

**Sustainable Consumption for Effective Ecosystem-based  
Adaptation in Urban and Peri-Urban Settlements in the  
Lowlands of Nepal**

**By**

**SAMJHANA BISTA (Ms.)**

**MSc. SPRING-Regional Development Planning and Management  
TU Dortmund University, Germany/Universidad Austral de Chile, Chile**

**MSc. Environmental Management and Sustainable Development  
Pokhara University, Nepal**

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## **DECLARATION**

**According to the internal guidelines for implementing the PhD regulation of the Faculty of Spatial Planning (§ 9 PromO):**

### **Declaration of Independent Work**

I declare that I have completed the thesis independently using only the aids, sources and tools specified. Aids, sources and tools used in the dissertation were duly referenced. I have not applied for a doctor's degree in the doctoral subject elsewhere and do not hold a corresponding doctor's degree. I have taken due note of the Faculty of Spatial Planning PhD Regulations, published in the Official Gazette of TU Dortmund University on the basis of the resolution in PromA of 16/04/2014 and 9/7/2014.

I declare that I have successfully completed the requirements of the structured PhD programme (§ 9 PromO) as attached.

**Dortmund, January 2024**

**Samjhana Bista**

## THE EXAMINATION COMMITTEE

<b>Chairperson</b>	Univ. Prof. Dr. René Tribble, TU Dortmund University
<b>First Supervisor</b>	Univ. Prof. Dr. Dietwald Gruehn, TU Dortmund University
<b>Second Supervisor</b>	Prof. Em. Dr. Einhard Schmidt-Kallert, TU Dortmund University

## **Disclaimer**

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## ABSTRACT

The concept of sustainability is not new to Nepal and was accepted as early as the Brundtland Commission published its report in 1987. Integrating the concept into multiple sectors, such as consumption and production has been a challenge, especially with the fast pace of urbanisation. The agricultural lands and green spaces are displaced by the build-up areas, and the consumption of natural resources has been rampant. Besides, socio-cultural as well as behaviour and knowledge of individuals have largely influenced the consumption pattern. The individual and household consumption behaviour determines their affection towards nature and natural resources. However, very few studies have been conducted to see the linkage between sustainable consumption and nature conservation, such as ecosystem-based adaptation (EbA) practices, and no research was reported from Nepal in this regard. Hence, this study was conducted to assess the role of sustainable consumption in the effectiveness of EbA practices in urban and peri-urban areas, considering the case of Bheemdatt Municipality in Western Nepal.

A mixed research method was applied which included primary data collection from household surveys (271=135 respondents in urban, and 136 in peri-urban), focus group discussions (2 in urban and 2 in peri-urban), key informant interviews (11 key persons) and experts' consultation workshop (1) as well as secondary data from literature reviews and documents published by the Government of Nepal (GoN). SPSS Version 29 and MS Excel were applied to analyse the quantitative data statistically, which were presented in graphs, charts, and tables. Qualitative information was presented in the text and boxes, and this information was used to triangulate the quantitative data/information.

The major areas of consumption by the individual household were identified to be food, energy, water, education, health, lifestyle changes, recreational services, and environmental goods (such as forest goods). This research focused only on three areas: food, choice of mobility and recreation. All the respondent households were found to use at least one modern facility in terms of food consumption where people used ovens, refrigerators, rice cookers, LPG gas, water boilers, etc. Regarding the choice of mobility/means of transportation, people used bicycles/tricycles, motorcycles/scooters, three-wheelers, Jeep/trucks, etc. The majority of households in urban and peri-urban (58%) used at least two means of transportation. Similarly, people used parks and open spaces for several

purposes, of which the majority of respondents (92%) used them for recreation. The respondents also expressed their interest in paying the premium price for the improved parks and green open spaces in their neighbourhood. The major factors influencing household/individual consumption were people's lifestyle being more luxury-oriented, busy schedule of household members, availability of modern facilities, peer-pressure, increasing income, laziness, modernisation and urbanisation. People's age, education level, economic status, knowledge, their association with community-level networks/groups were the other influencing factors towards the way people consumed.

The research findings show that the consumption behaviour of people living in urban and peri-urban does not differ significantly as they are dependent on each other for resources, services, and supplies. Similarly, the people in the study area were found less aware on climate change and their impacts. Under conditions such as awareness on climate and health benefits, people were willing to pay the premium price for green food products. As the local government had a special legal instrument passed on the promotion of electric scooters, it was popular mainly among the older population. The legislative frameworks was developed by the local government in 2017, but none of them considered sustainable household consumption as the strategy to climate change adaptation. Many of these frameworks express a strong concern for conservation and protection, but their linkage to people's lifestyles and daily consumption behaviour is untouched.

Several efforts of EbA practices such as the construction of natural ponds, plantation of trees in open spaces, conservation of forests, construction of sheds, etc. were found practised by the community as part of the development projects introduced in the region, or as an autonomous practice. The results indicate that the individuals who are engaged in such initiatives (60% of them) also practise environment-friendly behaviours at the household level such as growing their own vegetables in the backyard, using bicycles to work, using green parks instead of sophisticated gym centres, among others. The concept of sustainable consumption is still an unknown terminology to many people. The study, therefore, collected evidence to claim that sustainable consumption should be considered as one of the indicators of effective EbA.



The findings will be very relevant to the government entities at all levels (local, provincial, federal) during planning and implementation to promote sustainable consumption, so that the loss and damages due to climate change is reduced. Considering that this study is one of the very few of its kind from developing countries, it will contribute to the existing literature on sustainable household consumption. At the same time, the findings will contribute to the theoretical understanding of sustainable consumption and build on the scientific knowledge of nature-based climate adaptation practices and its social connections such as the consumption pattern. The findings will be relevant for policymakers at the federal, provincial, and local levels; and development practitioners in designing and implementing context-specific projects focused on climate actions. Furthermore, it will pave the path for national as well as international discussions and commitments for climate financing efforts that are evidence-based, locally driven and local solutions-oriented.

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## ACRONYMS

ADB	Asia Development Bank
ADS	Agriculture Development Strategy
AEPC	Alternative Energy Promotion Centre
BASW	British Association of Social Workers
BMU	German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CBD	Convention on Biodiversity
CBS	Central Bureau of Statistics
CCCI	Cities and Climate Change Initiative
CDM	Clean Development Mechanism
CFUG	Community Forest Users Group
CIF	Climate Investment Fund
CVM	Contingent Valuation Method
EbA	Ecosystem-based Adaptation
EEA	European Economic Area
ENDRM	Environment Natural Resources and Disaster Risk Management Sub-Committee
ENPHO	Environment and Public Health Organisation
EU	European Union
FAO	Food and Agriculture Organisation
FCPF	Forest Carbon Participation Facility
FCDO	Foreign Commonwealth and Development Office
FEBA	Friends of Ecosystem-based Adaptation
FECOFUN	Federation of Community Forest Users Nepal
FGD	Focus Group Discussion
GCF	Global Climate Fund
GDP	Gross Domestic Product
GIZ	Deutsche Gessellschaft fur Internationale Zussamensarbeit
GLOF	Glacial Lake Outburst Flood
GNI	Gross National Income
GoN	Government of Nepal
HDI	Human Development Index

HERD	Health Research and Social Development Forum
HH	Household Survey
ICIMOD	International Centre for Integrated Mountain Development
IIED	International Institute for Environment and Development
IPCC	Inter-governmental Panel on Climate Change
IUCN	The World Conservation Union
KAP	Knowledge, Attitude and Practice
KII	Key Informant Interview
LAPA	Local Adaptation Plan of Action
LDCF	Least Developed Countries Fund
LGOA	Local Governance Operation Act
MCCIC	Multi-stakeholder Climate Change Initiatives Coordination Committee
MDMC	Municipal Disaster Management Committee
MLD	Ministry of Local Development
MoFE	Ministry of Forest and Environment
MoHA	Ministry of Home Affairs
MoUD	Ministry of Urban Development
MPI	Multidimensional Poverty Index
MPPW	Ministry of Physical Planning and Works
MSMEs	Medium and Small-Scale Enterprises
NAPA	National Adaptation Programme of Action
NASA	National Aeronautics and Space Administration
NbS	Nature-based Solutions
NCCSP	National Climate Change Support Programme
NDC	Nationally Determined Contribution
NGO	Non-Government Organisation
NPC	National Planning Commission
NTFP	Non-Timber Forest Products
NTNC	National Trust for Nature Conservation
NUDS	National Urban Development Authority
NUP	National Urban Policy
ODI	Organisational Development Index

OECD	Organisation for Economic Cooperation and Development
PwD	Person with Disability
PPCR	Pilot Programme for Climate Resilience
PPP	Public-Private Partnership
REDD	Reducing Emissions from Deforestation and forest Degradation
RET	Renewable Energy Technologies
RUAF	Resource Centres on Urban Agriculture and Food Security
SCP	Sustainable Consumption and Production
SDG	Sustainable Development Goal
SEM	Socio-Ecological Model
SIDA	Swedish International Development Cooperation (SIDA)
SIDS	Small Island Developing States
SLR	Systematic Literature Review
SPCR	Strategic Programme for Climate Resilience
SPSS	Statistical Package for Social Sciences
SUD-Net	Sustainable Urban Development-Network
TAL	Terai Arc Landscape
UACC	Urban Agriculture and Climate Change
UN	United Nations
UNCSD	United Nations Commission on Sustainable Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UPAF	Urban and Peri-Urban Agriculture and Forestry
VBN	Value, Belief, Norm
VDC	Village Development Committee
WCMC	World Conservation Monitoring Centre
WFP	World Food Programme
WRI	World Research Institute
WTP	Willingness to Pay
WWF	World Wildlife Fund

## GLOSSARY

**Adaptation:** Strategies and actions taken by human beings to adopt to the new conditions aroused because of climate change and protect themselves from the harmful impacts/loss and damages from the changing climate (IPCC, 2014).

**Consumption:** In this research, consumption mainly refers to the individual and household level use of resources including food, water, energy, fuel, fuelwood, etc. (Princen, 1999).

**Climate Change:** Change in the climate condition in multiple forms (mainly the temperature) because of natural and anthropogenic causes throughout the globe, which can have a negative impact on the lives existing on the planet, and the livelihood of human beings (Bast, 2010).

**Ecosystem-based Adaptation:** Understood within the umbrella of Nature-based Solutions and utilizes an ecosystem approach (can be small, medium to large) to adapt to the changing climate (GIZ, UNEP-WCMC & FEBA (2020)).

**Ecosystem Services:** The goods and services provided directly or indirectly by nature, which can be smaller or larger ecosystems (Sang, Hageman and Svannel, 2021).

**Mitigation:** Contribution made towards reducing the greenhouse gases generated from various anthropogenic sources (CBD, 2019).

**Nature-based Solutions:** Activities that utilize natural methods and/or natural resources to cope with the loss and damages that climate change may cause, adapt to changing climate, mitigate impacts of climate change and reduce impacts from natural hazards (IUCN, 2022).

**Sustainable Consumption:** Wise use of resources when using. Not necessarily less, but using only what is required and using resources in an environment/climate-friendly manner (UNEP, 2011).

**Sustainable Transportation:** Using means of mobility that are environment-friendly, utilise less energy and have less emissions (GoN, 2014).

**Sustainable Food Consumption:** Ways of consuming food that is grown by individual households and utilising organic manure; ensuring less wastage of food and utilising only what is required (Shrestha, Shrestha and Vaidhya, 2020).

**Urbanisation:** Urbanisation is understood as the aggregation of services, infrastructure, work, consumption, sophistication, industry, and progress (Sayer, 1984).

**Urban Green Parks:** A small-medium plot of land set aside publicly by the government in the form of gardens, parks, and other green infrastructures (Goddard, Dougill and Benton, 2010).





# CHAPTER 1: INTRODUCTION

## 1.1 Background of the Study

### 1.1.1 Issues of resource consumption and environment

Globally, resource use and environmental degradation have been increasing with the growth in human population. The way resource utilisation or consumption occurs differs from person to person and country to country. The present state of environmental health has mainly been attributed to the population and haphazard urbanisation (Adhul-Muhmin, 2007). The consumption pattern leads to environmental pressures and degradation (Mont and Power, 2010; Hicks, 2010). In densely populated areas, mainly in urban and peri-urban areas, where the economic activities, use of modern technologies and education level are higher, resource consumption is rapidly increasing (Sharma, Nguyen and Grote, 2018).

Resource consumption and environmental degradation are interlinked, with resource consumption triggering increases in greenhouse gas emissions that directly impact biological and social life. (UN-Habitat, 2011; Hicks, 2010). Anthropogenic activities not only increase the use of resources but also accelerate climate change, which shows that the consumption of resources largely contributes to the global climatic condition (Howard, 2022). Hence, achieving proper resource consumption and controlling environmental degradation is challenging. Despite which, it remains an important area to explore in the context of a changing world.

### 1.1.2 Influencing factors in consumption behaviour and patterns

Consumption is understood as the use of resources including food, water, energy, fuel, fuelwood, etc. at the individual and household level. It depends on individuals' behaviour and socio-economic background of the community and country. For most consumers, happiness is defined by their economic status and standard of living (Huang and Rust, 2011), which can sometimes come at the expense of environmental health. The lifestyle of an individual with uncontrolled consumption patterns and limited knowledge of their environmental consequences can contribute to unsustainable consumption (Hoque, 2014). Various social factors determine a person's behaviour regarding the use of resources, among which cognitive dissonance is one. Such a situation arises when the state of mind is confused, and sustainability issues compete with other socio-cultural concerns, leaving a

person unable to decide what to choose (Behr and Iyengar, 1985) among the available options. The economic sector is one of the major influencing factors in the consumption capacity of a community and a country (Kim, 2017). The Asia-Pacific Region is fast growing in terms of economy and is also the world's largest user of natural resources (UNEP, 2015). This also means that the region faces a challenge in sustainably consuming and producing resources to meet the sustainable development goals.

### **1.1.3 Consumption in urban and peri-urban areas**

The consumption patterns in urban and peri-urban largely differ, and in most instances, depend upon the level of income and knowledge. In urban areas, the consumption of processed, packaged, and readymade foods has increased, resulting in increased pressure on the natural environment (FAO, 2017). Productive agricultural land in peri-urban is disappearing and green spaces in urban areas are diminishing (Lucertini and Giustino, 2021). Urbanisation can also be accompanied by high levels of poverty, unemployment, and food insecurity (Satterthwaite, McGranahan and Tacoli, 2010) both in urban and peri-urban areas. Urban areas are responsible for generating greenhouse gases, increasing waste, and accounting for 75% of the total resource consumption (World Bank, 2022). Even in a developing country like Nepal, urban households consume 1.7 times more than rural households, and the richest households consume 4.2 times more than the poorest households (CBS and UNDP, 2016). As a result, ecosystems and human well-being in the cities are degrading due to reduced green spaces, natural areas, and an increase in concrete areas (Kabisch et al., 2017).

