economic activity.
A5	Forest and Ecosystem management for supporting climate led adaptation innovation (Forest Policy **pg 12**, 2014)	Both these policies imply integrated approaches to natural resource management. Forest based adaptation can directly contribute to synergies by increasing the forest cover (mitigation potential), and also providing habitat for biodiversity, aiding in water conservation, providing opportunities for agro-forestry as well as use of forest products (adaptation potential).
A6	Community based management through integrated management of agriculture, water, forest and biodiversity sector (NAPA **pg 29**, 2010)	
A7	Prioritizing and implementing programs on sustainable management of forests, agro- forestry, pasture, rangeland and soil conservation (Climate Change Policy **8.7.3**, 2011)	86% of the experts interviewed responded that this policy is synergistic in nature as the sustainable management of the resources can contribute to mitigation by reducing emissions from haphazard management of the resources. However, the remaining 14% experts identified conflicts in this policy under the pretext that current pasture and rangeland management practices are not conducive for controlling deforestation and land degradation.
A8	Utilization, promotion, conservation of forest resources as a means of alternative livelihoods (Climate Change Policy **8.7.2**, 2011)	Despite being formulated as an adaptation policy, A8 has potential for mitigation as well. Experts responded that promoting the use of forest resources as alternative livelihoods encourages forest conservation, including community forestry among user groups, and can aid in mitigation by enhancing forest carbon stocks.
A9	Afforestation in urban areas, including residential areas, and road- side plantations for environment friendly infrastruture development (Forest Policy **pg 6**, 2014)	Urban greening can contribute to mitigation by fostering carbon sequestration. They can also affect the micro- climate and help in regulating temperatures in urban areas. Additionally, this policy builds linkages between urban systems and forestry, thereby making way for inter- sectoral interactions.
A10	Use integrated river basin approach for land and water conservation and increased land productivity (Forest Policy **pg 8,** 2014)	Integrated river basin approach is a strong adaptation based program that can contribute to increased productivity. Although this policy is more focused on adaptation, it can contribute to mitigation by increased land productivity and consequently

		increased soil carbon stock. However, 29% of the experts argues that there are no interactions because in the context of Nepal, forest management, water conservation and land productivity policies are not in line with one another.
A11	Developing mechanism for optimal utilization of international regional and local funding sources, including REDD (Climate Change Policy **8.7.7**, 2011)	28% of the experts stated that there are possible conflicts in these policies because no appropriate mechanisms have been developed yet under the current legal and policy measures. Likewise, because carbon trading is a relatively new concept in Nepal, social and other policy supports for this are yet to be harnessed. 49% of the experts are in favor of possible synergies as REDD+, despite being a mitigation centric concept, can contribute to increasing livelihood and adaptive capacity.
A12	Use REDD+ as a means for generating finance through carbon trading (Forest Policy **pg 13**, 2014)	
A13	Provide financial and technical support for alternative energy, biogas, bio- briquette, improved cooking stoves and biofuel (Forest policy **pg 13**, 2014)	Synergies in this policy are derived from increased access to energy while simultaneously reducing the dependence on fossil fuels and promoting renewable energy and energy efficiency.
A14	Enhancing the adaptive capacity of food grains and species from the possible impacts of climate change (Climate Change policy **8.4.4**, 2011)	28% of the experts state that there are possible conflicts in this policy, primarily because climate policies and measures have not been fully implemented in agriculture sector in Nepal. At the same time, this policy does not support REDD as enhancing food security is believed to conflict with increasing forest cover and reducing land degradation.

II. Energy

Energy sector in Nepal is chiefly dominated by the traditional energy for domestic usage accounting for about 86% of the national energy consumption (K. C. et al., 2011). The policies are therefore chiefly directed towards access to energy and energy security. Nepal also demonstrates a tremendous potential for hydropower production and other sources of renewable energy, which can contribute to mitigation. The results from the interview reveal that all the energy policies considered in the study has potential for synergies between mitigation and adaptation, with the interaction scores ranging from 0 to 3. The maximum interactions in this sector were identified as reinforcing policies (score=2), followed by indivisible (score=3). However, experts also identified that energy sector policies have no significant interactions (score=0), as can be seen in Fig 4.6.

(Note: Refer to Table 4.1.2 for the detailed version of policies E1- E5.)