### **1.1.4 Sustainable consumption and climate change adaptation**

People use resources sustainably only when they have environmental awareness, an integrated and widely accepted approach to sustainable consumption and production, and favourable policies, such as those for greenhouse gas-emitting technologies, are in place. (UNEP, 2011). At the same time, the issue of climate change should be addressed concurrently at all levels: local, regional, and global (NASA, 2022). In recent years, approximately half of the global human population inhabit in urban areas (UNDESA, 2014), and will be affected by climate change severely (White, Habib and Hardisty, 2019). Smaller and larger ecosystems are being disrupted as urbanisation drives a significant conversion from rural to peri-urban and urban landscapes (Seto, 2011), which directly impacts the changing climate.

Human activities that exert pressure on natural resources can lead to the long-term loss of biodiversity (Goddard, Dougill and Benton, 2010), as well as a reduction in the functions and services that ecosystems provide. Mitigative, preventive and adaptive measures should also come from people so that the quality of life is enhanced, biodiversity is protected, and atmospheric greenhouse gases are reduced (Scarano, 2017). One of such adaptation practice is Ecosystem-based Adaptation (EbA), which is particularly relevant to developing nations such as Nepal. It safeguards most of the biodiversity and maintains ecosystem health in all its forms. According to the CBD (2019), EbA mainly focuses on *‘helping people adapt to climate change, promoting the active use of biodiversity and ecosystem services, and applying in the context of an overall adaptation strategy’*. Climate change adaptation-related activities, initiatives, approaches, strategies and/or measures that are rooted in people, ecosystems and restoration are qualified as EbA (FEBA, 2017).

Species diversity can be conserved greatly if the green areas in urban environments are preserved and protected, as they provide a home to a wide variety of floral and faunal species (Goddard, Dougill and Benton, 2010) along with several environmental and cultural benefits, while also contributing to climate change adaptation and mitigation (Kabisch et al., 2017). In addition, NbS such as EbA in urban spaces can enhance the beauty of urban landscapes by considering the services provided by nature (CBD, 2019).

While urbanisation in Nepal is increasing at a rapid pace, with high urban growth in a few large and medium cities (Bakrania, 2015), urban areas are becoming increasingly vulnerable to climate change. This calls for more sustainable solutions. Cities and artificial urban areas have a significant environmental impact (Newman, 2006), as the demand for nature and natural resources increases with a growing population (Baro et al., 2015). This demand is likely to increase in the future, both in absolute terms, and in terms of vulnerability to climate change (Klopfer, Westerholt and Gruehn, 2021). Among the various ecosystem-related approaches within the NbS Family, EbA is becoming increasingly popular, which places people at the centre and empowers them to conserve natural resources and seek local support for restoration and sustainable management activities (Cohen-Shacham et al., 2016). Hence, sustainable consumption and climate change adaptation, particularly EbA in urban and peri-urban areas, are interlinked and represent new areas of research for assessing their association.

## **1.2 Brief Overview of Nepal**

### **1.2.1 Geography**

Nepal is ranked as the 93<sup>rd</sup> largest country in the world by land size and is located along the slopes of the Himalayan Mountains between China and India in South Central Asia. It has a land area of 147,516 km<sup>2</sup> and has the largest elevational gradient in the world, ranging from tropical alluvial plains as low as 67 metres above sea level (masl) in the lowland to the alpine-nival earth's highest peak, Mount Everest at 8,848.84 masl (MoFE, 2021). Nepal can be divided into five major physiographic zones: the high himalayas, high mountains, middle mountains, siwalik hills and terai plains. All five zones extend lengthwise from east to west across the country. The climate varies from alpine cold semi-desert type in the trans-Himalayan zone to tropical humid type in the tropical lowlands in the south (GoN, 2014). Nepal is a geologically and climatically vulnerable country due to its location on the thrust line of the Indian and Tibetan tectonic plates, as well as the presence of young mountains and the Churiya/Siwalik hills it bears (ADB, 2020).

### **1.2.2 Demography**

According to the National Census of 2021, the population of Nepal is 29,192,480, which is an increase of 10.18% in one decade. Among these, the male population is 14,291,311 (49%) and the female population is 14,901,169 (51%). The average family size is 4.37. Considering the most recent definition of urban in Nepal (people living in metropolitan, sub-metropolitan and municipalities), 63.19% reside in urban areas, which also encompasses peri-urban areas in physical terms. The population density in Nepal is 198 per square kilometre (CBS, 2022).

### **1.2.3 Culture**

Nepal is rich in cultural diversity, housing a diverse array of ethnic, caste, linguistic and religious communities (Dixit and Ramachandran, 2002). Over 100 ethnic groups inhabit the country, speaking more than 106 languages/dialects and practicing a variety of religions, mainly Hinduism, Buddhism, Islam, Christianity, and other localised religions (Pradhan, 2007).

#### **1.2.4 Natural resources**

Nepal possesses a unique environment and ecosystems with rich natural resources, abundant fresh water and agricultural land. Approximately 44.74% of the total land area is covered by forests, of which 23.3% are protected areas (national parks, conservation areas and wildlife reserves) (GoN/MoFE, 2016). A total of 118 ecosystems have been identified in Nepal, including 112 forest ecosystems, four cultivation ecosystems, one water body ecosystem and one glacier/snow/rock ecosystem (GoN, 2014). Nepal has a total drainage area of 194,471 square kilometres comprising more than 6,000 rivers (CBS, 2019). Other water bodies include 5,000 lakes, 1,380 reservoirs, and 3,808 glaciers with 1,466 glacier lakes. About 21 glacier lakes are identified with a risk of glacial lake outburst flood (GLOF) (ICIMOD, 2011).

The lowlands of Nepal are rich in biodiversity and serve as a habitat for some of the most charismatic species, including bengal tigers, one-horned rhinoceros, asiatic elephants, snow leopards and others. Recognising its conservation value, the GoN has declared various sites as special conservation landscapes - Terai Arc Landscape (TAL), Chitwan-Annapurna-Langtang Landscape and Sacred Himalayan Landscape. This move marked the shift from site-based, species-focused conservation to community-based landscape-level conservation.

#### **1.2.5 Political administration**

Nepal is a young federal democratic republic country. Over the last three decades, the nation underwent a prolonged political transition, evolving from absolute monarchy to a constitutional monarchy with multi-party democracy, and eventually to a Federal Democratic Republic (GoN/NPC, 2017). Under the new federal system established in 2017, the country operates with three layers of government: local, provincial and federal. Administratively, Nepal is divided into 7 provinces, 77 districts, 6 metropolitan cities, 11 sub-metropolitan, 276 municipalities and 460 rural municipalities. Municipalities and rural municipalities are local-level functional administrative units and are commonly called “*Palikas*” in the Nepali language.

### **1.2.6 Human development situation**

More recent data shows that Gross National Income (GNI) per capita has reached USD 1,264.49 in 2022. Nepal's national Human Development Index (HDI) score stood at 0.602 in 2022, ranking 143<sup>rd</sup> (UNDP, 2022). Its score in urban areas (0.647) surpasses that of rural areas (0.561) with a large urban-rural gap. This results in a GDI value of 0.886. Similarly, Nepal holds the 113<sup>th</sup> position in the global Gender Inequality Index. Principally, men and women have equal human rights as per the recent and major policy reforms in Nepal. However, women have faced centuries of discrimination in terms of access to political rights, property, information, education, reproductive rights, livelihoods, and more. The 2021 female HDI value for Nepal is 0.584, contrasting with 0.621 for males, resulting in a GDI value of 0.942. This places Nepal into Group 3, which comprises countries with medium equality in HDI achievements between women and men (UNDP, 2022). The incidence of multidimensional poverty (H) is 17.4%. Comparing globally, Nepal's 2019 multiple poverty index (MPI) value of 0.074 is below Bangladesh's 2019 MPI of 0.104. These values are computed from the Nepal Multiple Indicator Cluster Survey (NMICS) and are lower than the MPI values for all South Asian countries except the Maldives (GoN, 2020).

### **1.2.7 Situation of climate change**

Nepal is among the most vulnerable countries to the impacts of climate change and climate-induced disasters. Globally, Nepal ranks fourth, eleventh, and thirtieth in terms of vulnerability to climate change, earthquake, and flood risks respectively. As per the disaster database in Nepal, 15 weather-related disasters are recorded: floods, landslides, epidemics, fires, lightning, heavy rain, drought, glacial lake outburst flood (GLOF), heat waves, cold waves, storms, avalanches, blizzards, hail and wildfires. The trend analysis of 14 types of climate-related disasters (except GLOFs) shows that the incidence of disasters has significantly increased, particularly after 1990. Except for meteorological droughts, all disasters show an increasing trend (MOFE, 2021). Data reveals that more than 80% of property loss due to disasters is attributable to climate hazards, particularly water-related events such as floods, landslides, and glacial lake outburst floods (GLOFs). Water-related disasters claim more than 300 lives a year, displacing people and destroying homes, farmland, and other essential infrastructure (Bishokarma, 2017).

The extreme weather events have not only resulted in loss of life, property, and livelihoods (MoFE, 2018a), but have also forced youth to migrate, displaced indigenous groups, and disrupted social harmony. Out of 77 districts, 50 districts are ranked high to very high in terms of vulnerability to the effects of climate change (MoFE, 2021). The climate change trend in Nepal (1971-2014) shows that the annual maximum temperature is increasing by 0.05<sup>0</sup>C/yr. Average annual precipitation is expected to rise in both the shorter term (2030) and longer-term (2050) (MOFE, 2018). Climate change has the potential to drive fundamental shifts in the food security landscape in Nepal, thereby significantly disrupting the food system and food supply chain. As average temperatures rise and rainfall patterns shift over the coming decades, the impact will be felt across various sectors, including agriculture (NPC and WFP, 2019).

Various concepts of NbS, such as EbA are gaining popularity in Nepal. The annual loss and damage due to climate-induced disasters is very high (DCA, 2022). There are very few induced/planned EbA projects in Nepal and none in the entire lowland region of Nepal, which is equally vulnerable from a climate change perspective. Local and indigenous people knowingly or unknowingly practice various forms of EbA practices. While the issues of groundwater pollution, deforestation and over-exploitation are severe in the lowlands, loss and damages due to climate change are less discussed and under explored. This calls for an urgent need to address the detachment between prevailing local issues and global climate change (Nash et al., 2019).

### **1.2.8 Urbanisation trend in Nepal**

Nepal has remained one of the least urbanised countries in Asia until very recently. Various urban transitions in spatial, demographic, and economic arenas have been observed in recent times. Until 2014, it was one of the top ten fastest-urbanising countries in the world (UNDESA, 2014). The transition of Nepal from a predominantly rural to an emerging urban economy is mainly due to the decision from the GoN to merge rural administrative units and declare them as municipalities, administratively classifying them as urban units in Nepal. In 2017, the GoN decided to implement a major territorial reform based on the constitutional provisions through the Local Level Restructuring Commission (LLRC) following the promulgation of the new Constitution of Nepal in 2015. Despite the policies and acts on urban resilience and disaster risk reduction (DRR), most of the local governing

bodies lack post-disaster preparedness plans, such as reconstruction and debris management, which are critical for a speedy recovery of society from a disaster (GoN/MoUD, 2017).

### **1.2.9 Legislative frameworks in Nepal**

The National Urban Policy (NUP) 2007 has identified some major issues to address through its policy, including structurally unbalanced urbanisation, weak rural-urban linkages, environmental degradation, ambiguous national policy, lack of horizontal linkages between institutions, urban poverty, and weak municipal capacity (ADB, 2020). The NUP has also highlighted the existing poor physical infrastructure, environmental degradation, inadequate basic services such as drinking water and solid waste management, and squatter settlements as outcomes of inadequate rural-urban linkages. The GoN/MoUD (2017) has acknowledged the lack of knowledge on climate impact in various urban ecological regions of Nepal but does not provide solutions on how to improve the situation. The Industrial Policy 2011 has mentioned the necessity of environmentally friendly production practices, such as low-energy technologies and other technologies that cause less harm to the environment. It has also highlighted the need to practice sustainable production practices. However, the methods for ensuring the consumption of sustainable products are not mentioned. Moreover, the relevant policies developed in the previous two decades, including Industrial Policy 2011, Urban Policy 2007 and Transport Policy 2001 have placed less emphasis on consumption practices.

Nepal's 'Nationally Determined Contributions' commit to reducing national emissions and improving adaptation to climate change by adhering to the Environment-Friendly Local Governance Framework (EFLG, 2013). There are several other documents including Climate Change Policy (2011; revised in 2019), National Adaptation Programme of Actions (NAPA, 2010), Local Adaptation Plan of Action (LAPA, 2011), National Adaptation Plan (NAP, 2021), Agriculture Development Strategy (ADS, 2015-2035); all of which put agricultural productivity and climate change adaptation and mitigation at the forefront of the agenda. The GoN has declared 2018–2028 as the 'Energy Decade' and has envisioned sustainable energy sector development through the development and expansion of hydroelectricity and renewable energy. The Renewable Energy Subsidy Policy (2016) provides subsidies on various Renewable Energy Technologies (RETs) including solar



water lifting, solar irrigation, biogas, gasifiers, waste to energy and productive end uses. The ADS (2014) highlight the integration of small-scale enterprises with modern technologies and improving agri-food systems. It also acknowledges the promotion of agroecology, organic farming and efficient use of energy/water for agricultural purposes. These policies, however, do not investigate the consumer's perspective, their knowledge and awareness of sustainable practices, and how the proper implementation of these policies can contribute to reducing the impacts of climate change.

The NAPA and LAPA are highly focused on identifying solutions to reduce losses and damages due to climate change from the people's perspective and implementation from the government side. Various government and non-government organisations are working to mainstream LAPA into the plans of local government, especially after the federalisation. This decision was made in order to develop and implement projects to address local climatic issues, build resilience, enhance the adaptive capacities of multiple stakeholders at the local level and integrate these plans into the development plans. The Local Governance Operation Act (LGOA, 2017) mandates all local governments to formulate, implement, monitor, evaluate and regulate policies, legislations, standards, and norms related to the development projects and programmes, including food and nutrition security. Similarly, the Right to Food and Food Sovereignty Act (2018) provides the right to all citizens of Nepal to be able to access sufficient nutritious food throughout the year and to be free from hunger.

#### **1.2.10 Institutional capacity of the government agencies on climate action**

Climate change is considered a cross-cutting development issue in Nepal, and efforts are being made to mainstream it across multiple sectors. Nepal's longer-term development vision is also guided by the Sustainable Development Goals (SDGs), for which a target-based roadmap has been developed. The fifteenth periodic plan of Nepal has prioritised adaptation, and hence, collaboration among multiple stakeholders and themes has been emphasized (MoFE, 2021a). At the policy level, Nepal developed a Climate Change Policy in 2011 and revised it in 2019. The policy addresses both mitigation and adaptation, with the adaptation component focusing on building adaptation and resilience by the local communities, which aligns with the priorities identified by NAPA (2010). In 2021, Nepal launched NAP, which aims to reduce the country's vulnerability to climate change and

facilitate the integration of climate change adaptation in policies, programmes and activities across sectors and levels. The GoN also emphasizes the importance of adaptation and resilience-building in reducing loss and damage to people as well as nature from the impacts of climate change and identifies NAP as a key mechanism for articulating the country's adaptation needs.

The systems within urban areas largely differ in terms of population and resource availability. Rapid urban sprawl and informal settlements have further deteriorated the situation (GoN/MoUD, 2017). Furthermore, municipalities lack institutional capacity, proper planning, and funding mechanisms to manage the urban environment, which includes coping with disasters, providing safety and security, and enhancing socio-cultural aspects such as the preservation of open spaces. The National Transport Policy (2001) has highlighted that the local government should have environmental considerations when managing transport infrastructure and conserving green belts in urban areas but does not provide suggestions on the implementation modality.

On the financing side, Nepal introduced a climate change budget code during the fiscal year 2012/13. A technical committee on climate finance was established under the leadership of the Ministry of Finance. Although the capacity to mobilise funds from international sources is inadequate, several successful examples of accessing funds have been noted. These include climate finance from mechanisms under the UNFCCC, such as the Least Developed Countries Fund (LDCF) and the Adaptation Fund, as well as approval for NAP readiness funding from the Green Climate Fund in 2016. Outside the UNFCCC, several bilateral and multilateral donors have also supported the implementation of adaptation programmes (notably DFID, EU and UNDP among others). Both the Climate Change Policy and the NAP focus on nine thematic areas (agriculture and food security, water resources and energy, public health, water, sanitation, and hygiene, urban settlements and infrastructure, forests and biodiversity, climate-induced disasters, tourism, natural and cultural heritage, gender and social inclusion, and livelihood and governance) and cross-cutting issues (GoN, 2019).

### **1.2.11 Concept of sustainable consumption in Nepal**

While there are several plans, policies, programmes and institutional structures in place, the concept of sustainable consumption at the individual and household level is still in its infancy. Due to the climate-induced shocks and stresses, many poorer households in Nepal have sold their assets and reduced their food consumption in recent years (World Bank, 2019). About 53.8% of household consumption in Nepal is spent on food, followed by 12.9% on rent, 5.5% on durables, 4% on education, 3.9% on alcohol and tobacco, 2.2% on utilities and 17.8% on non-food items such as medical, social security, cultural expenditure, etc. (CBS and UNDP, 2016). Food is primarily processed for cooking purposes, and it cannot be ignored. About 87% of the total household energy demand is attributed to biomass used for the cooking sector (Malla, 2022). The GoN prioritised energy, transportation, industry, and commerce as part of a low-carbon and climate-resilient development strategy in 2015 (Chhetri, 2017); where energy is one of the major household consumption sectors in rural Nepal.

Nepal does not produce enough food for its own citizens and much of the food produced is mainly for household consumption (Chhetri, 2017). Agricultural production is therefore, crucial in terms of food consumption in Nepal. While the need for agricultural production has increased, deforestation leading to land conversion and fuelwood consumption has also increased (Amachher, Hyde and Joshee, 2007). Firewood is used not only for cooking but also for heating and lighting purposes, resulting in the use of 235–1,130 kg per capita per year, which greatly varies with geography and outside temperature (Rijal, 2018). In some instances, consumption patterns are also determined by family size, especially the number of children. Families having a son as their firstborn are likely to have a lesser number of children and lesser consumption, and vice versa (Libois and Somville, 2018) in Nepal.

### **1.3 Personal Motivation for this Research**

I started my career in the development field as early as 2001 as a volunteer in a Nepalese National NGO, when I was still at my university and a student of Bachelor of Science in Environmental Sciences. I completed my Master of Sciences in Environmental Management and Sustainable Development and continued my profession as a development practitioner. I received the opportunity to undertake my second master's degree in Regional Development Planning and Management jointly under the Faculty of Spatial Planning at

TU Dortmund University, Germany and Universidad Austral de Chile between 2008 and 2010. I have always believed in communicating science in the simplest way possible to all the relevant stakeholders, mainly those whom the research is all about. Since then, my interest has been in natural parks, sustainable energy, sustainable livelihood, etc. That said, the nexus between people and nature and the exploration of the Anthropocene has been my area of interest. I had expressed my interest in a PhD and therefore, applied to TU Dortmund University in 2011, and got accepted. Due to funding constraints, I could not continue my dream and had to halt for the time being.

I continued working with several national, international and bilateral organisations in Nepal that focused on climate actions on the ground and climate advocacy. More concretely, I was frequently attracted to the proposal calls announced by the SWITCH-Asia Programme. This is an Asia Regional Programme launched in 2007 as part of the European Union's priority to support a programme of sustainable consumption and production (SCP) in its regional cooperation strategy with Asia. Back in 2017, I was engaged in developing a development project for Western Nepal on circular economy mainly focusing on greening the agriculture value chain. As part of the needs assessment, we tried to explore the level of knowledge and understanding of multiple stakeholders on sustainable consumption and production. To my surprise, the level of understanding of sustainable consumption and production was almost zero in some areas even though Nepal, especially the Western Part is hugely impacted by the changing climate.

As part of my professional requirement, I got the opportunity to engage in the design of multiple projects focused on climate actions, NbS sustainability, and EbA among others in the subsequent years. Equally, I was engaged in several needs assessments. As the needs assessments were project-bound and time-bound, our studies were mainly surficial. As an environmentalist and planner by profession as well as degree, my interest to dig deeper and explore the reality on the ground grew stronger. This then pushed my inner researcher self to devote more time to re-take my dream of PhD, design my research project, to execute myself in the form of a PhD research.

My entire PhD Journey has been tremendously motivating considering that I am a development professional and as such, I had multiple opportunities to be part of the

proposal design teams, dialogues and discussions. For example, while designing a project for the Global EbA Fund in 2020, I got further confirmation that the effectiveness of EbA interventions is largely conservation focused in practice, although it has a tremendous social component in the paper. Areas such as the lifestyle of people, household level consumption, etc. are hardly considered. This supported me in refining the research ideas and focusing, until I produced a complete thesis.

## CHAPTER 2: THEORETICAL BACKGROUND

### 2.1 Introduction

This chapter presents the conceptual background, key definitions and theories associated with sustainable consumption and EbA. It starts with the concept of sustainability and sustainable consumption, followed by the nexus between urban areas and climate change, urban areas and sustainable consumption, and the concept of NbS and EbA. Nepalese context has been presented under a dedicated section. Finally, the chapter presents the indicators of sustainable consumption, the effectiveness of EbA and how the linkage between these two sectors has been explored in previous literature.

#### 2.1.1 Concept of sustainability

The term “Sustainability” has been used in different disciplines mainly in economic, social and environmental sectors (Kuhlman and Farrington, 2010). It was defined by Hanns Carl von Carlowitz in forestry management in the early 1700s (Van Carlowitz, 1713). Since then, it has been adopted by different agencies and used in natural resource management (Wilderer, 2007). However, to explain sustainability, the human environment was considered a part of development in the 1970s and ‘sustainable development’ was coined as a policy concept in the Brundtland Report 1987 (UN, 1987; Kuhlman and Farrington, 2010). This and various other aspects of sustainability were then officially disseminated in the United Nations Conference on Environment and Development (Rio Conference) in 1992, emphasizing that sustainability should create a conducive environment for people living now, thereby securing the resources for future generations (UN, 1987).

In order to achieve sustainability, people take voluntary action to simplify their lifestyle (Alexander, 2011). Literature suggests that the term “life-style” was first used by a psychologist, Alfred Adler in 1929 to indicate individual’s basic characteristics including his reactions and behaviour. Adler’s work was then elaborated and complemented by several researchers. Ansbacher in 1967 suggested the definition of lifestyle to be categorised into three levels – at individual level, group/family level and societal level. Further, Veal (1993) in their review article on the concept of lifestyle, added that the lifestyle can include activities such as consumption pattern, leisure activities and domestic practices such as styles of cooking/eating, child-rearing practices, home decorating/furnishing style, etc.

## **2.1.2 Concept of consumption and sustainable consumption**

### **Concept of consumption**

The concept of consumption appears to date back to 1945 when it was described within the context of economic surplus (Boulding, 1945). Consumption was defined to exist where production occurred, conveying the idea that one needs to destroy something to consume something. In 1993, Bocoock cited several examples and acknowledged the previous understanding of consumption while attempting to explain the term through the lens of social sciences, cultural studies, and communications. In their book, they explained how the definition of consumers has changed over time, and how the living patterns of certain groups of individuals have defined consumption. They also provided examples of consumption, such as lifestyles, self-identified use of leisure time by different age groups and the use of commodities (such as clothes, footwear, popular music) that are directly linked to modern capitalism. However, they also acknowledged the fact that some religious groups consider the negative environmental impact consumption can have.

The term started being popular among a wider audience only after the Oslo Symposium in 1994 when the term “sustainable consumption” was formally introduced (Liu et al., 2017). In the review article published by Liu et al. (2017), which analysed relevant literature published between 1995 and 2014, the authors claim that the research on sustainable consumption gained more popularity among researchers only after 2006 when collaborations between researchers from various countries occurred, and the interrelated issues at both local and global levels were communicated.

### **Definition of sustainable consumption**

With the increasing population, the demand of natural resources has increased all over the world. The utilisation of resources in households/individuals (private) and by the public (government) leads to direct environmental pressures. The consumption of food and drink, housing, infrastructure, and mobility by private consumers are considered key environmental pressure categories, influenced by economic, demographic, technological innovation, urbanisation, and socio-cultural aspects (EEA, 2012). To reduce pressure on the environment, sustainable consumption is required, with considerable attention in both the developed and developing countries. Sustainable living tends to limit the level of

consumption while maintaining well-being (Miller and Spoolman, 2008). The Rio Declaration and the World Summit on Sustainable Development, Johannesburg in 2012 also emphasized voluntary efforts to promote sustainable consumption.

UNEP (2011) has defined SCP as “a holistic approach to minimising the negative environmental impacts from consumption and production systems while promoting the quality of life for all”. The key principles of SCP, as suggested by UNEP (2015) focus on using available resources without degrading them and promoting economic growth through the wise use of natural resources, and the promotion of reuse and recycling of resources to enhance efficiency. Consumption has also been a status symbol in some Asian countries, such as meat consumption in Vietnam and Thailand (Sharma, Nguyen and Grote, 2018). Gerbens-Leenes and Nonhebel (2002) have argued that the consumption pattern may soon be considered an important variable for total land requirements.

In developed countries, such as European countries, some important policy initiatives for adaptation and collective efforts have been identified and initiated. For example, the Danish information campaign ‘One Tonne Less’, the Dutch tax incentive scheme ‘Green Funds’, the British ‘Red/Green calculator’, and the E6pan-European internet platform ‘Top Ten’ (Scholl et al., 2010) might prove inspiring for reforming future policies. Some of the anthropogenic activities that impact the environment include agriculture, transportation, home energy use, water use and waste (Miller and Spoolman, 2008), which can be considered while introducing initiatives and campaigns.

### **2.1.3 Understanding sustainable consumption through the lens of available theories**

Consumption is influenced by and associated with a diverse array of social, cultural, economic and environmental factors that creates a complex interrelation among them (Hicks, 2010). Hence, the concept of sustainable consumption can be linked to various concepts and theories. Primarily, the socio-ecological theory, theory on climate change, ecological modernisation theory, theory of practice, theory of value, belief and norms, and theory of consumption have been considered relevant. These theories have been frequently referred to and have guided the development of the theoretical framework in this research.



**Socio-ecological theory:** Different socio-ecological theories have been explained as constructivist thoughts and practices in the field (Bousquet et al., 2015). De Molina and Toledo (2014) explained the social-ecological theory by explaining how people and nature interact and how anthropogenic impacts on nature are visible, indicating an unbalance between the two and sometimes leading to the extinction of one of the floral/faunal species. Various evidence shows that nature is impacted by anthropogenic activities in different ways. In the 1970s, Urie Bronfenbrenner (Bronfenbrenner, 1977) initially introduced the socio-ecological model (SEM) as a concept for understanding human development over time, which was later formalised as a theory in the 1980s (Bronfenbrenner, 1977). Furthermore, Holling (1973) explained resilience and ecological systems, and later Mont (2007) proposed the concept of consumption and ecological economics. Evans and Jackson (2008) also argued that consumer behaviour and lifestyle are important factors to consider and can sometimes create challenges in understanding the concept of sustainable consumerism and achieving sustainable consumption in practice.

**Ecological modernisation:** Ecological modernisation theory emerged in the 1980s and further advanced in the 1990s, particularly in relation to environmental reform processes (Glynn, Cadman and Maraseni, 2017). This theory goes beyond the traditional or conventional stage to re-adaptation by modern means such as scientific knowledgebase and advanced technology to make development more sustainable (Huber, 2008). Within the realm of ‘social sciences of environmental reform’, ecological modernisation stands out as one of the strongest, most well-known, widely cited, and constantly debated concepts. Ecological modernisation was used to define the processes of environmental reform within modern-day social science (Mol, Spaargaren and Sonnenfeld, 2009). This includes how politics, prevailing markets and institutional mechanisms can be integrated into the policies and practices of pro-environmental interventions (Mol, Spaargaren and Sonnenfeld, 2009).

**Theory of practice:** Practice theory is the combination of social, cultural and theory of sciences that are contributed by philosophers (Wittgenstein) to Sociologists (Bourdieu and Giddens). The interaction among norms, values or material constraints with consumption practices (Rouse, 2007; Warde, 2005) is better explained within the scope of practice theory. This theory was introduced initially by the philosopher, followed by the interpretations by Schatzki, and the sociologists - Bourdieu and Giddens (Corsini et al.,

2019). So far, the practice theories have found application in numerous areas of consumer studies such as mobility, hygiene, nutrition, and energy consumption. These areas of consumption have utilised practice theory to explain that human being's behaviour is because of their practices. This makes the social attributes continuously changing the composition of interconnected human activities, and of what these activities embody. Theories of practice mark a departure from individualistic approaches and therefore, provide insights into the dynamics of social norms, motivations, and perceptions, and how they transform through continuous action (Corsini et al., 2019).