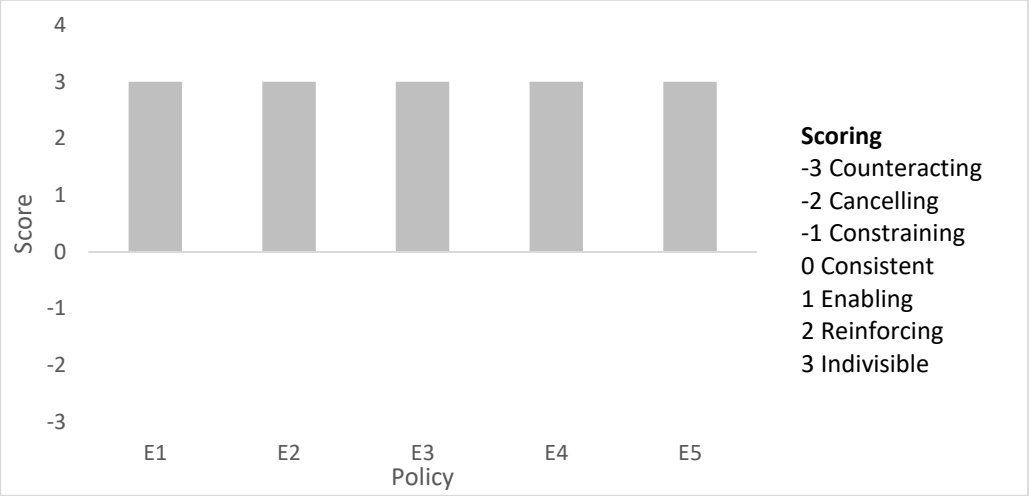

Fig 4.5: Graph showing range of interaction scores in Energy policy

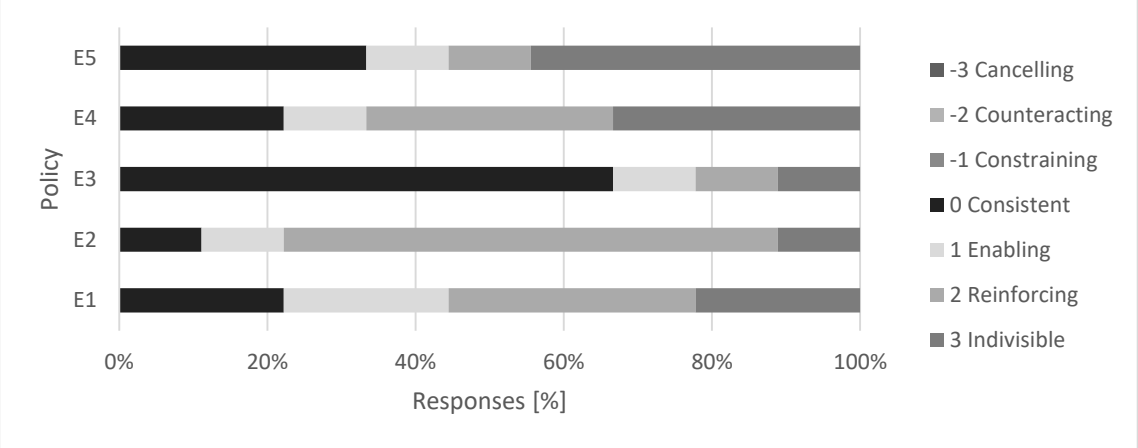

Fig 4.6: Frequency distribution for interaction scores in Energy policies

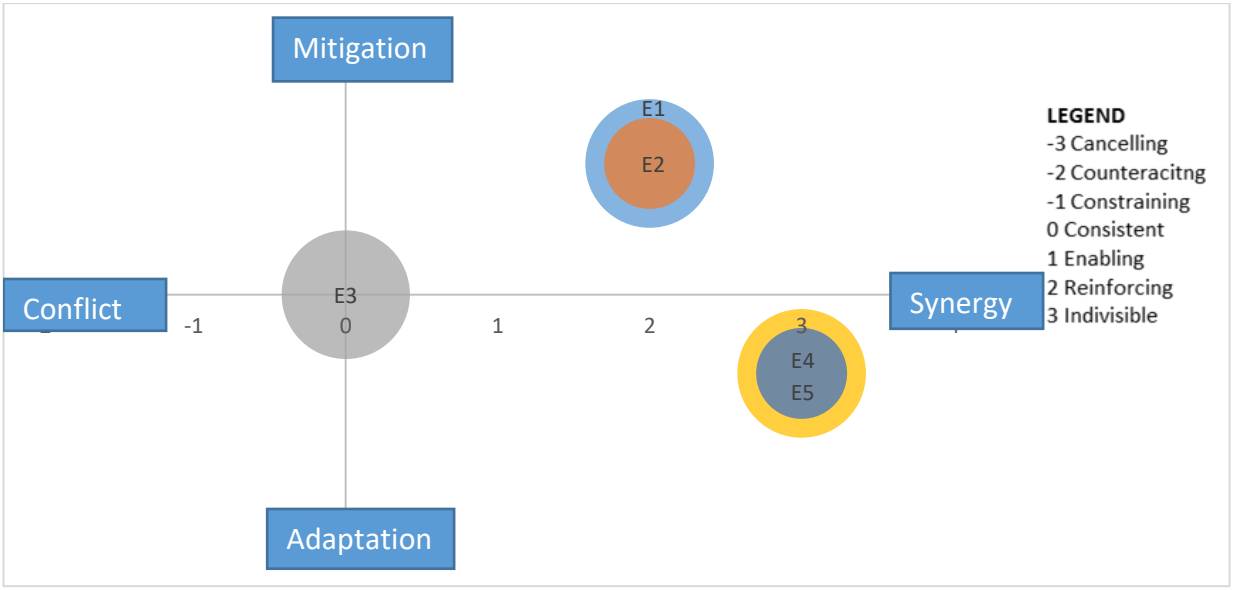

Fig 4.7: Perception mapping for interactions in Energy policies (Note: The extent of synergies are independent of the size of the bubbles)

It can be seen from fig 4.7 that there are no conflicts identified in energy sector policies. Adaptation policies have a higher potential of synergies with mitigation. However, E3 policy, which revolves around fuel tax, is observed to be neither an adaptation policy, nor mitigation, as it was formulated so as to improve air quality and reduce air pollution. The modal score for this policy is 0, meaning this policy has no potential for possible interactions. The mechanisms of these interactions are described in Table 4.1.2.

Table 4.1.2: Table showing the mechanism of interactions in Energy policies

Policy	Policy description	Mechanism of interaction
E1	Expand and decentralize energy mix, and promote renewable energy including solar/ hydro/ bioenergy (National Communications, 2014)	These policies are chiefly mitigation policies that aim to reduce the dependence on fossil fuels by encouraging renewable sources of energy. The synergies in these policies arise from the fact that these policies not only ensure mitigation, but also help to build the adaptive capacity of communities by providing opportunities of livelihood diversification. Likewise, these policies also pave the way for further detailed approaches related with specific energy sources.
E2	Encouraging investments in clean energy sources with priority on hydropower from national, regional and international sources (Climate change policy: **8.7.4**, 2011)	
E3	Increases in fuel taxes, incentives for mass transport systems, and fiscal incentives and subsidies for alternative fuels and vehicles. (National communications **pg 66**, 2014)	Fuel tax as a policy helps to reduce the dependence on fossil fuels, thereby helping in mitigation. 66% of the experts also believe that fuel taxes policies do not have any interactions as these are mostly mitigation policies, with no adaptation co-

		benefits. However, the revenue generated from this can be used to subsidize renewable energy technologies and energy efficient technologies thereby aiding in energy security.
E4	Development of solar energy technologies will be encouraged by integrating it with technologies for drying and cooking of food, purifying water, lighting and communication systems (Rural Energy Policy **4.4.3**, 2006)	These policies have been formulated primarily to ensure rural energy access as well as security. However, an emphasis renewable rural energy reduces the dependence on traditional fuel sources (primarily biomass) for domestic purposes, thereby helping to reduce emissions. Moreover, these policies also make renewable energy affordable to rural households, thereby promoting the use of clean and renewable sources of energy.
E5	Subsidies, credit and soft loan for Renewable energy sources (Renewable Energy Subsidy Policy, 2016)	

III. Urban systems

Policies in urban systems are focused at both adaptation and mitigation, and have potential for synergies, with the interaction scores ranging from 0 to 3 (fig 4.4). The maximum interactions identified in this sector were enabling (score= 1) followed by reinforcing (score=2). Policies for urban settlement with climate change dimensions and climate smart urban settlements, although are quite vast, have the scope for synergies between mitigation and adaptation. Urban settlements with provisions for rainwater harvesting, solar lighting, green areas, and increased public transportation can result in climate resilience that can increase the adaptive capacity while simultaneously contributing towards mitigation. However, promoting climate smart settlements throughout the country can be a strenuous task, chiefly due to the varied topography of the country and scattered settlements. Policies that promote electricity- based transportation, which are largely mitigation centric, need to be implemented on a phase- wise basis in order to ensure a smooth transition from fossil fuel based urban transportation to renewable energy based transportation. Although the concept might seem far- fetched in the present context, experts opine that it can be definitely achieved if done in a proper phase- wise manner.

(Note: Refer to Table 4.1.3 for the detailed version of policies U1- U6.)

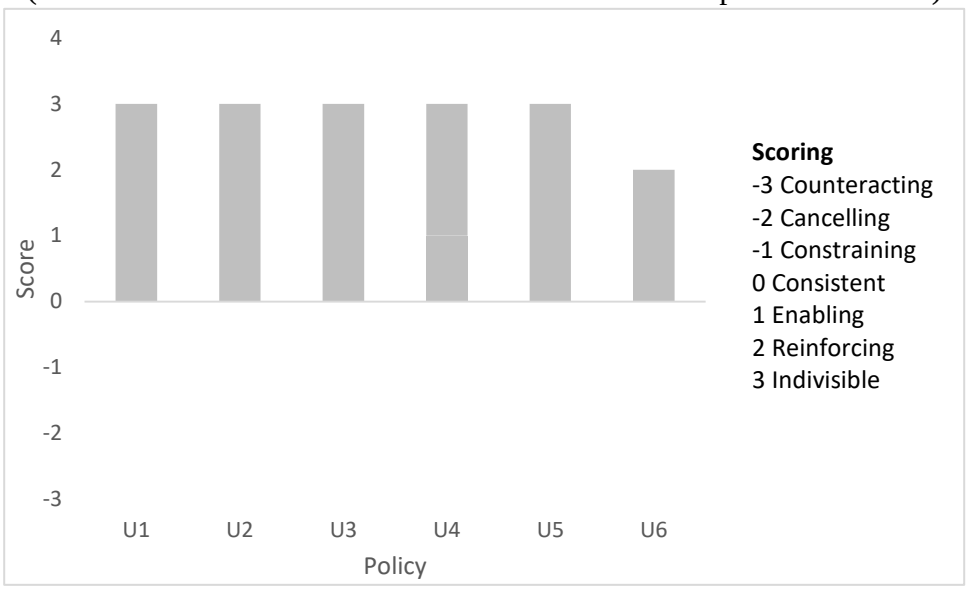

Fig 4.8: Graph showing range of interaction scores in Urban systems policies

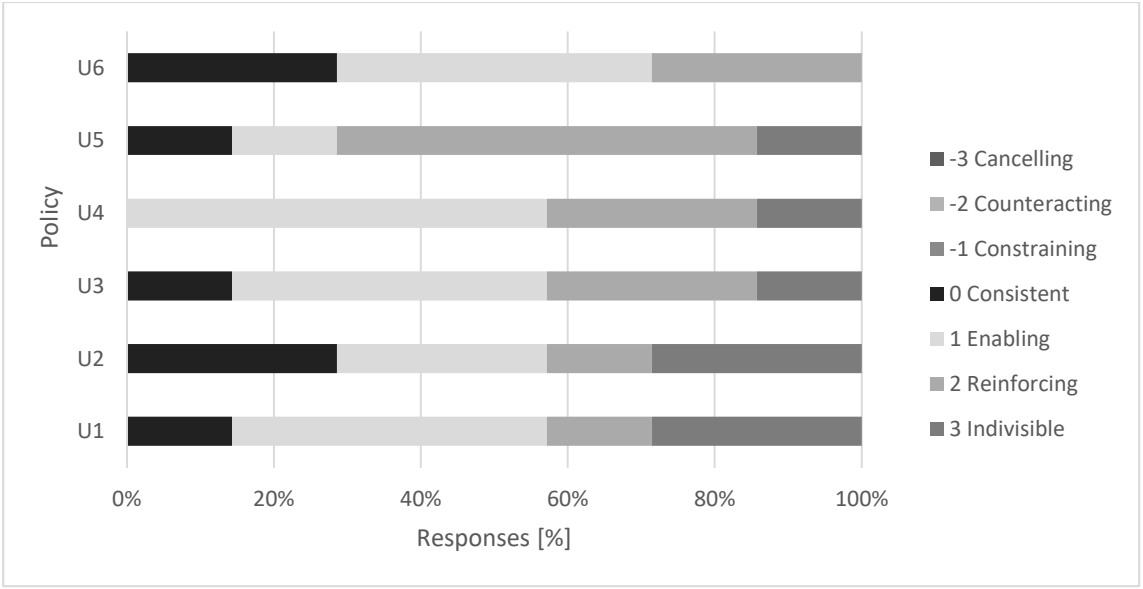

Fig 4.9: Frequency distribution for interactions in Urban systems policies

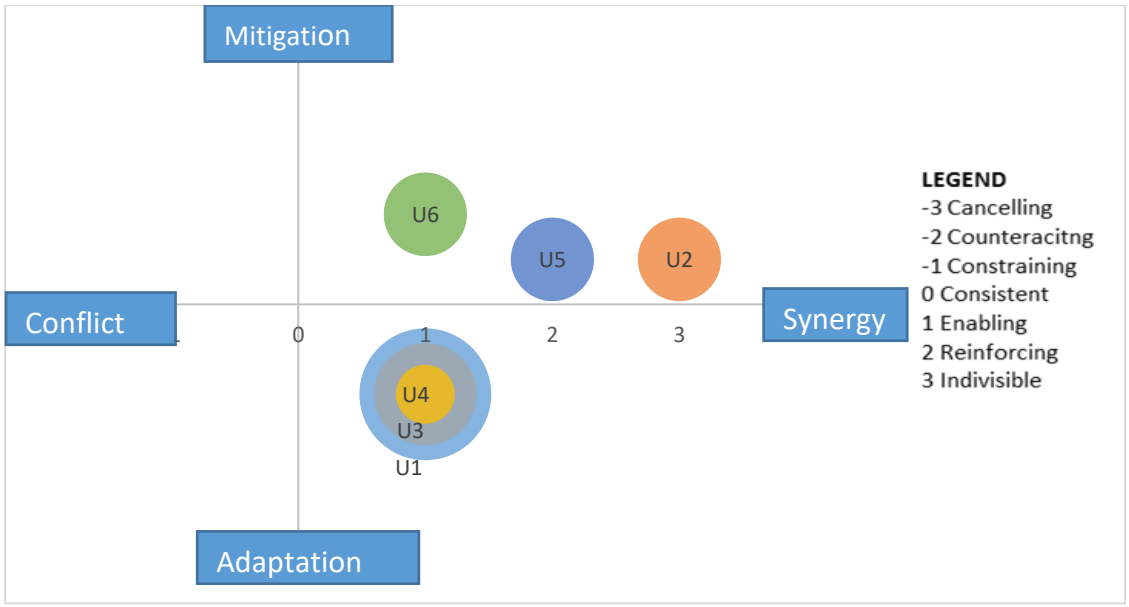

Fig: 4.10: Perception mapping of interactions in water sector policies (Note: The extent of interactions are independent of the size of the bubbles)

As can be seen in fig 4.10, 4 of the 6 urban systems policies have modal score 1, inferring that U1, U3 and U4 (adaptation policies) are enabling for mitigation, while U6 (mitigation policy) is an enabling policy for adaptation. The mechanisms of the interactions are described in table 4.1.3.

Table 4.1.3: Table showing the mechanism of interactions in Urban systems policies

Policy	Policy description	Mechanism of interaction
U1	Formulating and implementing design standards for climate resilient construction of bridges, dams, river flood control and other infrastructure (Climate Change policy **8.2.8**, 2011)	This policy is primarily targeted to adapt to the negative impacts of climate change. However, these can also have some effects on mitigation. Design standards for dams as well as transmission lines, in particular, can have repercussions for mitigation. Moreover, climate resilient infrastructure designs can also help in mitigation from a life- cycle assessment point of view. Construction of climate resilient infrastructures will provide lower emissions in the long run than development of the same infrastructure multiple times.
U2	Building codes with provision for rainwater harvesting and solar lighting (Climate Policy, 2011)	Although formulated chiefly as a mitigation policy, this policy also has potential for synergies with adaptation, especially in addressing water as well as energy security. Rainwater harvesting can help to address the pressing issue of water scarcity, thereby increasing the adaptive capacity. At the same

		time, it can contribute to mitigation indirectly through a lesser energy use that comes partially from diesel generators used for groundwater extraction. Likewise, provision of solar lighting can help to shift from the dependence on fossil fuel backed power sources in the urban areas.
U3	Promoting climate smart urban settlement (NAPA **pg 31**, 2010)	Climate smart urban settlement in itself is a broad terminology, with an emphasis on adaptation. However, developing a proper model for smart settlements with provisions of proper water drainage, designs for waste-to-energy, rainwater harvesting, renewable sources of energy, urban greening and other considerations must be made in order to fully harness these synergies with mitigation. 100% of the experts believed that enforcing building codes have synergies ranging from 1 to 3.
U4	Enforcing building codes in municipal areas with climate change dimensions (NAPA **pg 31**, 2010)	
U5	Developing and promoting transport industries that use electricity (Climate Change policy **8.2.7**, 2011)	Urban transport policies have a lot of potential for mitigation. Phase- wise development of urban transportation can contribute exclusively towards mitigation. However, when applied with other transportation policies including traffic management as well as modal shifts and development of transportation infrastructure can contribute to climate resilience.
U6	Increase electric vehicle up to 20% by 2020 (Environment-Friendly Vehicle and Transport Policy as mentioned in INDC **pg. 4**, 2016)	

IV. Water

Positive as well as negative interactions were identified in the water sector policies, the scores ranged for -2 to 3 (Fig 4.5). Experts identified that majority of the water sector policies are based on adaptation, and therefore, the maximum number of interaction scores were 0, whereby there are no significant interactions with mitigation. This was followed by interaction score of 2, implying that the policies are reinforcing in nature. The extent of conflicts identified in this sector was constraining (score= -1). Hydropower development aids directly to mitigation as well as addressing the issue of energy security. However, the development of hydropower has consequences for settlements, where by communities have to be displaced for the development of reservoir- type hydropower. Likewise, unplanned settlements can also be an issue in the vicinity of the hydropower projects, where construction of housing is not done in a climate-resilient manner. Therefore, there is an eminent need of co-ordination between the water sector and urban systems sector in order to avoid such consequences. Apart from this, policies for rainwater harvesting can indirectly contribute to mitigation in that dependency on diesel pumps for groundwater extraction will be reduced thereby reducing emissions. Policies for water – induced disaster risk reduction and monitoring not only aid in adaptation – these form the basis for early warning monitoring as well as design standards for buildings and other infrastructures, but also contribute in mitigation, albeit indirectly - these result in more robust transmission lines.

(Note: Refer to Table 4.1.4 for the detailed version of policies W1- W5.)