**Value belief norm theory of environmentalism:** Stern (1994) initially highlighted that choosing environmentally friendly behaviour, such as in the transport sector can be based on a sense of moral obligation to act in a sustainable fashion (Lind et al., 2014). Stern's value-belief-norm theory of environmentalism (VBN theory) provides a framework for investigating normative factors that promote sustainable attitudes and behaviour (Stern et al., 1999) i.e., pro-environmental behaviour. Oreg and Katz-Gerro (2006) have also argued that a certain type of environmental behaviour and attitude (pro-environment) is deeply rooted in the cultural values of the society one comes from, regardless of individuality. Lind et al. (2015) identified variables such as an individual's values, beliefs, and environmental consciousness, which are reflected in one's behaviour in multiple ways. Similarly, Jaung et al. (2022) used the VBN theory in Singapore to conclude that urban nature can act as a solution to motivate sustainable consumption by individuals.

**Theory of sustainable consumption:** Sustainable consumption requires social, economic and environmental sustainability, with household consumption being one of the key determining factors (EEA, 2012). The way people spend on goods and services, their use/reuse and waste behaviour and the technological characteristics of products determine the total environmental impact of consumption (Van den Bergh and Carnonell 1999). Dubey et al. (2016) have argued that institutional arrangements and governance systems offer useful insight to understand the sustainable behaviour of consumers. Influential activities among peers, family members, organisations and companies are instrumental in promoting pro-environmental behaviour, while external forces have a limited role to play. Stakeholders in an institution or household members in a family may exhibit different behaviours in various situations, and these cannot be predicted unless there is an equal level

of information sharing and knowledge among household members. Stavrakas, Papadelis and Flamos (2019) have emphasised that to reduce the risks associated with behavioural uncertainties concerning the effectiveness of a certain scheme or activity, especially in the case of risk-averse consumers, different sources of positive outcomes should be investigated and communicated.

Lim (2017) introduced three different theoretical perspectives for explaining sustainable consumption: responsible consumption, anti-consumption, and mindful consumption. Wang et al. (2020) found that social capital and influences encourage the adoption of sustainable consumption, while price factors simultaneously discourage such behaviour, compelling service providers to rethink their strategies. Sustainable consumption is a voluntary effort, but its definition can be vague due to its connection with multiple factors. On top of that, the definition of sustainable consumption encompasses various aspects including consuming less, consuming green, reusing, recycling, recovering and more. Anantharaman (2018) argued that all these examples can form an integral part of sustainable consumption and they also argued that it can be a tool for liberation.

*“Sustainable consumption can be a ‘politics of possibility’ in the sense that it asks how things could be, beyond the current practices and what can be the alternative ways of living well within the ecological limit and beyond consumerism” (Anantharaman 2018, pp.558).*

Similarly, with respect to sustainable consumption, Han (2020) developed a Theory of Green Purchase Behaviour (TGPB), where he explained that individuals’ green purchase behaviour is impacted by knowledge and awareness, past behaviour, as well as social and environmental norms. TGPB was developed with close consideration of the VBN theory.

## **2.2 Dimensions of Sustainable Consumption**

### **2.2.1 Social dimensions**

Studies on sustainable consumption have focused on various dimensions and have established the relationship among different variables. Values and beliefs determine the perception of consumers where environmental and social impacts depend on their choices (Ayala, 2018). The relationship between sustainable consumption and people’s well-being is more complex to comprehend (Carrero, Valor and Redondo, 2020). The authors also

suggested that understanding the relationship between sustainable consumption and well-being might help leveraging points of action to support sustainable consumers and persuade younger consumers to embrace this lifestyle.

A systematic literature review conducted by Fischer et al. (2017) regarding mindfulness and sustainable consumption provided evidence that characteristics associated with mindfulness are faintly, but consistently, correlated with various measures of individual sustainable consumption behaviour. Their study revealed that mindfulness has small but stable effects on a range of different sustainability behaviour, and most interestingly, it can enhance the capacity to reduce materialistic values and promote well-being.

### **2.2.2 Economic dimensions**

Consumer demand for resources, energy, goods, and services can vary depending on their income (Ayala, 2018). Disposable income at the individual and household level influences the consumption pattern (OECD, 2008). For example, private consumption in European countries tends to exceed public consumption (Hicks, 2010).

Water, Energy and Food (WEF) are the most basic human needs and share a strong connection (Estrada, 2018) in one's choice of lifestyle as well as the use of natural resources. Additionally, understanding the interconnection between water, food and energy is central to achieving sustainable development, all three of which are increasingly demanded by the current world which faces a rapidly increasing population, growing urbanisation and unprecedented economic growth (UN, 2022). The Brundtland Report, 1987 forecasted that resource consumption especially in developing countries is likely to increase due to population and income. The same report has also noted that for living standards to be sustainable, consumption standards should be set and that the needs of many urban poor are considered. Often, consumption in developing countries is low but unbalanced in many ways, resulting from income disparity and the purchasing power of individuals.

Max-Neef (1987) put forth a forward-looking argument that development in the modern context should be defined in terms of human development, quality of life and satisfying their needs, rather than relying on measures such as gross national products (GNPs).

People's ways of needs and consumption are best known to the individuals themselves and therefore, the realisation of what is "needed" and what is "sufficient" must be decided by the individuals themselves. His arguments made perfect sense while understanding the concept of sustainable consumption, as it is more about individuals' decision to find contentment and maintain happiness with the available resources. In that sense, it is also about an individual's state of mind. Furthermore, Max-Neef (1992) also emphasized that the poorer the people are, the richer their knowledge should be about their interdependence with nature, a culture of self-reliance and an appreciation of simpler things over the larger and sophisticated things. In 2010, he presented the concept of needs and satisfiers through a book chapter on Development and Human Needs. He argued that fundamental human needs are finite and remain the same across all individuals and cultures (Max-Neef, 2017). It is the 'greed' that has led human beings towards a more unsustainable way of living their lives. While Max-Neef's theory of human needs has been widely used since it started, Gasper (2022) also presented Max-Neef's model as a practical tool for supporting societal transitions and being relevant for local sustainable development.

In this context, Kurz, Donaghue and Walker (2005) identified the ways in which energy and water are constructed as resources, along with the discursive strategies mobilised by members of a community to account for and legitimise specific resource consumption practices. They found that participants considered water as a scarce, shared, natural resource that must not be wasted, while energy was not even considered a consumable resource. The Bonn 2011 Conference - *WEF nexus- Solutions for Green Economy* focused on applying a nexus approach as an urgent policy lever to achieve water, energy, and food security, promoting a more integrated solution. In broader terms, the nexus between these three sectors provides an informed and transparent framework for understanding the trade-offs to meet increasing demand without compromising sustainability (Leck et al., 2015). However, Spiegelberg et al. (2017), in their study, found no direct relevance among WEF in their research area and recommended further studies in similar settings. Simpson and Jewitt (2019) also emphasized that the challenge lies in supporting the sustainability of natural resources such as water, energy, and food resources, without reducing access to these resources for all levels of society.

### **2.2.3 Environmental dimensions**

Responsible consumption and production (SDG 12) is one of the key sustainable development goals. Environmental degradation caused by urbanisation, industrialisation, deforestation, pollution, etc. are the environmental issues related to consumption and production. With the growing climate change and its impacts across the globe, the need for more sustainable consumption practices has become more urgent to cope with climate uncertainty and vulnerability.

Climate vulnerability is “the degree to which geophysical, biological and socio-economic systems are susceptible to and unable to cope with the adverse impacts of climate change” (IPCC, 2007). IPCC (2014) has defined adaptation as “the process of adjustment to actual or expected climate and its effects”, and has estimated that in the next decade alone, at least 32 to 132 million additional people will fall into extreme poverty because of the impact of climate change. The combination of global warming and a rapidly growing population has induced changes in land use patterns, increased pollution, and disturbances to habitats and various ecosystems within the urban setting. The increasing pollution has not only degraded the quality of urban areas but has led to the loss of biodiversity and ecosystems, making people more vulnerable, especially when they reside in developing countries such as Sub-Saharan Africa and Asia (WRI, 2022).

## **2.3 Understanding Consumption in Urban Areas**

Before delving into the concepts of consumption and sustainable consumption in urban areas, it is important to understand the concept of urbanisation and the factors associated with sustainable urban development.

### **2.3.1 Urbanisation, climate change and sustainability**

#### **Concept of urban and urbanisation**

The term “urban” has been defined in various ways, with many definitions encompassing the aggregation of services, infrastructure, work, consumption, sophistication, industry, and progress (Sayer, 1984), as opposed to nature, agriculture, production, simplicity and tradition, which are associated with rural areas. In the case of Nepal, the cities are mainly the result of self-generated urbanisation. The concept of self-generated urbanisation identifies two separate situations for urbanisation to occur: first, when people start

producing more through non-agricultural activities (Hawley, 1981); second, when people possess the capacity to work independently (Bodo, 2015). This concept also posits that rural-urban migration was the driving force behind this form of urbanisation, as people began relocating to cities for employment in factories (Childe, 1950).

Weeks (2010) also agrees with the perspective of considering urban as a “place-based characteristic” (pp. 34), where people are spatially concentrated, and the focus on agricultural activities is diminished; conversely, all areas not designated as urban are categorised as rural. The increasing population has led to an increased demand for food, which has given rise to new food insecurity issues in urban areas, necessitating the implementation of urban agriculture (Opitz et al., 2016). Batty (2021) attempted to investigate the “urban science” in terms of the way services, citizens and information are distributed, and the interactions among various activities that evolve and change in these areas. The definition of urban has evolved to accommodate the changing context, demands, and needs of the residents living in these environments.

Urbanisation normally occurs when new concepts and innovations are introduced within a society, such as ‘industrialisation, technological application, information penetration and cultural diffusion’ (Smith, 1996). In understanding urbanisation in the modern context, it is important to understand the evolution and development that has taken place from the primitive era (Stone Age) to the new or modern patterns of societal operation. Similarly, the importance of technology in social organisation and shaping of society is crucial to understand. Although the world appears vastly different today compared to the past, it cannot be viewed in isolation (Kasarda and Crenshaw, 1991). Despite differences in spatial structure, resource abundance and demographic variations, imagining cities without the integration of artificial and natural environment is not possible. Moreover, the urban lifestyle plays a crucial role in determining the amount of resources people consume.

When studying urban areas, peri-urban areas should not be overlooked. Defining peri-urban areas has proven to be challenging, much like defining urban areas. The OECD (1999) in its report on peri-urban agriculture, also acknowledged the difficulty in identifying peri-urban areas. These areas fall within a grey area and can be viewed as a transitional/mediating area from rural to urban.

## **Urban functions**

Urban zones are characterised by dense populations, a service-oriented economy, well-developed infrastructure, and diverse social structures. In contrast, peri-urban areas are located on the outskirts of cities where it retains common attributes of both urban and rural areas, including agricultural livelihoods. Cities and artificial urban structures can have a strong environmental impact when they are managed inappropriately (Newman, 2006). For example, the high population density results in a high demand for ecosystem services, such as nature-based recreation, local climate regulation and/or clean air (Baro et al., 2015). This demand is likely to further increase in the future in absolute terms, as the size of cities is projected to increase. A Geographic Information System (GIS) can be employed to collect, analyse, visualise, and comprehend geospatial data. The spatial information of risk-prone areas and infrastructures in such areas, analysed using GIS, is a helpful tool in assessing disaster risks and disaster impact coverage, and effectively planning disaster management activities before, during and after a disaster (Holser, 2016).

## **Urban ecosystem**

The term ‘ecosystem’ was first introduced by Tansley (1935), who highlighted the interaction between biological and physical components in certain settings, which can vary in size and nature (Jax, 1988). This concept gradually gained traction among ecologists over the years and was applied in various sectors such as agriculture, forestry, water management, wetlands, businesses, among others. With rapid urbanisation and economic development, ecosystems within urban areas started to get attention from researchers. Davis and Glick (1978) presented the concept of the urban ecosystem, highlighting that urbanisation largely isolates natural habitats, especially those for flora and fauna. Urban ecosystems cannot be studied in isolation and therefore, Bolund and Hunhammer (1999) identified trees along the street, smaller forests, cultivated land, wetlands, lakes, and streams within urban settings as potential ecosystems that play a significant role in enhancing people’s lives.