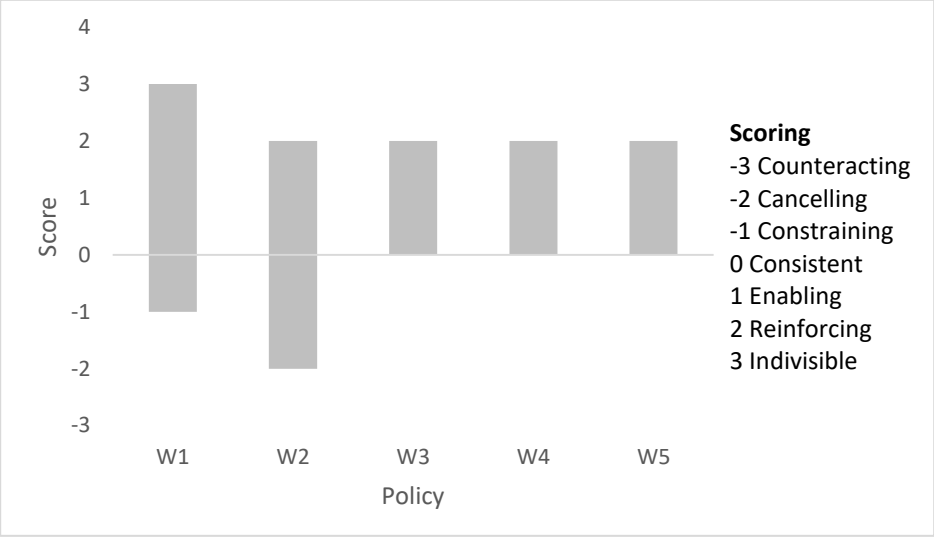

Fig 4.11: Graph showing range of interaction scores in Water policies

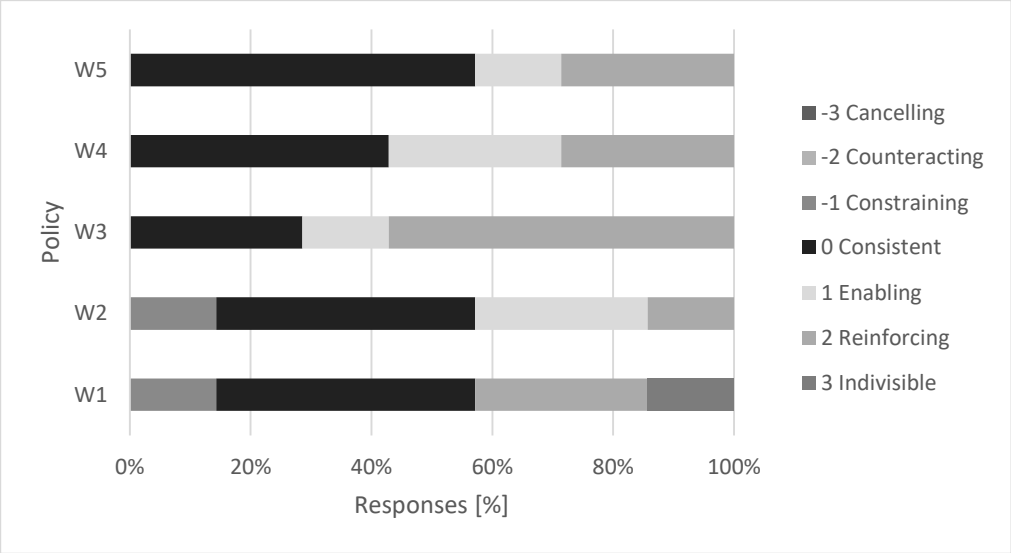

Fig 4.12: Frequency distribution for interaction scores in water sector policies

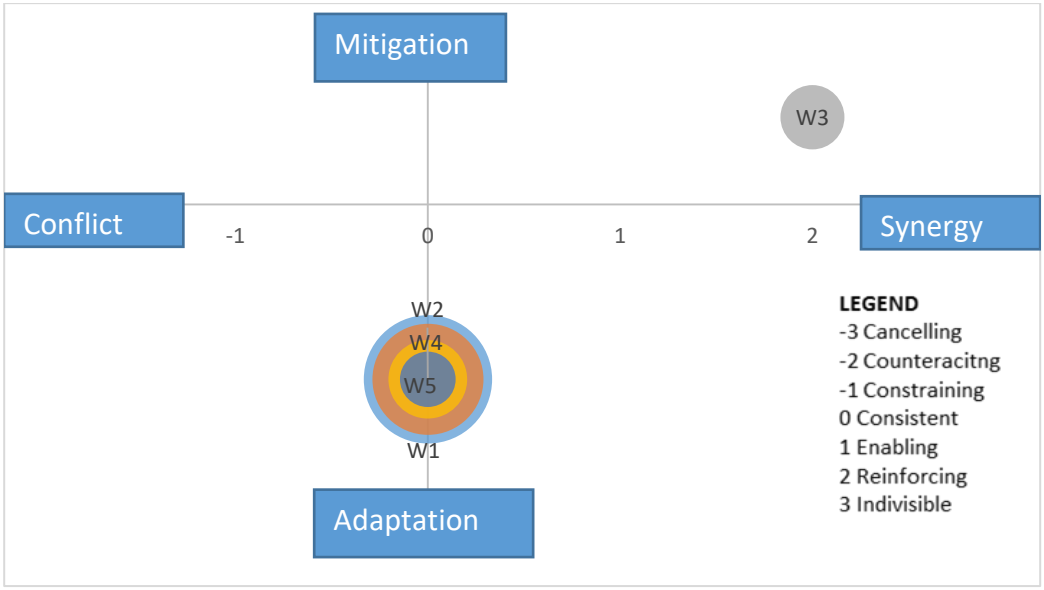

Fig 4.13: Perception mapping for interaction scores in Water policies (Note: The extent of interactions are independent of the size of the bubbles)

It can be seen from Fig 4.13 that 4 of the 5 policies in water sector have the modal score 0, implying that majority of the experts believe that water sector policies are largely focused on adaptation and do not have potential interactions with mitigation. However, W3 policy (mitigation policy) has a modal score of 2, implying that although originally formulated for mitigation, this policy has reinforcing implications for adaptation. The mechanisms of the interactions are described in Table 4.1.4.

Table 4.1.4: Table showing the mechanism of interactions in Water policies

Policy	Policy description	Mechanism
W1	Conserve soil and water through measures such as source protection, rain water harvesting and environmental sanitation (Climate Change policy **8.7.5**, 2011)	Water and soil conservation policies have potential synergies between mitigation and adaptation in that addressing the issue of water scarcity can indirectly help mitigate emissions by reducing the dependency on diesel pumps for water extraction, or fossil fuel operated water tankers to meet with the water demands. The extent of synergies can depend on the processes used for water conservation: for example water conservation in ponds could lead to increased methane emissions as opposed to groundwater harvesting. However, the conflicts in these policies arise from the fact that a basin approach for source protection could potentially limit hydropower development thereby impacting potential mitigation.
W2	Adopting a basin approach for water management through regular monitoring of water resource availability (Climate Change Policy **8.7.8**, 2011)	

W3	Cost-Effective Hydropower Developed in a Sustainable Manner (National Water Plan **pg 12**, 2002)	71% of the experts interviewed responded that there are possible synergies in this policy, while the remaining 29% stated that this was a mitigation policy. The possible synergies arise when the energy generated is affordable and accessible to all, especially in rural households; and the infrastructures for the hydropower are built in a climate resilient manner, with components of Disaster Risk Reduction (DRR) as well as climate change into consideration.
W4	GLOF monitoring and Disaster Risk Reduction (NAPA **pg 30**, 2010)	These two policies are primarily focused on adaptation. Approximately 50% of the experts identified these policies as solely adaptation policies with no mitigation potential. However, the remaining experts believe that these policies do have potential for synergies as these policies can further the development of climate resilient infrastructures, including dams, reservoirs and transmission lines for hydropower, which can enhance mitigation potential. Likewise, plantations for reducing flood risk can also add to mitigation.
W5	Forecasting water-induced disasters and risks created from climate change and providing early warning information, developing necessary mechanism for the implementation of preventive measures and ensuring regular supervision, and enhancing capacity (Climate Change policy **8.1.4**, 2011)	

4.2 Identification and prioritization of opportunities and barriers for pursuing the synergies and minimizing the conflicts

4.2.1 Identification of opportunities and barriers

Before the second round of interviews with the experts, a list of possible opportunities and barriers to harness the synergies and minimize the conflicts was prepared, which was validated by the experts and further additions to the list were made resulting in the following list of opportunities and barriers:

Table 4.2.1: Initial list of opportunities and barriers

List of opportunities	List of barriers
i. Dedicated climate change institution	i. Lack of institutional co-ordination
ii. Low Carbon Economic Development Strategy	ii. Inter- sectoral disconnect
iii. Ecosystem- based adaptation	iii. Lack of a functional dedicated climate change institution
iv. Integrated Water Resource Management	iv. Donor interest driven implementation
v. Payment of Ecosystem Services	v. Lack of willingness to pursue mitigation
vi. Transformative adaptation	

vii. Sustainable Development Goals viii. CDM ix. Carbon finance x. REDD+ strategy xi. Technology Transfer xii. Private Sector involvement xiii. Civil Society engagement xiv. Community based adaptation xv. Mainstreaming climate change and DRR into development planning	vi. Lack of knowledge management and institutionalization vii. Technical and financial constraint viii. Human capacity constraint ix. Gaps in policy formulation and implementation x. Lack of scientific evidence about benefits of pursuing synergies xi. Patents and Intellectual Property Rights (IPR)

This list was consolidated to form a shorter, yet inclusive list of opportunities and barriers, which are described in tables 4.2.1 and 4.2.2 respectively.

Table 4.2.2: Final list of opportunities

Carbon Market/ Finance	Carbon market refers to "the market based mechanism for trading carbon credits, including CDM, voluntary carbon markets as well as REDD+". Carbon finance refers to the "financing mechanisms for lowering emissions. It includes investments for low- carbon projects, and can be both internal and external. Internal carbon finance includes the government's budget allocation to low carbon development, whereas external finance mechanisms include financial support from donor agencies". Both these mechanisms can create opportunities to initiate projects that have scope for synergies between mitigation and adaptation.
Climate Change Dedicated institution	An institution that is dedicated to all the climate change related activities in the country. Climate Change Council, a pre- existing body which is chaired by the Prime Minister, to provide overall policy coordination and guidance on climate change matters, can be one such institution that ensures climate change mitigation as well as adaptation are mainstreamed into policy formulation in all sectors. This is to ensure not only mainstreaming of climate change components into development planning, but also to warrant cross-sectoral conflicts are avoided to the extent possible, while maintaining harmonious policies across several sectors. Therefore, a dedicated institution is an important opportunity for integrating mitigation and adaptation into policies.
Low Carbon Economic Development Strategy	This refers to the "forward-looking national economic development plans or strategies that encompass low-emission and/or climate-resilient economic growth". The objective of the strategy is to identify the key approaches and interventions that will allow Nepal to maximize its resilience and low carbon growth potential without compromising the overall growth potential of all development sectors. The major sectors considered in the strategy are Energy,

	Forestry, Agriculture, Industry, Transport, Building & Waste, and cross cutting issues (Policy, Financing, Gender Equity and Social inclusion (GESI) & Institutions).The draft version of the strategy has already been prepared, and can act as an opportunity to explore sustainable low carbon economic growth while building climate resilience.
Payment of Ecosystem Services (PES)	PES refers to the "incentives offered to resource users for proactively and deliberately engaging in resource use practices designed to secure the provision of the services". It is considered as market based approach to conserve ecosystems to ensure a sustainable supply of the ecosystems' services (Wunder, 2005). However, there are alternative, "PES-like" schemes, which aim for the same goal but can adopt slightly different approaches and do not necessarily follow the same market based approach. In particular to the case of developing and mountainous countries like Nepal, strictly market based PES schemes may not be fully functioning. PES-like schemes are therefore designed to maximize the total social benefits (ICIMOD, 2015).
Private Sector and Civil Society	Private sector encompasses "all for- profit business organizations that are involved in the field of climate change. It includes business ventures that are operating in adaptation and/ or mitigation with a profit motive". Civil society refers to "the aggregate of non- governmental organizations and institutions that is independent of the government". It primarily includes non for profit organizations that are engaged in the field of climate change. Both private sector and civil society play an important role in outreach, with or without partnerships with the government, particularly in rural areas, where the access of the government is rather limited, thereby acting as important avenues for pursuing synergies.
Transformative Adaptation	It refers to "adaptation that changes the fundamental attributes of a system in response to climate and its effects". The chief idea for a transformative approach is that adapting incremental adaptation to human- induced changes in the Earth system will remain ineffective unless the systemic aspects of vulnerability and unsustainability are sufficiently addressed (Ribot 2011, O'Brien 2012). The fifth IPCC Assessment Report states that "transformation could reflect strengthened, altered, or aligned paradigms, goals, or values towards promoting adaptation for sustainable development, including poverty reduction".

Table 4.2.3: Final list of barriers

Inadequate institutional co- ordination	There is a siloed approach towards policy formulation for mainstreaming climate change components into development

	agenda. There exists a lack of adequate inter- sectoral and inter-departmental co-ordination in Nepal in this regard. Potential interactions (either synergies or conflicts) tend to be overlooked as each institution prioritizes its own development agendas over others. This can act as a fundamental barrier in pursuing the potential synergies.
Donor- interest driven implementation	A lot of climate change related projects in Nepal are funded by multilateral agencies and banks, and bilateral development partners. The implementation of such projects depend on donor interest, which is rather rigid and does not consider the possible synergies between both mitigation and adaptation. This in turn has resulted climate change related projects to emphasize largely on adaptation. Such interests of the donors in projects can act as a prominent barrier to pursue synergies.
Knowledge gaps	Knowledge gaps chiefly encompasses two gaps: (i) Lack of adequate scientific evidence of the benefits of pursuing synergies, and (ii) knowledge gaps from policy formulation to implementation. Limited scientific evidence is present on the benefits of pursuing synergies between mitigation and adaptation. Moreover, because policy formulation is mostly a top- down approach, there exists a gap between policy formulation and policy implementation. Dissemination of knowledge from policy level to implementation is lacking, as a result of which there is no consideration of synergies during the implementation of projects. Inadequate knowledge management adds to the burden of knowledge gaps, which in turn acts as a barrier for harnessing the synergies.
Resource and capacity constraint	In the context of Nepal, there is a lack of adequate technical, technological, financial resource and capacity for climate change. Issues such as patents and IPRs can pose financial barriers in accessing new technologies and techniques to address climate change. Affordability of technologies become a major concern in terms of sustainability. Likewise, trained human resources with adequate capacity to deal with the dual issue of mitigation-adaptation is also lacking, because of which consideration of synergies in policies is missing.
Lack of willingness to pursue mitigation	Nepal places a significant emphasis on adaptation over mitigation with the rationale that it contributes to less than 0.1% of the total global emissions. Although Nepal is forward in terms of adaptation plans and policies with documentation of NAPAs that has furthered to formation of LAPAs, it still has not formulated a NAMA document yet. In the context of Nepal, 'Low Carbon Economic Development' is preferred over mitigation and concrete attempts to pursue mitigation as a plan of action is lacking. The argument behind this preference is that mitigation targets are mandatory and Nepal may not be able to fulfil those targets in due time without

	hindering its economic development. This poses a serious barrier to explore potential synergies.

4.2.2 Prioritization of opportunities and barriers

AHP was carried out as described in the methodology section to rank and prioritize the opportunities and barriers. The results of AHP are presented in terms of normalized score, and the subsequent ranks are also given in tables 4.2.4 and 4.2.5 for opportunities and barriers respectively.

Table 4.2.4: Normalized scores and Ranks of Opportunities

Opportunity number	Opportunity description	Normalized score	Rank
O1	Carbon Market/ Finance	0.153764	5
O2	Climate Change Dedicated institution	0.22803	1
O3	Low Carbon Economic Development Strategy	0.169953	2
O4	Payment of Ecosystem Services (PES)	0.135845	6
O5	Private Sector and Civil Society	0.154824	4
O6	Transformative Adaptation	0.157584	3

In the context of Nepal, a climate change dedicated institution is the most important opportunity for pursuing synergies between climate change policies. The chief bodies responsible for formulation and implementation of climate change policies are the Ministry of Population and Environment (MoPE) and Ministry of Federal Affairs and Local Development (MoFALD) respectively. Nepal also has a National Climate Change Support Group (NCCSP), and an Alternative Energy Promotion Centre (AEPC) working towards climate change under the MoPE. However, rather than having multiple institutions and programs working towards the same common goal, having a single institution that is dedicated to all climate change related decisions in the country is desirable. In the presence of such an institution, other departments cannot override their decisions and inter- sectoral conflicts can also be managed. One such institution can be the pre- existing Climate Change Council. However, in order for this to be an effective opportunity, the council has to be staffed with well- trained human resources from multiple sectors so as to avoid any biases towards any particular sector.

Table 4.2.5: Normalized scores and Ranks of Barriers

Barrier number	Barrier description	Normalized score	Rank
B1	Donor interest driven implementation	0.196688	2
B2	Inadequate institutional co- ordination	0.278209	1
B3	Knowledge gaps	0.178952	4
B4	Lack of willingness to pursue mitigation	0.158372	5
B5	Resource and capacity constraint	0.187779	3

The most prominent barrier for harnessing synergies in the context of Nepal is inadequate institutional co- ordination. Such lack of institutional co-ordination as a barrier while pursuing synergies has been highlighted in other studies as well, stating that there are diverse stakeholders

involved (Klein, 2005) and reaching a consensus can therefore be difficult. Policy formulation is done in silos in Nepal, and biases for developing individual sectors are present, thereby making inadequate co- ordination a very prominent barrier to pursue potential synergies.