Similarly, Savard, Clergeau and Mennechez (2000) emphasized the need to focus on biodiversity conservation within urban settings not only to present diversity but also to educate people about its importance. In subsequent decades, the study of urban ecosystems



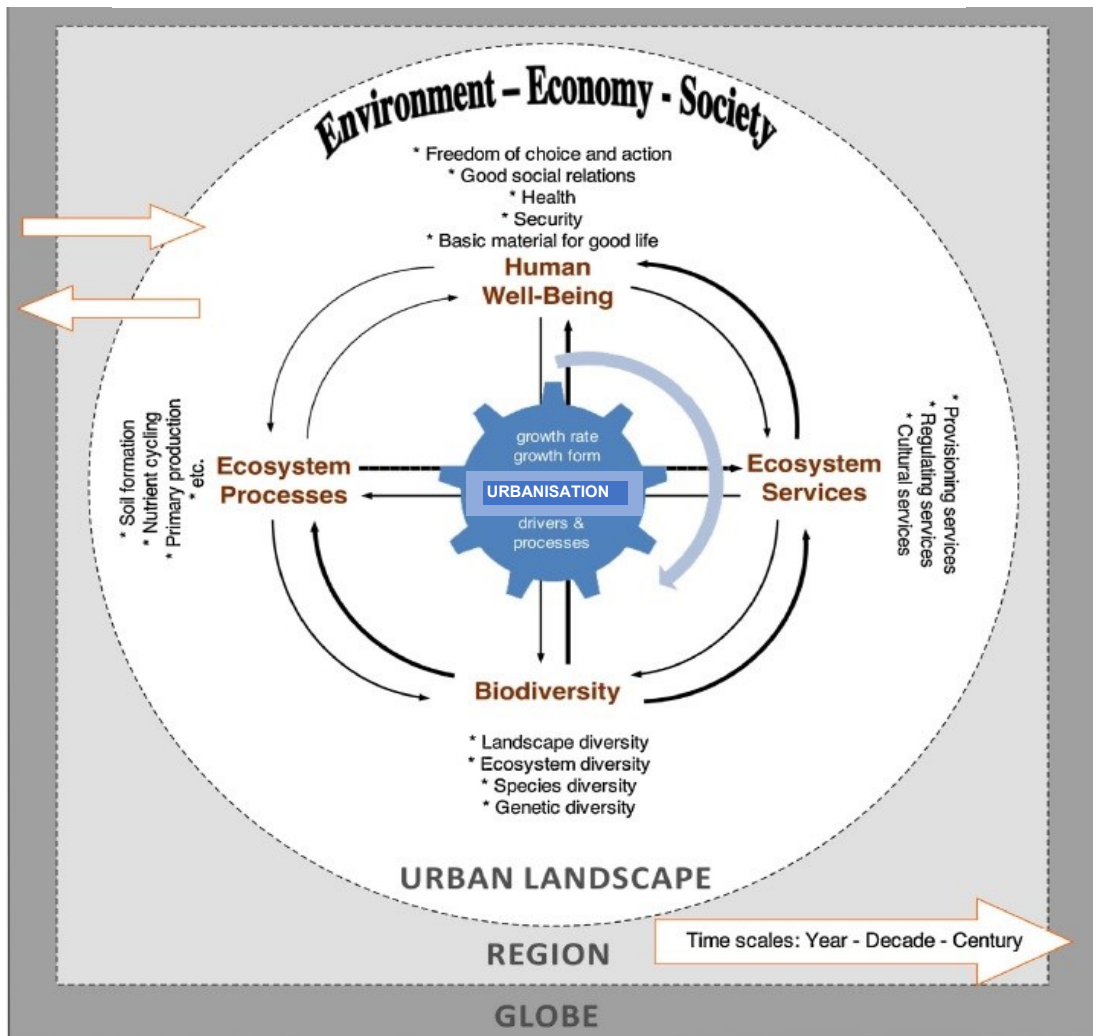
was expanded to consider multiple artificial infrastructures as well, such as transportation services and constructed parks (Kremer et al., 2016).

The indicators of urban ecosystems are urban green areas, linear elements and trees, urban and peri-urban agriculture, and urban blue infrastructures. Similarly, the indicators of ecosystem services include water, food, and other regulatory services. Parsa et al. (2019) in their study on 'Evaluating the potential contribution of urban ecosystem services to climate change mitigation' proposed an approach to analyse the possible future contribution of urban trees in mitigating climate change at the city scale, which can help urban planners to understand the current and future tree resources, through regulating ecosystem services, which revealed the potential of urban trees in carbon storage and sequestration. The peri-urban areas are mostly flexible and their demarcation changes over time as the peri-urban tends to become more urban and the rural becomes peri-urban (Gomes et al., 2020). There is also an increasingly held view that rural, peri-urban, and urban environments operate as a system rather than independently (Jaquinta, 2017), with peri-urban areas being those near urban areas and arising from in-place (in-situ) urbanisation.

The development of peri-urban areas involves the conversion of rural lands into residential use, closer sub-division, changes in land use and a shifting blend of urban and rural activities and functions (Figure 1). Changes occurring within these areas can have significant impacts on agricultural uses and productivity, environmental amenity and natural habitat, supply and quality of water, and water and energy consumption (Gomes et al., 2020). In contrast to the present scenario where food and water scarcity is common in urban areas, the historical urban population benefitted from ample water, energy, land and food supplies, as well as ecosystem services that the community depended upon (Gomes et al., 2020).

Both in urban and peri-urban areas, ecosystem services play a vital role. Sang, Hageman and Svannel (2021) have identified 13 ecosystem services in urban areas: agricultural fields, mature trees, water improvement, allotments, green trees/bushes, wetlands, parks, playgrounds, rain gardens, wetlands, urban forests, and green paths. These findings are a novel contribution to the growing body of work that examines how the concept of urban ecosystem services is adapted and applied in various practical contexts.

Figure 1: Urban ecosystem services



Source: Wu et al., 2014

Urban and peri-urban ecosystems, including wetlands, green spaces, agricultural land and forests, provide a wide range of important services for urban communities, which include natural resources such as food and water, and regulatory functions such as reduced risk to flood-related damages, cooling effect, air purification, among others (Sang, Hageman and Svannel, 2021). In addition, urban ecosystems provide protective and cultural benefits (UNEP, 2015). In an urban context, the EbA research is even more fragmented due to the presence of differing disciplinary approaches and concepts (Brink et al., 2016).

## 2.4 Impact of Climate Change in Urban Area

Cities, by their definition, have higher population density, services and demand for services from citizens. Consequently, natural and other kinds of resources are extensively used,

leading to a higher generation of waste and greenhouse gas emissions. Moreover, urban areas experience a higher frequency of events such as heat waves, droughts, storms, erratic precipitation, and strong winds. These occurrences deteriorate natural hazards like water scarcity, air pollution and water pollution (UN-Habitat, 2008). Climatic variables such as temperature and precipitation have been changing for numerous years, mainly within urban areas.

The natural process of change is triggered by human activities, particularly industrialisation, deforestation, and urbanisation. Bast (2010) presented seven theories of climate change, of which two theories - (i) Anthropogenic Global Warming (AGW) and (ii) Human forcings besides greenhouse gases are related to human activities. While there have been many developments in the theories of climate change that answer why and how climate change occurs, these two theories hold relevance for understanding climate change in the context of developing countries. AGW, the first theory of climate change contends that human emissions of greenhouse gases, principally carbon dioxide (CO<sub>2</sub>), methane, and nitrous oxide, are causing a catastrophic rise in global temperature. At the same time, this research has also considered *Human forcings besides greenhouse gases Theory* which complements AGW by highlighting that human beings' greatest influence on climate is not only through greenhouse gas emissions, but also through the transformation of earth's surface by clearing forests, irrigating deserts, and building cities (Bast, 2010). This research acknowledges that human beings' practices largely contribute to emissions and seeks to test the assumption that pro-environmental human behaviour helps in reducing the losses and damages due to climate change.

## **2.5 Consumption of Urban Ecosystem Services and their Sustainability**

### **2.5.1 Understanding ecosystem services**

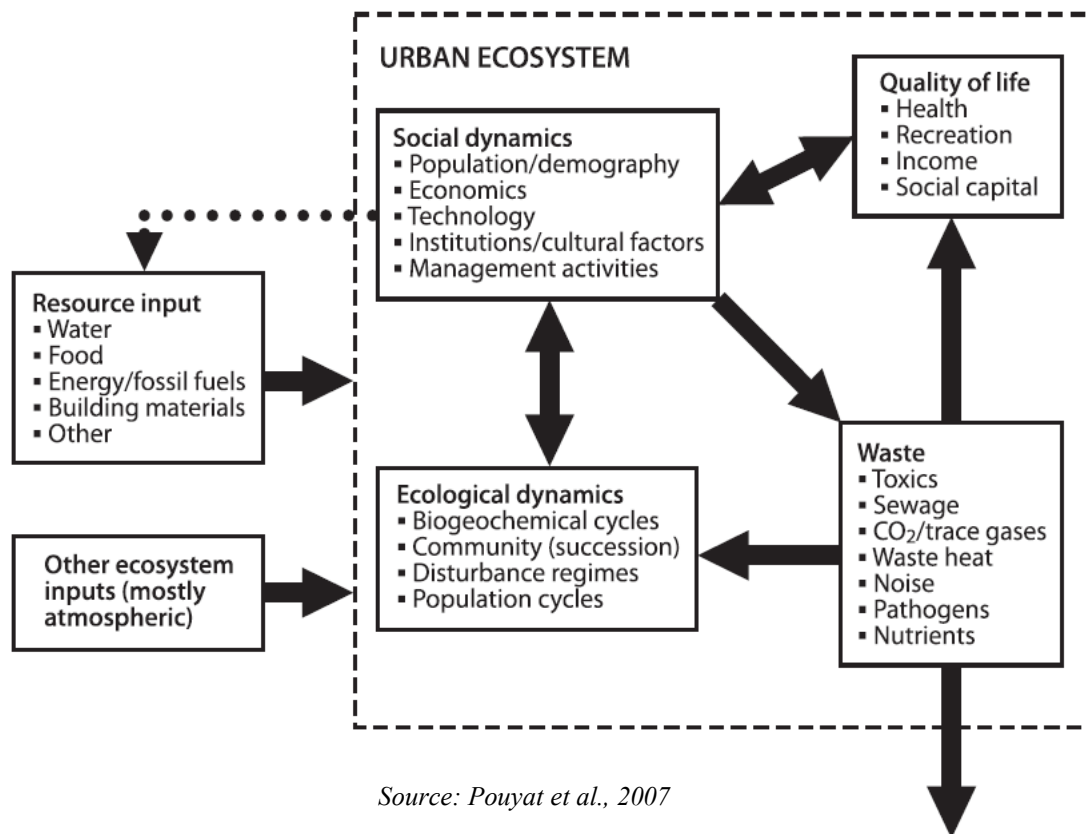
As Boccock (2008) highlighted, consumption and the ideology of consumerism are more visible in cities, which is also true for the consumption of ecosystem services provided by a certain ecosystem. Ecosystem services are the natural processes and situations that ensure that human life is up and running, thereby providing natural goods (such as food, forage, biodiversity, pharmaceuticals, etc.) and regulating natural functions such as cleaning, recycling and renewal (Daily, 1997). In other words, services that humanity derives from

existing ecosystems are termed ecosystem services (Bolund and Hunhammer, 1999). The ecosystem services mainly include provisioning, regulating and cultural services that are associated with people's needs and aspirations, along with the supporting services that serve as prerequisites for the smooth functioning of all other services (MEA, 2005).

In the context of urban areas, the definition of ecosystem services itself can become comparatively complex as it can include several smaller ecosystems within the urban structure. Air filtration, micro-climate regulation at street and city levels, noise reduction, rainwater drainage, sewage treatment, recreational and cultural values, etc. are some of the ecosystem services that can be derived from urban ecosystems (Bolund and Hunhammer, 1999).

Components of urban services such as housing, transportation and sanitation should be considered as part of urban ecosystem services (Tan et al., 2020). Russo and Cirella (2021) claimed that the studies on urban ecosystem services are especially important for landscape architects, urban planners, and policymakers to make the cities safer, resilient, and adaptable to climate change as the quality of human life hugely depends on the way we manage ecosystem services (Figure 2).

*Figure 2: Components of urban ecosystem*



Source: Pouyat et al., 2007

### 2.5.2 Food in urban areas – provisioning services

Food produced is one of the ‘provisioning ecosystem services’, which depends hugely on the natural systems (supporting services of nature) and is impacted by the changing climate (MEA, 2005). Globally, food consumes 46% of the land use followed by 26% for shelter and 15% for services (Ivanova et al., 2006). People appear to be more aware of the relationship between their health and eating patterns which, however, is not the case with environmental impact. Moreover, more than a quarter of greenhouse gas emissions (80% by livestock) are generated because of food production (Springmann et al., 2016). Based on the reference scenario of 2050, they further highlight that transitioning towards more plant-based diets that are in line with standard dietary guidelines could reduce global mortality by 6 -10%, and food-related greenhouse gas emissions by 29-70%.

With the growing urbanisation, especially in developing countries like Nepal, there is a growing need for food and associated natural resources. Urbanisation can also be

accompanied by high levels of poverty, unemployment and food insecurity; thereby further deteriorating the nutritional status of individuals and households (FAO, 2017) The Milan Urban Food Policy Pact, 2015 focuses on protecting biodiversity and adapting as well as mitigating climate change, thereby ensuring the human rights of every individual regarding the right to food and developing a system that is safe, meets the need of all categories of citizens, and establishes mechanisms for universal access to food.

The Good Food Cities: “Achieving a Planetary Health Diet for All” Declaration (2019) addresses two key issues: mitigating and adapting to the climate emergency, achieved through a commitment to transform local agricultural as well as food practices to ensure equitable access to nutritious food for everyone. The C40 Cities Declaration (2022) also acknowledges that food consumption patterns constitute the largest contributor to climate change, biodiversity loss and changes in land use. In their February 2022 declaration, the network highlighted how cities and mayors could influence food availability and regulate food advertisements to promote whole foods and discourage ultra-processed foods. This can be much more relevant to the regions with growing economies and rapid urbanisation like Nepal; where the quality of life is often misconceived with the type of food people consume, the affordability of processed foods, and the frequency of eating out at restaurants.

Urban food systems do not operate in isolation; rather, they are linked to peri-urban, national and international forces (Bohle and Adhikari, 2002). Subedi et al. (2020) claim that the challenges in food consumption in Nepal are observed due to increased population pressure, disrupted food markets, changing preferences in food consumption, and a lack of awareness among people regarding nutritional food consumption. The lower levels of education and income are the major reasons in Nepal to prevent accessibility of the globalising food system (Sharma and Pudasaini, 2020). On one hand, these factors might restrict the access of the impoverished people to processed and packaged foods; on the other hand, they might hinder the consumption of a balanced diet due to inadequate awareness.

### **2.5.3 Choice of transport/mobility facilities - regulating services**

The transportation system is one of the major components of the urban ecosystem. As urban system includes both natural and human-made systems, transport system forms an integral part of the services provided by the urban ecosystem (Tan et al., 2020). Transportation has remained one of the major causes of environmental and public health problems in urban areas over the last two decades (Bolund and Hunhammer, 1999). The development of transportation infrastructure and the modes of transportation individuals choose for commuting play a significant role in regulating the urban ecosystem services. While the commitment to the Paris Agreement to limit emissions to 2<sup>0</sup>C requires sectors such as transport to be controlled, it also contributes towards achieving negative carbon emissions. Many technological innovations, such as the adoption of electric vehicles, have been in practice around the cities in the world, which when combined with the effort to reduce the demand for high-emission mode of transportation (Creutzig et al., 2016) can contribute to sustainability. Transportation has also been considered one of the indicators of urban ecosystem health (Zeng et al., 2016), as it not only regulates the air pollution level, but also noise pollution, and overcrowding in the urban environment.

Previous research from both developed and developing countries have cited several examples of people's preferences and choices concerning the use of environmentally friendly means of transportation. Factors such as individuals' income and awareness level (Lind et al., 2015), personal norms and values (Jakovcevic and Steg, 2013), as well as considerations of safety and security, have been observed to impact these choices.