4.2.3 Consistency ratios

Consistency is one of the most important factors in AHP. An inconsistency of 10% or less implies that the adjustment is small compared to the actual values of the eigenvector entries. Higher values of Consistency Ratio (CR) imply that the pairwise judgment are just about random and are not trustworthy.

The overall consistency result of the study is presented in table 4.2.6. The answers are consistent as CR< 0.1.

Table 4.2.6: Consistency Ratios for Opportunities and Barriers

	Criteria	**λ_{max}**	**CI**	**CR**
Opportunities	Administrative Feasibility	6.099	0.019	0.015
	Sustainability	6.162	0.032	0.026
	Anticipated effectiveness	6.138	0.277	0.022
	Political acceptability	6.167	0.032	0.026
Barriers	Impact of barrier on operationalizing opportunity	5.142	0.035	0.03
	Lifespan of a barrier	5.06	0.015	0.013
	Level of political effort required to remove the barrier	5.06	0.015	0.026

CHAPTER 5
CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Conclusions

The main aim of this paper is to carry out an overall assessment of the state of interactions between the national level mitigation and adaptation policies to address the climate change, including the possible opportunities as well as barrier to harness the potential synergies in the policies. Although Nepal has been on the forefront of addressing climate change, the focus has primarily been on adaptation and much work remains to be done to shift the heavy emphasis on adaptation towards possible synergies between mitigation and adaptation. Pursuing the synergies will not only aid in Nepal's overall goal of a climate resilient low carbon economic development, but also enable Nepal to access climate funds for mitigation as well as adaptation. Nepal's heavy focus on adaptation has enabled it to access only adaptation funds; integrating mitigation through possible synergies will assist in opening pathways for mitigation funds.

Several climate change related policies have been formulated in Nepal in the form of Climate Change Policy (2011), iNDCs/ NDCs (2016), NAPA (2010) as well as other sectoral policies that integrate climate change. However, siloed approach towards mitigation and adaptation can be observed in these policies. An overall GHG reduction target is not yet set in NDCs, because of which the quantification of emission reduction cannot be done. However, these and other sectoral climate change related policies in Nepal have a scope for a number of interactions, both positive and negative.

The main findings of this study includes the presence of interactions between adaptation and mitigation policies. The extent of these interactions range from only enabling to being indivisible for attaining adaptation/ mitigation goals. Moreover, the scope of these interactions are not only limited to the same sector, but expand to other sectors as well. Synergies have been identified across AFOLU, Urban systems, energy as well as water sector, while conflicts have been identified only in AFOLU and water sector policies. The maximum number of synergies as well as conflicts in the context of Nepal are present in AFOLU policies. The policies in this sector are inter- twined with land use planning, water use, energy management and various other sectoral policies as well. Maximum number of non- interactions were observed in water and energy sectors as the policies in these sectors place an emphasis on adaptation in case of water sector, while in case of energy sector, more emphasis is placed on mitigation sector. Conflicts were identified in AFOLU and water sectors: AFOLU sector was observed to have a higher number of potential conflicts in the policies than water sector. The conflicts in policies in both these sectors in the context of Nepal were identified due to lack of appropriate measures and mechanisms to further the possible synergies that might be present in the respective sectors.

Several opportunities as well as barriers were recognized to pursue the synergies and avoid the conflicts present in the policies. The most prominent opportunity to harness the synergies and minimize the conflicts is a dedicated climate change institution, which refers to an institution that is dedicated to all the climate change related activities in the country. Climate Change Council, a pre- existing body which is chaired by the Prime Minister, to assist in overall policy

coordination as well as guidance on climate change issues, can be one such institution that ensures climate change mitigation as well as adaptation are mainstreamed into policy formulation in all sectors. This is to ensure not only mainstreaming of climate change components into development planning, but also to warrant cross- sectoral conflicts are avoided to the extent possible, while maintaining harmonious policies across several sectors. Therefore, a dedicated institution is an important opportunity for integrating mitigation and adaptation into policies. A Low Carbon Economic Development Strategy was identified as the second most important opportunity. This refers to the "forward-looking national economic development plans or strategies that encompass low-emission and/or climate-resilient economic growth". The objective of the strategy is to recognize the key approaches and actions that will allow Nepal to maximize its climate resilience while simultaneously pursuing its low carbon growth potential without compromising the overall growth potential of all development sectors. The major sectors considered in the strategy are Energy, Agriculture, Forestry, Industry, Building & Waste, Transport, and cross cutting issues (Policy, Financing, Gender Equity and Social inclusion (GESI) & Institutions).The draft version of the strategy has already been prepared, and can act as an opportunity to explore sustainable low carbon economic growth while building climate resilience. Nepal already possesses both these opportunities in the form of a Climate Change Council and the draft of LCEDS respectively.

Likewise, the most prominent barrier is inadequate institutional co- ordination among the various institutions that are responsible for formulating the sectoral policies related and relevant to climate change. This lack of co- ordination refers to the siloed approach towards policy formulation for mainstreaming climate change components into development agenda. There exists a lack of adequate inter- sectoral and inter- departmental co-ordination. Potential interactions (either synergies or conflicts) tend to be overlooked as each institution prioritizes its own development agendas over others. This is a major barrier that is largely responsible for the segregated approach towards climate change despite the presence of obvious as well as less-obvious inter- sectoral interactions.

In a nutshell, there are several synergies across various climate change policies of Nepal. A few conflicts are also present in AFOLU and water sector policies. However, much work needs to be done to integrate these synergies in policy formulation. An institution dedicated to addressing climate change issues of Nepal is an excellent opportunity to harness the synergies, which can not only integrate mitigation as well as adaptation into development policies, but also offer avenues for pursuing the cross- sectoral interactions that have also been identified. Likewise, the major barrier to harness the synergies is an inadequate co-ordination among the different institutions that are involved in climate change policy formulation. This lack of co- ordination has to be addressed so as to be able to pursue the synergies. The opportunities to harness synergies have to be exploited while simultaneously removing the barriers so as to achieve a climate resilient low carbon economic development.

5.2 Policy implications

Based on the findings of this study, following policy implications have been drawn:

1. A well- functioning dedicated climate change institution with well- trained human resources should be established. Moreover, the institution should promote effective co-ordination among different institutions and sectors.
2. Policy formulation should be a comprehensive and integrative process that adopts a cross- sectoral and interdisciplinary approach that encourages synergies across sectors to pursue climate resilient pathways. This calls for mainstreaming of climate change impacts into all development policies while simultaneously integrating and considering the possible interactions with other sectors as well. All sectors should have an overall goal of addressing climate change and support in looking for well- crafted and coordinated opportunities to adapt to and limit the magnitude of climate change.
3. Institutionalized knowledge management must be carried out to ensure effective and timely dissemination of knowledge across relevant stakeholders.
4. More avenues for public- private partnerships have to be explored, where government sector works in policy formulation and monitoring, while private sectors can actively engage in investment and implementation. This partnership is especially crucial for AFOLU and water sectors. In case of water sector, PPP can result in higher investment from the private sector, while in case of AFOLU, private sectors can be actively involved in sustainable forest management and agroforestry. Although PPP is practiced extensively in the form of community forestry in Nepal, it has to be up-scaled and expanded to other sectors as well.
5. Donor- driven implementation in Nepal exists dues to lack of need analysis. Comprehensive need analyses should be carried out to find out the missing links in policies between mitigation and adaptation, and also on the mitigation potential of the country, especially from AFOLU and urban systems sectors as these have the highest number of identified synergies.

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APPENDICES

APPENDIX A: Questionnaire for objective 1

Agriculture, Forestry and Land use:	Adapt	Mitigate	Remarks
1. Maintain at least 40% forest area (Forest policy **pg 5**, 2015)			
2. Enhance forest carbon stock by at least 5% by 2025 compared to 2015 level (Forestry Sector Strategy 2016-2025 in INDC **pg 3**, 2016)			
3. Expanding the scope of carbon sequestration through scientific management of forests, formulating and implementing land use plans and controlling deforestation (Climate Change policy **8.2.3**, 2011)			
4. Encouraging carbon sequestration and investing some of the benefits from the use of forest products for controlling forest fires and conserving forests (Climate Change Policy **8.7.6**, 2011 & Forest policy 2015)			
5. Forest and Ecosystem management for supporting climate led adaptation innovation (Forest Policy **pg 12**, 2014)			
6. Community based management through integrated management of agriculture, water, forest and biodiversity sector (NAPA **pg 29**, 2010)			
7. Prioritizing and implementing programs on sustainable management of forests, agro-forestry, pasture, rangeland and soil conservation (Climate Change Policy **8.7.3**, 2011)			
8. Utilization, promotion, conservation of forest resources as a means of alternative livelihoods (Climate Change Policy **8.7.2**, 2011)			
9. Afforestation in urban areas, including residential areas, and road- side plantations for environment friendly infrastruture development (Forest Policy **pg 6**, 2014)			
10. Use integrated river basin approah for land and water conservtion and increased land prodictivity (Forest Policy **pg 8,** 2014)			

11. Developing mechanism for optimal utilization of international regional and local funding sources, including REDD (Climate Change Policy **8.7.7**, 2011)			
12. Use REDD+ as a means for generating finance through carbon trading (Forest Policy **pg 13**, 2014)			
13. Provide financial and techincal support for alterantive energy, biogas, biobriquette, improved cooking stoves and biofuel (Forest policy **pg 13**, 2014)			
14. Enhancing the adaptive capacity of food grains and species from the possible impacts of climate change (Climate Change policy **8.4.4**, 2011)			

Energy:	**Adapt**	**Mitigate**	**Remarks**
1. Expand and decentralize energy mix, and promote renewable energy including solar/ hydro/ bioenergy (National Communications, 2014)			
2. Encouraging investments in clean energy sources with priority on hydropower from national, regional and international sources (Climate change policy: **8.7.4**, 2011)			
3. Increases in fuel taxes, incentives for mass transport systems, and fiscal incentives and subsidies for alternative fuels and vehicles. (National communications **pg 66**, 2014)			
4. Development of solar energy technologies will be encouraged by integrating it with technologies for drying and cooking of food, purifying water, lighting and communication systems (Rural Energy Policy **4.4.3**, 2006)			
5. Subsidies, credit and soft loan for Renewable energy sources (Renewable Energy Subsidy Policy, 2016)			

Urban systems:	**Adapt**	**Mitigate**	**Remarks**
1. Formulating and implementing design standards for climate resilient construction of bridges, dams, river flood control and other			

infrastructure (Climate Change policy **8.2.8**, 2011)			
2. Building codes with provision for rainwater harvesting and solar lighting (Climate Policy, 2011)			
3. Promoting climate smart urban settlement (NAPA **pg 31**, 2010)			
3. Enforcing building codes in municipal areas with climate change dimensions (NAPA **pg 31**, 2010)			
4. Developing and promoting transport industries that use electricity (Climate Change policy **8.2.7**, 2011)			
5. Increase electric vehicle up to 20% by 2020 (Environment-Friendly Vehicle and Transport Policy as mentioned in INDC **pg. 4**, 2016)			

Water:			
1. Conserve soil and water through measures such as source protection, rain water harvesting and environmental sanitation (Climate Change policy **8.7.5**, 2011)			
2. Adopting a basin approach for water management through regular monitoring of water resource availability (Climate Change Policy **8.7.8**, 2011)			
3. Cost-Effective Hydropower Developed in a Sustainable Manner (National Water Plan **pg 12**, 2002)			
4. GLOF monitoring and Disaster Risk Reduction (NAPA **pg 30**, 2010)			
5. Forecasting water-induced disasters and risks created from climate change and providing early warning information, developing necessary mechanism for the implementation of preventive measures and ensuring regular supervision, and enhancing capacity (Climate Change policy **8.1.4**, 2011)			

APPENDIX B: Questionnaire for Objective 2

Opportunities

The following are the list of opportunities that have been identified for pursuing the synergies in climate change policies of Nepal, and the criteria against which they will be assessed.

Criteria	Opportunities
Administrative Feasibility Sustainability Anticipated effectiveness Political acceptability	Carbon market/ finance CC dedicated institution Low Carbon Economic Development Strategy Payment of Ecosystem Services Private Sector and Civil Society Transformative Adaptation

Taxonomy of criteria:

Administrative Feasibility	Pursuing the opportunities to harness synergies requires a good organizational set-up with appropriate infrastructure, manpower and technical support. This constraint frequently limits developing countries. Therefore, administrative feasibility should be considered as one of the evaluation criteria.
Sustainability	Different opportunities may have different levels of sustainability when pursued. How can the opportunities that result in greater ownership as well as maximizes synergies should be considered as a criteria.
Anticipated effectiveness	Different opportunities have different anticipated levels of effectiveness when pursued. Pursuing one opportunity over the other could result in a higher level of efficiency. Thus, how well the opportunity can be pursued and if its effectiveness erodes over time should be considered as a criteria for evaluating alternative opportunities.
Political acceptability	In most developing countries, it is difficult to get political support for most emissions reduction policies because policy makers are more likely to prioritize economic and social developmental needs over environmental issues. The operationalization of the opportunities through political and bureaucratic processes can be a challenge for developing countries. Hence, political acceptability should be one of the evaluation criteria.

Taxonomy of Opportunities

Carbon Market/ Finance	Market based mechanism for trading carbon credits/ Financing mechanisms for lowering emissions
Climate Change Dedicated institution	An institution dedicated to all the climate change related activities in the country
Low Carbon Economic Development Strategy	forward-looking national economic development plans or strategies that encompass low-emission and/or climate-resilient economic growth
Payment of Ecosystem Services	Incentives offered to resource users for proactively and deliberately engaging in resource use practices designed to secure the provision of the services
Transformative Adaptation	Adaptation that changes the fundamental attributes of a system in response to climate and its effects

Pairwise Comparison of criteria

Using Saaty's scale of fundamental judgement, a 1-9 scale, we will compare the criteria on which the indicators were identified. The meaning of the numbers is given in the table below:

Intensity of Importance	Definition	Explanation
1	Equal importance of both options	Two activities contribute equally to the objective
3	Moderate importance of one option	Judgement slightly favors one criteria over another
5	Strong importance for one option	Judgement strongly favors one criteria over another
7	Very strong importance for one option	A criteria is favored very strongly over another
9	Extreme importance for one option	Judgement favoring a criteria is of the highest possible order of affirmation

Pairwise Comparison of Criteria

It is important that the opportunities for pursuing the synergies in climate change policies of Nepal be prioritized on the basis of a set of criteria. Please place a mark on your desired scale.

Example: it might be slightly more important for an opportunity to be feasible so that it can deliver effectiveness. Hence, the score 3.

Administrative feasibility				X						Anticipated effectiveness
	9	7	5	3	1	3	5	7	9	

Administrative feasibility										Anticipated effectiveness
	9	7	5	3	1	3	5	7	9	

Administrative feasibility										Political acceptability
	9	7	5	3	1	3	5	7	9	

Administrative feasibility										Sustainability
	9	7	5	3	1	3	5	7	9	

Anticipated effectiveness										Political acceptability
	9	7	5	3	1	3	5	7	9	

Anticipated effectiveness										Sustainability
	9	7	5	3	1	3	5	7	9	

Political acceptability										Sustainability
	9	7	5	3	1	3	5	7	9	

Pairwise comparison of opportunities against criteria

Please compare each opportunity by keeping single criteria in view each time. We have four criteria at hand and we will compare each opportunity applying these three criteria.

Example:

Administrative feasibility: From an administrative point of view, operating a well-functioning climate change dedicated institution might be more feasible than using the carbon market. Hence, the score of 3 for CC dedicated institution.

Carbon market/ finance						X				CC dedicated institution
	9	7	5	3	1	3	5	7	9	

Political acceptability: Using carbon markets and finance mechanisms and operating a climate change dedicated institution may be equally politically acceptable. Therefore, the scale can be 1.