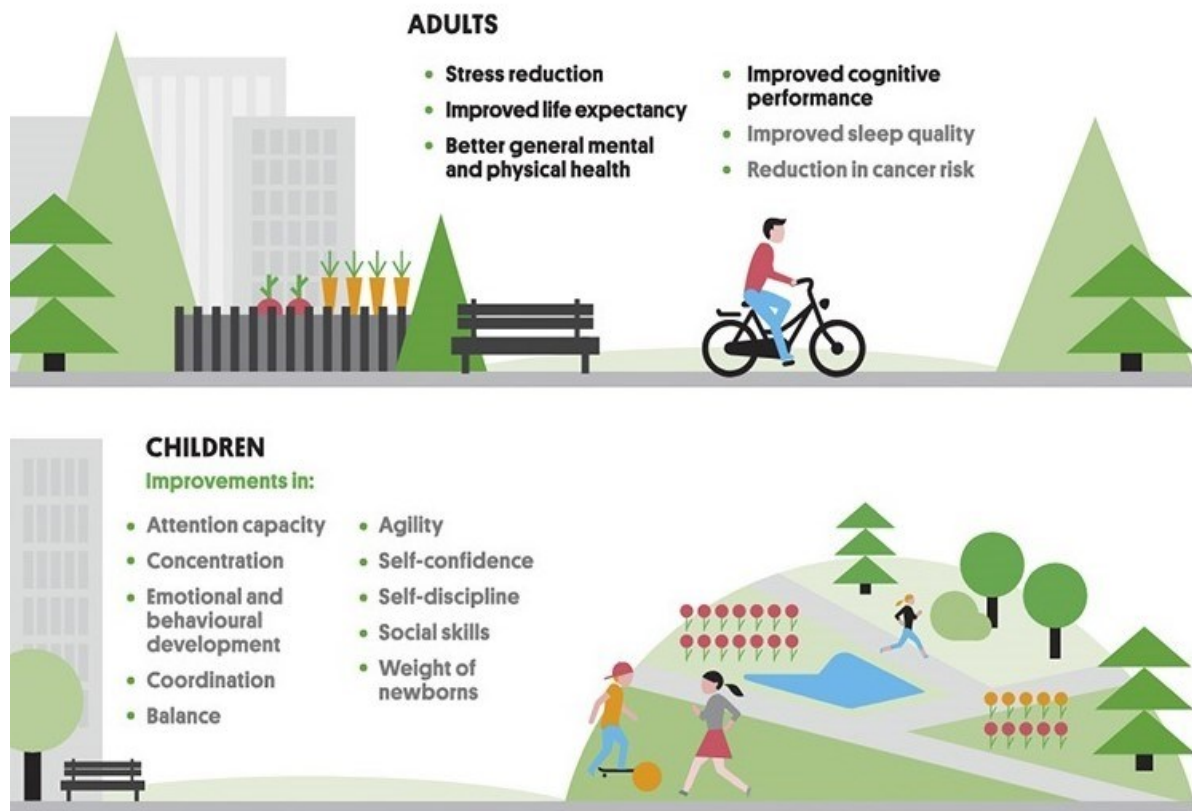
### **2.5.4 Parks and open spaces-cultural services**

Recreational areas such as open spaces and green parks of various sizes are common ecosystem types in urban areas, which can be natural as well as built-up (Pukowiec-Kurda, 2022). Such areas provide health benefits and ecological advantages, such as air purification. Given that the urban environment is mainly characterised by population density and the associated opportunities it offers, the demand for ecosystem services and their consumption by humankind is often exhausted, which ultimately leads to local as well as global climate change (Grimm et al., 2008). Among the ecosystem services, cultural services such as urban parks and green spaces are found to be widely used and are popular among urban dwellers. These spaces also play an important role in regulating

environmental services such as air and water (Lee and Kim, 2015). Although they are non-tangible and indirect consumption areas, urban parks and green spaces provide strong emotional satisfaction and contribute to the overall well-being of citizens (Chiesura, 2004).

Green infrastructures help in climate regulation, improve urban biodiversity, provide nature experiences and recreational services, and offer health benefits to urban citizens (Breuste et al., 2013). As the multiple benefits of urban green parks have been widely recognised, their use/acceptance and the factors affecting their use have been extensively studied both in developed and developing countries, and spanning urban, peri-urban, and rural contexts. The use can be largely associated with demographic variables such as income (Idris, Hoque and Susanto, 2022; Kalfas et al., 2022) and the physical features of the park itself (Idris, Hoque and Susanto, 2022).

*Figure 3: Health benefits of green spaces*



Source: Gascon, 2019

The educational status of the people (which does not always guarantee knowledge), occupation and household location are important factors that might affect the use of parks



(Xiong et al., 2018). The quantity and quality of open spaces can also influence decisions made by the authorities, the public's desire and need to access such services, and the type and extent of benefits provided by parks and open spaces (Wilkerson et al., 2018). Gascon (2019) highlighted the health benefits of natural spaces for both adults and children, contributing to their quality of life and happiness (Figure 3). This aspect is equally important to consider yet remains an under-researched area.

## **2.6 Indicators of Sustainable Consumption at the Household Level**

Sustainable consumption is extensively studied when it is coupled with sustainable production. This concept was briefly introduced during the Brundtland Commission in 1987. Sustainable production also necessitates efficient production technology and the cultivation of demand for sustainable consumption among consumers. However, the transition dynamics towards sustainable consumption received limited attention or study until the past three decades (Liu, Oosterveer and Spaargaren, 2016).

People's consumption pattern and behaviour are largely influenced by their economic status; in most cases, consumption of goods and services increases with higher income (Caeiro et al., 2012). Studies on consumption and production for business purposes, and in developed countries started as early as 1979. However, individual, and societal-level lifestyle changes as part of consumption patterns began to gain traction only around 2006 (Wang et al., 2019), a trend observed in both developed and developing countries. In 2008, the European Commission published its SCP and the Sustainable Industrial Policy Plan (2008) which largely encouraged the public, service providers and policymakers to develop and utilise resource-efficient products, along with recommending consumer awareness of environmentally friendly behaviours (Caeiro et al., 2012).

Indicators of sustainable consumption vary significantly based on factors such as geography, ethnicity, urbanisation, industrialisation, among others. Studies and interventions on sustainable development should consider the role of society in sustainable development, with a special emphasis on sustainable consumption and production (UNEP, 2015). SDGs place a robust emphasis on the social dimension of sustainability; however, many established indicators are interconnected and overlap, warranting further research in this regard (Dong and Hauschild, 2017).

In their study on measuring sustainable consumption, Geiger, Fisher and Schrader (2018) have presented a cube model of sustainable consumption behaviour, which is situated right at the nexus of impact-related information from the natural sciences and individual behaviour from the social sciences at a per capita level. Individual values, beliefs and norms were acknowledged as determinants of sustainable actions: consumer behaviour to purchase environmentally friendly products and services, willingness to pay a green price premium to protect the environment, and ecological citizenship by signing petitions in support of environmental groups for reducing environmental crises (Roy, 2021). Shittu (2020) has identified challenges in consumption patterns such as excessive household consumption, reduced simplicity, limited use of renewable energy sources; insufficient environmental education; costly lifestyles; and varied consumption patterns across socio-cultural groups.

The shift to SCP has the potential to reduce greenhouse gas emissions and the release of hazardous substances, ultimately lessening the harm to ecosystems, human vulnerability, and overall well-being in the long run (UNEP, 2015). However, achieving this requires changing consumer behaviour through social influence, habit formation, individual self, feelings and cognition, and tangibility (White, Habib and Hardisty, 2019). The formulation of appropriate policy outcomes to promote sustainable consumption is another important factor that should be considered when measuring consumption trends using established indicators (Bentley, Fien and Neil, 2009).

The United Nations Department of Economic and Social Affairs (UNDESA, 2007) has published a set of indicators as an important element of the United Nations Commission on Sustainable Development (CSD). A core set of seventeen SCP indicators were selected, including indicators specific to household sustainable consumption such as energy, materials, water, land, mobility, consumer goods and services, food, and recreation (Caeiro et al., 2012). Other research such as Delgado and Miles, (1997); GrØnhØj (2006); Lorek and Spangenberg (2001); OECD (1999); OECD (2008); Sutcliffe, Hooper and Howell, (2008); and Wiedmann et al. (2005) conducted on household sustainable consumption have also identified areas of household consumption that encompass food, transport, and recreational activities, which could contribute to the definition of sustainable consumption.

Lifestyle is an individual's choice in how they live their life. One's beliefs, knowledge, transportation and other costs, emotions, and friends and family support are factors known to predict the adoption of behaviour change (Murray et al., 2013), and can indicate whether the consumption behaviour or patterns are sustainable. Their behaviour defines individuals into different categories: (i) conventional consumers (non-green consumers having no perceived benefits), (ii) emerging green consumers (consumers who recognise the benefits but are not motivated to purchase green products), (iii) price-sensitive green consumers (those who are aware of eco-labeled product, but unwilling to pay green price premium), and (iv) environmentally green consumers (consumers who are willing to purchase products with green credentials) (Roy, 2021).

## **2.7 Understanding NbS and EbA within a Framework of Sustainable Consumption**

IUCN has defined NbS as interventions that are capable to protect, manage and conserve natural ecosystems, thereby keeping the welfare of human beings at the centre. This means creating a win-win situation for both the people and nature (Cohen-Shacham et al., 2016). By definition, NbS appears to encompass several approaches to protection and conservation that take into account people and the environment simultaneously, with EbA being one of such kind. Moreover, all sorts of actions aimed at protecting, managing, and restoring ecosystems - both small and large - that address environmental and climate challenges, biodiversity issues and offer alternative sources of livelihood for human beings as part of a larger adaptation strategy fall under the scope of a viable NbS (Rizvi, Baig and Verdone, 2015). NbS can, therefore, be considered a flexible and integrated approach that acknowledges diverse land use patterns and urban complexities, moving beyond traditional planning approaches to provide solutions (Dorst et al., 2019).

EbA involves utilising biodiversity and the services provided by healthy ecosystems to help people in adapting to the effects of climate change (GIZ, 2018). For an ecosystem to be considered healthy, activities should be designed in a manner that considers current and future climatic conditions and potential losses and damages (Muthee et al., 2021). It is usually evaluated in bio-geophysical terms and the use of economic or social valuations is rarely conducted, despite their significance. Previous research has explored issues of equity and/or stakeholder participation in the design and implementation of EbA. This requires

sustainable consumption behaviour at the individual and household levels as well, given that people's livelihoods are directly associated with water, energy, food and biodiversity. EbA is a form of NbS, and the concept, as well as the focus of the concept, varies widely among past researchers. Some consider it a policy fix and a sustainability transition while others have considered it a solution to reduce vulnerability to changing climate conditions (Scarano, 2017). GIZ (2018) has put people at the centre when defining EbA and has highlighted the need to maintain ecosystems so that people can derive long-term benefits and adapt effectively to changing climate conditions. Research conducted by Reid et al. shows that EbA can provide a variety of socio-economic, environmental, and other long-term adaptation-related benefits, after a sustained period of waiting, continuous effort and energy investment to reap those benefits. For EbA to be effective, the following criteria were used by Reid et al. (2017) and Reid et al. (2019):

- Assists in reducing the vulnerability of people by increasing their adaptive capacity.
- Proposes methods and approaches that are financially and economically viable for producing services for local communities, mainly Indigenous populations.
- Strengthens ecosystems to withstand the impacts of climate change.

Understanding EbA better mainly in terms of their socio-economic co-benefit requires an understanding of the types of ecosystem services available in a particular setting. Zinia and MC Shane (2021), for example, in their study in Dhaka city identified canals, ponds, wetlands, cultivated land, parks/rooftop gardens, playgrounds/fields, open spaces/vacant plots, roadside trees, and graveyards as urban ecosystems. Important provisioning services in this context included fruits, vegetables, fish, fodder, timber, fuelwood, and medicinal/ornamental plants. Equally important is understanding the components associated with EbA such as ecological structures, ecological functions, adaptation benefits, valuation, and ecosystem management practices (Johnson et al., 2021). EbA measures, however, are finding their way into climate adaptation plans, in response to a broad range of climate change challenges (Kabisch et al., 2016), which is resulting in visible community-level impacts. In the study conducted by Reid et al. (2019), strong evidence of community-level impacts was observed in the form of local adaptation measures, increased resilience, and reduced climate vulnerability.

### **2.7.1 Autonomous EbA**

Perceived indigenous or local knowledge such as pond conservation, farming methods, soil and water conservation techniques, forest protection, preservation of local plant or tree species, ways of differentiating degraded from productive land, local practices addressing land degradation, fish habitats, migration routes, fire lines in the forest, etc. strengthen ecosystem health, increases the adaptive capacity of people and, and enhances the effectiveness of EbA interventions (Reid et al., 2019). Many studies and findings have focused on induced EbA, while very few studies have been conducted on autonomous adaptation practices, which is even more important to consider in the context of developing countries like Nepal. It is the spontaneous adjustment in response to changing climate (Carter et al., 1994). Autonomous EbA is “triggered by ecological changes in natural systems and by market or welfare changes in human systems” (IPCC, 2007, pp. 869).

The knowledge, values and socio-cultural settings available locally define autonomous adaptation (Bawakyillenuo, Yaro and Teye, 2016). Such strategies are adopted by communities impacted by the effects of climate change, who heavily depend on the use of natural resources. These strategies need to be informed by indigenous knowledge and practices, consider communities’ understanding of climate change impacts and aim to minimise the effects of climate change on livelihood activities (Rahman et al., 2021). When the practices/ideas of local people are incorporated with the planned activities at the same time, it can have a broader and more significant impact. Some adaptation practices can pose negative environmental impacts as well (Schipper, 2020). Forsyth and Evans (2013) have highlighted that the inputs required for adopting certain practices (such as environment friendly) by various communities and individuals may differ, making it infeasible for some (Forsyth and Evans, 2013).

There is a disconnect between policy interventions/directions and local people’s adaptation practices, despite both parties putting in their effort, but in isolation (O’Brien et al., 2007). This phenomenon can also be referred to as maladaptation and can be considered an unsustainable approach to consuming natural resources. Such adaptation practices are incapable of reducing climate-related risks and may even increase consequences for others (Juhola et al., 2015). These disconnects can perhaps be explained by highlighting the differences between the vulnerability framings used by various government agencies in

contrast to the needs and practices of affected communities. For example, most of the adaptation strategies in the high mountains and hills focus on addressing drought and water scarcity, while in the flood plains, the focus is on flash floods and heat stresses (Regmi and Bhandari, 2013). Juhola et al. (2015) have emphasized that local knowledge, adaptation practices, traditions, practices etc. should be considered when planning adaptation activities. Rahman and Hickey (2019) also confirmed this idea of designing the planned adaptation practices by studying and considering the local/existing adaptation practices, that are subconsciously performed.