Carbon market/ finance					X					CC dedicated institution
	9	7	5	3	1	3	5	7	9	

Comparison of opportunities by the Criteria '<u>Administrative feasibility</u>'

Carbon market/ finance										CC dedicated institution
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Low Carbon Development Strategy
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Low Carbon Development Strategy
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Payment of Ecosystem Services										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Payment of Ecosystem Services										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Private Sector and Civil Society										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Comparison of opportunities by the Criteria '<u>Anticipated effectiveness</u>'

Carbon market/ finance										CC dedicated institution
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Low Carbon Development Strategy
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Low Carbon Development Strategy
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Payment of Ecosystem Services										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Payment of Ecosystem Services										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Private Sector and Civil Society										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Comparison of opportunities by the Criteria '<u>Political acceptability</u>'

Carbon market/ finance										CC dedicated institution
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Low Carbon Development Strategy
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Low Carbon Development Strategy
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Payment of Ecosystem Services										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Payment of Ecosystem Services										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Private Sector and Civil Society										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Comparison of opportunities by the Criteria '<u>Sustainability</u>'

Carbon market/ finance										CC dedicated institution
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Low Carbon Development Strategy
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Carbon market/ finance										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Low Carbon Development Strategy
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

CC dedicated institution										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Payment of Ecosystem Services
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Low Carbon Development Strategy										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Payment of Ecosystem Services										Private Sector and Civil Society
	9	7	5	3	1	3	5	7	9	

Payment of Ecosystem Services										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Private Sector and Civil Society										Transformative adaptation
	9	7	5	3	1	3	5	7	9	

Barriers

The following are the list of barriers that have been identified for pursuing the synergies in climate change policies of Nepal, and the criteria against which they will be assessed.

Criteria	Barriers
Impact of barrier on operationalizing opportunity Level of political effort required to remove the barrier Lifespan of barriers	Inadequate institutional co- ordination Donor interest- driven implementation Knowledge gaps Resource and capacity constraint Lack of willingness to pursue mitigation

Taxonomy of criteria:

Impact of barrier on operationalizing opportunity	Different barriers have different degrees of impact on the adoption of efficient options. Removing barriers is more or less likely to result in the introduction of efficient options, depending on the specific barrier. This feature implicitly recognizes the importance of barriers. A barrier that is easy to overcome may have a low impact on the adoption of options. On the other hand, a barrier that is difficult to remove may have a larger impact on the adoption of options.
Lifespan of a barrier	Each barrier has its own lifespan, i.e., the time it takes to cease to be a barrier. Without any external intervention, some barriers tend to last longer than others. Normally, barriers with shorter life spans are preferable to those with longer ones.
Level of political effort required to remove the barrier	Political and bureaucratic efforts play major roles in removing barriers. Such efforts may include lobbying, introducing bureaucratic initiatives, and providing clear instructions to policy makers. However, barriers can be complex in nature. Barriers are often intertwined with other social and political considerations. The barrier may be linked to various government policies. The more complex a barrier is, the more difficult it is to overcome. Therefore, the level of political and bureaucratic effort required to remove the barriers depends upon the type of barrier considered.

Source: IPCC (1996), Shrestha and Abeygunawardana (2003), Ngyuen et al. (2010)

Taxonomy of barriers:

Inadequate institutional co- ordination	Lack of adequate inter- sectoral and inter- departmental co-ordination
Donor- interest driven implementation	Implementation of projects dependent on donor interest rather than possible synergies
Knowledge gaps	Lack of adequate evidence of the benefits of pursuing synergies, and knowledge gaps from policy formulation to implementation
Resource and capacity constraint	Lack of adequate technical, technological, financial resource and capacity

Lack of willingness to pursue mitigation	'Low Carbon Economic Development' preferred over 'mitigation' as mitigation could be mandatory

Pairwise comparison of criteria

It is important that the barriers be prioritized on the basis of a set of criteria. Please place a mark on your desired scale.

Example: In case of Nepal, the level of political effort required in removing a barrier can be strongly more important than the impact of barriers on operationalizing the possible opportunities. Therefore, the score of 5 for the former criteria.

Impact of barrier on opportunity operationalization							X			Level of political effort required to remove barrier
	9	7	5	3	1	3	5	7	9	

Impact of barrier on opportunity operationalization										Level of political effort required to remove barrier
	9	7	5	3	1	3	5	7	9	

Impact of barrier on opportunity operationalization										Lifespan of barriers
	9	7	5	3	1	3	5	7	9	

Level of political effort required to remove barrier										Lifespan of barriers
	9	7	5	3	1	3	5	7	9	

Pairwise comparison of barriers against criteria:

Please compare each barrier by keeping single criteria in view each time. We have three criteria at hand and we will compare each barrier applying these three criteria.

Example:

Impact of barrier of opportunity operationalization: Inadequate institutional co-ordination might be strongly more significant than donor driven implementation for operationalizing the opportunities. Therefore the scale can be 5 or 7.

Donor interest driven implementation							X			Inadequate institutional co-ordination
	9	7	5	3	1	3	5	7	9	

Lifespan of barrier: From a lifespan point of view, it might be easier to minister co-ordination between institutions opposed to altering donor interests.

Donor interest driven implementation		X								Inadequate institutional co-ordination
	9	7	5	3	1	3	5	7	9	

Pairwise comparison of barriers by the criteria '<u>Impact of barrier on opportunity operationalization</u>'

Donor interest driven implementation										Inadequate institutional co-ordination
	9	7	5	3	1	3	5	7	9	

Donor interest driven implementation	9	7	5	3	1	3	5	7	9	Knowledge gaps

Donor interest driven implementation										Lack of willingness to pursue mitigation
	9	7	5	3	1	3	5	7	9	

Donor interest driven implementation										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Inadequate institutional co-ordination										Knowledge gaps
	9	7	5	3	1	3	5	7	9	

Inadequate institutional co-ordination										Lack of willingness to pursue mitigation
	9	7	5	3	1	3	5	7	9	

Inadequate institutional co-ordination										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Knowledge gaps										Lack of willingness to pursue mitigation
	9	7	5	3	1	3	5	7	9	

Knowledge gaps										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Lack of willingness to pursue mitigation										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Pairwise comparison of barriers by the criteria '<u>Level of political effort required to remove the barrier</u>'

Donor interest driven implementation										Inadequate institutional co-ordination
	9	7	5	3	1	3	5	7	9	

Donor interest driven implementation										Knowledge gaps
	9	7	5	3	1	3	5	7	9	

Donor interest driven implementation										Lack of willingness to pursue mitigation
	9	7	5	3	1	3	5	7	9	

Donor interest driven implementation										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Inadequate institutional co-ordination										Knowledge gaps
	9	7	5	3	1	3	5	7	9	

Inadequate institutional co-ordination										Lack of willingness to pursue mitigation
	9	7	5	3	1	3	5	7	9	

Inadequate institutional co-ordination										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Knowledge gaps										Lack of willingness to pursue mitigation
	9	7	5	3	1	3	5	7	9	

Knowledge gaps										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Lack of willingness to pursue mitigation										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Pairwise comparison of barriers by the criteria '<u>Lifespan of barrier'</u>

Donor interest driven implementation										Inadequate institutional co-ordination
	9	7	5	3	1	3	5	7	9	

Donor interest driven implementation										Knowledge gaps
	9	7	5	3	1	3	5	7	9	

Donor interest driven implementation										Lack of willingness to pursue mitigation
	9	7	5	3	1	3	5	7	9	

Donor interest driven implementation										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Inadequate institutional co-ordination										Knowledge gaps
	9	7	5	3	1	3	5	7	9	

Inadequate institutional co-ordination										Lack of willingness to pursue mitigation
	9	7	5	3	1	3	5	7	9	

Inadequate institutional co-ordination										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Knowledge gaps										Lack of willingness to pursue mitigation
	9	7	5	3	1	3	5	7	9	

Knowledge gaps										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

Lack of willingness to pursue mitigation										Resource and capacity constraint
	9	7	5	3	1	3	5	7	9	

APPENDIX C: List of experts interviewed

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18	Dinanath Bhandari	Practical Action	
19	Ngamindra Dahal	CIAS	ngamindra@gmail.com
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22	Shambhu K. C.	Ministry of urban systems	
23	Pravakar Pradhan	AITM	
24	Prachet Shrestha	ECCA	
25	Mr. Devendra Adhikari		-
26	Mr. Vishwa Amatya	Practical Action	-

27	Mr. Ram Bastakoti	IWMI	-
28	Mr. Sunil Acharya	Practical Action	
29	Ms. Barsha Pandey	World Bank	-
30	Mr. Shree Raj Shakya	IOE	
31	Mr. Shital Regmi		-
32	Mr. Anil KC (NCCSP)	NCCSP	-
33	Mr. Deepak Parajuli		-
34	Mr. Anukram Adhikary	Forest Action	-