### **2.7.2 EbA in urban areas**

The concept of green infrastructure was introduced by Benedict and McMahon (2002), which integrates two concepts - linking parks and open spaces for the benefit of people; and thinking from the perspective of biodiversity conservation and habitat protection, which promotes the concept of using natural resources wisely without over-exploitation and demonstrates examples of preserving urban ecosystems. Urban areas are indicated as using modern and sophisticated equipment, the availability of goods and services and the access citizens have, to utilise the available services (Archer et al., 2014). They are both sources of greenhouse gas emissions and are vulnerable to the impacts of climate change (Bulkeley, 2013).

The emissions generated from production and consumption in urban areas due to citizens' aspirations to use modern facilities/lifestyles account for more than 80% of the world's greenhouse gas emissions (Hoornweg, Sugar and Trejos Gomez, 2011). More specifically, the city features are characterised by reduced water table and quality, reduced wind speed and exchange, increased emissions, reduced air humidity, reduced natural lighting, reduced vegetable cover, reduced biodiversity species, increased noise and increased temperature when compared to rural features (Wamsler, Brink and Rivera, 2013).

The complexity of the urban ecosystem itself exacerbates the impacts of climate change and complicates the process of adapting to and mitigating the associated impacts. Previous researchers have provided more evidence on the effectiveness and potential of green solutions (Kabisch et al., 2016 and 2017; Leal Filho et al., 2019). While a single solution may not be universally applicable, researchers have also suggested being adaptive and

exploring innovative solutions to contextualise the adaptation strategies on a regular basis (Ahern, Cilliers and Niemela, 2014). Some studies have proposed interesting ideas/strategies for stakeholder engagement. Archer et al. (2014) have emphasized the need to promote community-led adaptation efforts, where the local communities are engaged in the planning process, which can open the door for transformative urban governance. Leal Filho et al. (2019) also echo the concept of a transformative approach in their studies from developing countries, where they emphasize the promotion of low carbon emission and climate resilience to address urban issues such as poverty.

A study conducted by Hasegawa et al. (2014) provided evidence that climate change adaptation measures can reduce the percentage of the population at risk of hunger compared to those without any adaptation measures. Therefore, the engagement of local/municipal governments in promoting agriculture in urban and peri-urban areas plays a significant role in reducing urban hunger (Dubbeling, 2011). Similarly, the government should also promote the maintenance of urban green spaces, green belts, green fingers, parks, and other open spaces. Transportation is another principal area within the urban ecosystem that contributes to greenhouse gas emissions. The choice of transportation as part of one's lifestyle has an important role in maintaining a healthy urban ecosystem (Haurie, Sceia and Thenie, 2009), which may include shared riding, walking, communicating cost-benefit analysis, and strong buy-in from the government.

## **2.8 Measuring Effectiveness of Ecosystem-based Adaptation through Social Indicators**

EbA projects are aimed at implementing sustainable solutions towards adaptation to climate change. The effectiveness of induced interventions and autonomous EbA practices is therefore, vital and needs to be evaluated and measured. Unless EbA projects lead to the clear adaptation outcomes and identify indicators to measure these outcomes, it will be difficult to rigorously evaluate how effective EbA projects are in delivering adaptation benefits to human communities (Donatti et al., 2020). The effectiveness of the approaches differs in developing countries compared to developed ones, and in rural areas compared to urban ones. The quality of evaluation also largely depends on the availability and details of baseline information (Geneletti and Zardo, 2016) available and the knowledge gaps (Kabisch et al., 2017) identified. The complexities involved in developing, implementing,

monitoring, and evaluating EbA initiatives also underscore the need for further research, including concrete case studies and lessons from the field (Nalau, Becken and Mackey, 2018).

In order to measure the effectiveness of the EbA measures, a tracking indicator is important (GIZ, 2018). GCF (2016) has developed a framework for measuring performance, focusing on measurement at the outcome level too. Overall, FEBA (2017) has proposed three elements - climate change adaptation, biodiversity conservation and adaptation strategy - along with five criteria: (i) reduces social and environmental vulnerabilities; (ii) generates societal benefits; (iii) improves ecosystem health; (iv) supported by policies; and (v) supports equitable governance and enhances capacities” to ensure the effectiveness of EbA practices.

For EbA to be of high quality, FEBA (2017) has also proposed policy-level indicators such as (i) number of direct links between EbA measures with policies and legal frameworks; (ii) quality and type of policies that support the implementation of the EbA measures as well as its replication and upscaling; and (iii) involvement of political decision-makers in the process. Through a multi-expert’s workshop involving various countries, Kabisch et al. (2017) also identified decreased air pollution, the percentage reduction in flood risk, impact on quality-of-life happiness and employment, percentage allocated to green space planning by the government and percentage or the number of people owning or maintaining green spaces as the indicators of NbS, among others. From a social point of view, the major dimensions of human well-being that are important to measure are assets, livelihoods, food security, safety, resource security and health (Donatti et al., 2020).

In 2019, the characteristics of effective EbA were elaborated as follows:

#### **Key characteristics of effective EbA**

- **Human-centric:** People’s capacity to adapt to the changing climate and face the potential loss and damage due to climate change.
- **Harnesses nature’s capacity to support long-term human adaptation:** Maintaining ecosystem services by conserving, restoring, or managing ecosystem structure and function, and reducing non-climate stressors.



- **Draws on and validates traditional and local knowledge:** Building on autonomous adaptation practices, traditional knowledge and local practices to conserve nature.
- **Based on best available science:** Considering the available information, research findings and reports on climate parameters, ecological data in various environmental settings and geographical conditions.
- **Involves longer-term transformational change:** Addressing newer forms of climate vulnerability, loss and damages and challenges that may arise due to climate change; or bringing innovation to deal with the root causes of vulnerability.

*(Source: Reid et al., 2019)*

Some projects simply measure the short-term success of activities, such as the increased number of farmers implementing certain agricultural practices, or the number of hectares of mangroves restored (Donatti et al., 2020). Given that the human dimension is crucial when assessing the success of EbA projects, technical knowledge should be combined with local knowledge (Reid et al., 2017). Kabisch et al. (2016) in their study have suggested not only to rest on researching the design and early-stage implementation, but also to enable monitoring of the impacts they have in terms of human-environment relationships over time. They focused on quality of life, happiness and employment, and ownership by local people as some of the indicators that could be applied to measure the effectiveness of EbA. CBD (2019) has highlighted that climate change and DRR need to consider traditional practices for better outcomes. Tan et al. (2020) have confirmed the importance of socio-economic indicators together with ecological indicators so that the impact can be assessed. Feldmeyer et al. (2019) also emphasized that a purely quantitative, indicator-based approach is not sufficient to measure the effectiveness of EbA, and additional qualitative information is needed.

In urban areas specifically, green infrastructure and a full or semi-natural intervention as strategies for climate change mitigation/adaptation are more effective, cost-efficient, and sustainable compared to grey infrastructures (Martinez-Juarez et al., 2019). Moreover, natural solutions and practices are more relatable to the lives and livelihoods of people compared to the grey structures.

## **2.9 Linking Sustainable Consumption with EbA**

The concepts of consumption, sustainable consumption and climate change adaptation including EbA have largely been defined and researched in isolation, or the initiatives are focused on specific domains (e.g., energy or waste), and have not been applied as an integrated approach to sustainable consumption domains (Caeiro, Ramos and Huisingsh, 2012; Groulx et al., 2017). Groulx et al. (2017) conducted research in Canada's Parks and Protected Areas to understand the link between climate-driven environmental change, consumer behaviour and adaptation planning, which they claim to be the first research of its kind. They highlighted that induced or expert-driven adaptation programmes may lead to maladaptation if they do not consider the consumers' perceptions of environmental changes. Practices like bicycling to work, recycling and reusing goods, and eating organic food are important to consider as integral to and generative of larger societal transformations (Jackson, 2005) such as adopting greener solutions for adaptation.

Soga and Gaston (2016) drew an interesting conclusion from their study: supply creates demand meaning that the availability of urban nature and beauty creates pro-environmental behaviour among residents. The study conducted by Quoquab et al. (2019) further revealed that sustainable consumption behaviour is a three-dimensional construct consisting of 24 items including quality of life, care for environmental well-being, and care for future generations, among others. This can again be linked with what is supplied to them, what is available, and what knowledge they have about their local environment. Kabisch et al. (2016) also proposed a set of indicators for the effectiveness of NbS, including both the supply-side (environmental performance) and demand-side (health and well-being, citizens involvement). They also highlighted the need to include socio-demographic and socio-economic data in the assessment.

This was also confirmed later by Jaung et al. (2023) through their study in Singapore, where they argued that learning about the local urban nature and its importance can trigger pro-environmental behaviour among citizens. This not only benefits that location but also neighbouring areas where urban-urban and urban-rural interactions take place. In 2022, Wang et al. also emphasized the importance of studying demand and supply and understanding the interaction between people and nature, which could guide the policy formulation process.

## **2.10 Urbanisation, Sustainable Consumption, and Climate Change Adaptation in the Nepalese Context**

### **2.10.1 Poverty situation in Nepal**

Poverty has many faces. It varies from place to place as a multidimensional phenomenon that includes economic, social and environmental aspects, all of which are interconnected (Cobbinah, Erdiaw-Kwasie and Amoateng, 2015). Often, poverty is associated with the global south. Global extreme poverty decreased from 52.7% in 1990 to 2.9% in 2019. However, this improvement is not as evident in South Asia, which still has a significantly high proportion of multidimensional poor compared to other regions (SIDA, 2022). In Nepal, the intensity of deprivations (average among people living in multidimensional poverty) is 42.5%. The Multidimensional Poverty Index (MPI) value, which is the share of the population that is multi-dimensionally poor adjusted by the intensity of the deprivations, is 0.074 (ADB, 2023). The five-year development plan of Nepal includes poverty reduction as one of its targets. The 15<sup>th</sup> periodic plan (2019/20-2023/24) aims to reduce poverty from 18.7% to 11.0%. Additionally, the ambitious goal of achieving zero poverty by the year 2100/01 is set, although this seems challenging due to setbacks caused by the COVID-19 pandemic and frequent natural hazards that have increased poverty levels in Nepal (GoN/NPC, 2020).

### **2.10.2 Urbanisation and poverty in Nepal**

Defining urban in developing countries involves using population density thresholds and considering the availability of major infrastructures and services, similar to the approach in developed countries. However, life in urban areas holds a status symbol in developing countries, leading to increased internal migration and population density in urban areas (Bhattacharya, 2002). This is because urbanisation in developing countries opens opportunities for new ideas, innovations, and technologies, creating economies of scale and agglomeration. It also ensures access to capital and proximity to markets through increased industrialisation and infrastructure development (Cobbinah, Erdiaw-Kwasie and Amoateng, 2015). This phenomenon is particularly prominent in countries with centralised power, systems, and services.

Urbanisation in Nepal is rapidly increasing with substantial urban growth observed in a few large and medium-sized cities (Bakrania, 2015). Until 2017, 40% of the total population resided in 217 designated urban areas, with 50% of them living in the capital city, Kathmandu (GoN/MoUD, 2017). These statistics have, however, evolved over time and as of 2022 (CBS, 2022), 63.19% of the population lives in urban areas.

Poverty in Nepal is often regarded as primarily rural; however, the internal migration of rural individuals in search of employment opportunities in urban areas has contributed to an increase in the urban poor population. Urbanisation in developing countries also exposes the urban poor to various hazards, impacting the population based on their spatial distributions (Adams, Ghosh and Runeson, 2022). The NUDS (2017), therefore, aims to identify the spatial characteristics of the urban poor, implement targeted community development programmes and introduce pro-poor planning, particularly focusing on housing, infrastructure, and transportation (GoN/MoUD, 2017).

A study conducted by Boonyabancha et al. (2019) in Cambodia and Nepal indicated that urban poor individuals frequently face challenges related to food insecurity at multiple levels. The study also underscored the potential role of local governments in poverty reduction; however, they often lack the resources and capacity to design and implement projects that cater the specific needs of the urban poor. Puri, Joshi and Devkota (2022) emphasized that the population, in general, is drawn to infrastructural development and would be willing to adopt climate-friendly practices if such development initiatives were accessible. Therefore, they recommended the implementation of more targeted development climate-balanced interventions in the context of rapid urbanisation.

### **2.10.3 Urban ecosystems in Nepal**

The National Urban Development Strategy (NUDS, 2017) of Nepal envisions promoting cleanliness and maintaining greenery through various means such as green parks and open spaces (GoN/MoUD, 2017). Several past and recent studies (such as Brink et al., 2016) have explored options like urban parks and greenery to reduce hazards such as floods and heat in urban areas. However, many legal frameworks and guidelines in Nepal such as urban environment management guidelines in Nepal struggle to be effectively implemented. Municipalities in Nepal face challenges of insufficient institutional capacity,

investment planning, and funding mechanisms to adequately manage the urban environment that includes coping with disasters, improving greenery, providing safety and security, enhancing socio-cultural aspects like preservation of open spaces, etc. Open spaces are scarce in the cities of Nepal and their availability has rapidly declined in recent days, as exemplified in the most popular cities in Nepal: Kathmandu and Lalitpur, for example, have only 0.48% and 0.06% open spaces. The GDP data from the CBS shows that the urban GDP makes up 33.1% of the national GDP (NPC and UNDP, 2014) and 30% comes from the hinterland in proximity to or served by the urban centres. The NUDS (2017) also recognizes the significance of open spaces, urban greenery/forests, and urban agriculture as integral components of urban ecosystems (GoN/MoUD, 2017).

Urban inhabitants rely on natural and agricultural goods and services from rural areas. Communities are particularly vulnerable to the effects of climate change due to their limited access to the goods and services provided by functioning ecosystems (UNEP, 2014). Cities that are well-managed, have the necessary infrastructure, function effectively and optimise resource use for maximum impact can be considered sustainable (UNEP, 2014). NUDS (2017) also emphasizes the strengthening of production-distribution-consumption linkages between urban and rural areas, thereby addressing existing gaps and capitalising on the advantages of effectively connecting various settlements (GoN/MoUD, 2017).

In the past two decades, few studies have been conducted focusing on various urban ecosystems and their services in Nepal. Some of these studies focus on the agro-urban ecosystem (Waltner-Toews et al., 2005), species-focused conservation practices (Bhusal et al., 2019), suitable green infrastructures (Pokhrel, 2019), and ecosystem-based DRR and adaptation (Sandholz, 2016). These studies are primarily centred around the capital city-the Kathmandu Valley. Studies from other urban areas of Nepal including comparative case studies, are almost non-existent. Through their study, Pokhrel (2019) indicated that the population density is high, offering limited opportunities for developing green spaces in Kathmandu city, where only 4.47% and 7.19% of the spaces were considered suitable and moderately suitable respectively. Similarly, Sandholz (2016) has highlighted challenges in Kathmandu city stemming from unsuitable urban planning practices and complex governance systems and has recommended further studies on understanding the human-nature interactions and developing long-term strategies to integrate ecosystem-based solutions.

#### **2.10.4 Impact of climate change in Nepalese urban centres**

Urban areas provide opportunities for rapid economic growth on one hand while on the other hand, rapid greenhouse gas emissions that are directly or indirectly related to the efficiency of production and consumption come with it (UN-Habitat, 2011). In Nepal, a gradual increase in temperature has led to rising health concerns and increased energy use for cooling purposes, which in turn contributes to the Urban Heat Island (UHI) effect (MoFE, 2018). Most of the urban centres in Nepal are sensitive to the impacts of climate change, mainly due to haphazard urbanisation, unplanned settlements and expansion of concrete areas, and construction in disaster-prone areas (MoFE, 2021). In terms of risk, climate-related natural disasters such as floods, landslides, droughts, and extreme weather events have resulted in loss of life, property, and livelihoods, causing extensive damage to all climate-sensitive sectors and Nepal's economy (MoFE, 2018). According to the recent climate change vulnerability and risk assessment report (MoFE, 2021), 50 out of 77 districts rank as high to very high in terms of vulnerability to the effects of climate change.

The climate change trend in Nepal (1971-2014) shows that the annual maximum temperature is increasing by  $0.05^{\circ}\text{C}/\text{yr}$ . According to a report released by the Ministry of Forests and Environment (MoFE) and the International Centre for Integrated Mountain Development (ICIMOD) in 2019, the average annual precipitation is sure to rise in the coming years. In addition, the average temperature may rise by  $0.92\text{-}1.07^{\circ}\text{C}$  in the medium term,  $1.30\text{-}1.82^{\circ}\text{C}$  in the long term and it might increase by  $1.72\text{-}3.58^{\circ}\text{C}$  until the end of the century. As such, climate-induced disasters are more likely to aggravate in the future. As per the disaster database in Nepal, 15 weather-related disasters have been recorded, including floods, landslides, epidemics, fires, lightning, heavy rain, drought, glacial lake outburst floods (GLOFs), heat waves, cold waves, storms, avalanches, blizzards, hail and wildfires (MOFE, 2021).

A study conducted by Leal Filho et al. (2019) in the cities of developing countries analysed the vulnerability to climate change, as well as the risk and adaptation capacity of the cities to climate change. Some of the issues identified include (i) sea level rise and storms in George Town, Dhaka and Montevideo (ii) severely low rainfall and melting glaciers in Lima, (iii) increasing emergence of slums in Ibadan and Lome, (iv) increasing food insecurity and high food cost leading to urban poverty in Nairobi, and (v) high energy

consumption, encroachment on green spaces, environmental degradation, and the development of non-climate resilient infrastructures in Kuala Lumpur and Shanghai. Springmann et al. (2016) have unfolded the differing context faced by the developing world, asserted that greenhouse gas emissions might be necessary to achieve global dietary recommendations in some countries such as Sub-Saharan Africa, which also needs to be acknowledged by all the countries, including the developed ones, to balance the emissions per capita. UNEP (2015) also sounded the alarm regarding the rapid demand for natural resources driven by the swift pace of urbanisation and industrialisation in Asia-Pacific developing countries; and recommended the prudent and efficient use of these resources in demand.

Various studies have been conducted in the urban areas of Nepal regarding the impacts, with many of them focusing on water scarcity (Jha and Shrestha, 2013; Pandey, 2021) and the impact on health (Joshi et al., 2011; Dhital et al., 2016). Water resources are sharply declining in the urban areas of Nepal because of climate change. However, addressing this issue requires tackling policy and governance challenges. Jha and Shrestha (2013) have recommended fostering ongoing dialogues and interfaces between the public and the government to ensure judicious utilisation of water resources for climate adaptation. Giri et al. (2021) through their studies reveal that the inhabitants of informal settlements in the plain region are more vulnerable compared to those in the hilly region. Another study conducted by Pradhan et al. (2013) in the urban centres in the Southern Plain of Nepal highlighted various adaptation measures adopted to cope with the heat during summer; despite the adaptation measures, the study also emphasized that productivity largely declines during the summer.

#### **2.10.5 Consumption in urban areas of Nepal**

The Annual Household Survey 2015/16 conducted by the CBS of Statistics and UNDP in Nepal reported that the average annual household consumption in Nepal for 2015/16 was NPR. 322,730 (EUR 2,442), allocated towards goods and services, of which more than half (53.8%) was dedicated to food expenditures. Urban households were found to have a consumption rate 1.7 times higher than rural households, while the richest households exhibited consumption rates 4.2 times higher than the poorest households.

**Food consumption:** Nepal faces significant food insecurity in some of its provinces. Although a majority of Nepal's agricultural output stems from traditional farming methods, the introduction of modern, climate-friendly agricultural practices is a novel concept. The promotion of sustainable consumption and production thus presents challenges. The LGOA (2017) has vested local governments with complete responsibility and authority to develop, execute, oversee, evaluate, and regulate policies, legislation, standards, and norms pertaining to development projects and programmes, including those related to food and nutrition security. Furthermore, the Right to Food and Food Sovereignty Act (2018) stipulates that all Nepali citizens should have year-round access to nutritious food. With changing climatic conditions, urgent action is needed to bring about fundamental shifts in Nepal's food security landscape. The agriculture sector will bear the brunt of rising average temperatures and shifting rainfall patterns in the decades to come. Correspondingly, the risks associated with increased losses and damages due to climate-induced disasters will also escalate (NPC and WFP, 2019). In this context, the identification of sustainable methods for food production and consumption takes on heightened importance.

Households make choices among alternative lifestyles that result in varying environmental and social outcomes and create diverse demands on the economy and production system. This underscores the need for participatory sustainability policies and incentives aimed at consumers (UNEP, 2015) and local communities. Shrestha et al. (2020) have explored ways of sustainable food production, citing rooftop hydroponics as an example. They have identified space, willingness, affordability, human resources, time, knowledge, technology, and acceptance with incentives, as the major affecting factors. This concept, when successful, can provide an opportunity for practising urban agriculture to provide greeneries, fresh vegetables, and fruits to city dwellers.

In Nepal, there is no separate legislative framework (policy or act) that promotes and protects SCP practices at multiple levels and sectors – individual, household, community, private sector, academia, etc.). However, the prospect looks promising when the available policies, laws and strategies supporting sustainable development are implemented and well-communicated to targeted stakeholders in an integrated manner (Chhetri, 2017). With the federal structure in place, the local government bodies are independent and are mandated to design as well as implement the relevant acts, policies, and legislations on their own.



This opens an opportunity for the local governments to promote sustainable consumption by their citizens.

**Urban green parks:** The utilisation of open spaces and urban green parks in Nepal as recreational venues within urban centres remains a relatively underexplored option. Until about a decade ago, there were only a few smaller public parks that were often less managed, smaller in size and provided fewer opportunities for a larger number of people to spend quality time (Parajuli et al., 2008). This has, however, changed in recent years with more assessments, studies and projects taking place in urban centres of Nepal. Urban parks are now considered a crucial part of urban infrastructure (Thapa and Poudel, 2018; Poudel and Shrestha, 2022). Karuraratante et al. (2022) conducted research in Kathmandu, the capital city of Nepal and identified that the UHI effect is attributed to higher population density and lower density of green spaces. Studies conducted in other cities of Nepal including the western part also suggest that systematic mapping, planning, and managing open and green areas are required to reduce the effects of UHIs in Nepal (Kandel et al., 2022).

**Transportation:** The concept of sustainable mobility and transportation is still new in Nepal. The rapid growth in motored vehicles in developing countries like India and Nepal has led to air pollution, health problems and other socio-economic impacts that have attracted public concern and attention (Badami, 2005). Previous studies have explored several aspects of sustainable transportation within urban areas of developing countries. Transportation development has been recognised as one of the major strategies for accelerated economic development, and as such Nepal has a tremendous opportunity to adopt zero-energy transportation options (Pokharel and Acharya, 2015). The vision statement for the National Environmentally Sustainable Transport (EST) Strategy for Nepal (2014) is as follows:

*“Developing a transport system that is efficient, accessible, people-centric, affordable, reliable, safe, inclusive, and environmentally friendly” (pp.13).*

The document has also highlighted some of the challenges to a sustainable transport system in Nepal as (i) making appropriate investments, (ii) decoupling economic growth from motorisation, (iii) haphazard urban development and settlements, (iv) shifting from road to

railway, (v) enhancing institutional capacity in terms of regulation, database management and research (GoN, 2014). A study conducted by Liyanage et al. (2017) in the South Asian context including Nepal, offered some recommendations for sustainable transportation such as improving inter-settlement accessibility, introducing flyovers, enhancing public transport, introducing eco-friendly modes of transportation, and adopting strategies to reduce road accidents.

#### **2.10.6 Issues and challenges in sustainable consumption**

The transport sector in urban areas alone accounts for 26% of global CO<sub>2</sub> emissions and was identified as one of the major areas of emission reduction by the Kyoto Protocol in 1997. Despite these efforts, emissions from the transport sector continue to rise (Chapman, 2007). A study conducted by Mehmood (2021) derived an interesting finding that the age groups below 15 and above 65 generate less carbon dioxide (CO<sub>2</sub>) compared to the other age groups, while those in the most productive age group were found to be generating more CO<sub>2</sub>. A study in Nepal, focusing on vehicular emissions, found that CO<sub>2</sub> levels were the highest among all the emissions (Ghimire and Shrestha, 2014). The same study also highlighted that the emissions increase due to the poor quality of vehicles, their parts and the available fuel in the market. As the use of motorised vehicles continues to rise, so does the contribution to increased CO<sub>2</sub> emissions that drive climate change.

Various studies have been conducted to unfold the status of resource use sustainability in Nepal. Chhetri (2017) has reported that Nepal's use of resources is unsustainable, resulting in substantial waste production and rapid environmental degradation. The report suggests that the human-induced environmental damage in Nepal remains relatively manageable with appropriate mitigation measures. Rapidly growing urban areas such as Kathmandu still lack coherence, which can be corrected given the necessary political will. Devkota (2005), on the other hand, has claimed that the notion of sustainability was very short-term until the early 2000s. The perspective changed after the concept of community forestry in Nepal, local people started being committed to increasing the forest stock, while also utilising environmental resources such as fuel wood, food and timber.

The ten-year framework of programmes on sustainable consumption and production emphasizes that developed countries should take a leading role in this agenda, taking into

consideration the development and capabilities of developing countries (GoN, 2019). However, Nepal's SDG baseline report, 2017 has acknowledged that the agenda of sustainable consumption is more pertinent to developed countries and may not directly align with nations like Nepal. In the fiscal year 2016/17, only 4% of the total budget was allocated for the SDGs like reducing inequality, promoting sustainable consumption and production, protecting the environment, and adapting to climate change (GoN/NPC, 2017). This allocation underscores the relatively lower budget and priorities assigned to these sectors. Despite these challenges, the SDG report in 2022 (SDG 12) shows that Nepal is on track in terms of target achievements.

### **2.10.7 EbA introduction and implementation in Nepal**

Adapting to the adverse effects of climate change is a priority for Nepal. In the past decade, the GoN has undertaken numerous tangible measures to ensure that its development pathway is resilient to climate change and inclusive of the most vulnerable women and men. The more recent step to develop and execute NAP is expected to largely reduce the vulnerability and promote resilience to climate change by integrating effective adaptation approaches across various sectors and levels of the government.

The GoN has been prioritising adaptation activities as an important measure to cope with the changing climate in the form of several policy outcomes like the Climate Change Policy (2011) and the new NDC. In order to effectively implement these policies, action plans have been developed with concrete and specific targets for Nepal's developmental advancement by 2030 (MoFE, 2021). With the changing climatic condition across the globe, NbS provide options to make the cities resilient as they offer opportunities such as enhancing the quality of life, building social capital and fostering a sense of local ownership (Keniger et al., 2013; Hartig et al., 2014).

In Nepal, the concept of EbA was introduced in 2011, with the first urban EbA project initially planned in 2019 and formally initiated in 2022. However, practices that carry some of the principles of EbA in rural areas have been in practice for decades. Interestingly, even in developed countries like Germany, the notion of EbA in urban areas was relatively novel until 2015 (Wamsler, Brink and Rivera, 2013), as evidenced by the research carried out in eight municipalities in Southern Germany. The cross-cutting terms to EbA such as climate

adaptation and mitigation, green infrastructure, sustainable planning, etc. were used in these cities.

Several studies have been conducted in Nepal concerning the EbA and its effectiveness. Devkota, Shakya and Sudmeier-Rieux (2019) have claimed that focusing on EbA provides a high benefit-to-cost ratio in terms of damage prevention and considering engineering options; and have proposed strategies like reforestation, riverside plantations, and rangeland management. Similarly, they have highlighted investing in research such as development damage curves and flood vulnerable maps specific to the site, which could help decision makers to implement site-specific adaptation options. Though EbA is mentioned in most of Nepal's climate change and natural resources-related policies, it has been poorly prioritised, inadequately institutionalised and budgeted (Bhattarai et al., 2021). Kabisch et al. (2017) in their study has acknowledged citizen involvement as one of the indicators of NbS effectiveness, which includes EbA: involvement in green implementation projects (percentage of citizens involved), ownership and responsibility (percentage or no. of people owning or maintaining green spaces); and sharing and adopting NbS in a community (measured by New Media platforms such as Facebook- No. of "Likes").

Among the major lessons learned from the "EbA South Project" is budgeting in advance for the management and mitigation of foreseen and unforeseen risk areas/situations such as land-use conflict, social disharmony, ineffective government structures, disagreements regarding intervention options, and challenging environmental conditions (Mills et al., 2020). Sustainability is still an issue in Nepal, as the major projects on EbA are implemented on a smaller scale, are time-bound and primarily designed as isolated projects (Bhattarai et al., 2021). Payment for ecosystem services is one of the areas that can be promoted to enhance adaptation to climate change at a local scale (Karki et al., 2022); the concept is still in its infancy and poorly implemented.

## **2.11 Chapter Summary and Conclusion**

This chapter summarised definitions of various terms that are relevant to the research questions addressed in this thesis. Various concepts and historical backgrounds have also been explored, followed by the studies conducted internationally on sustainable

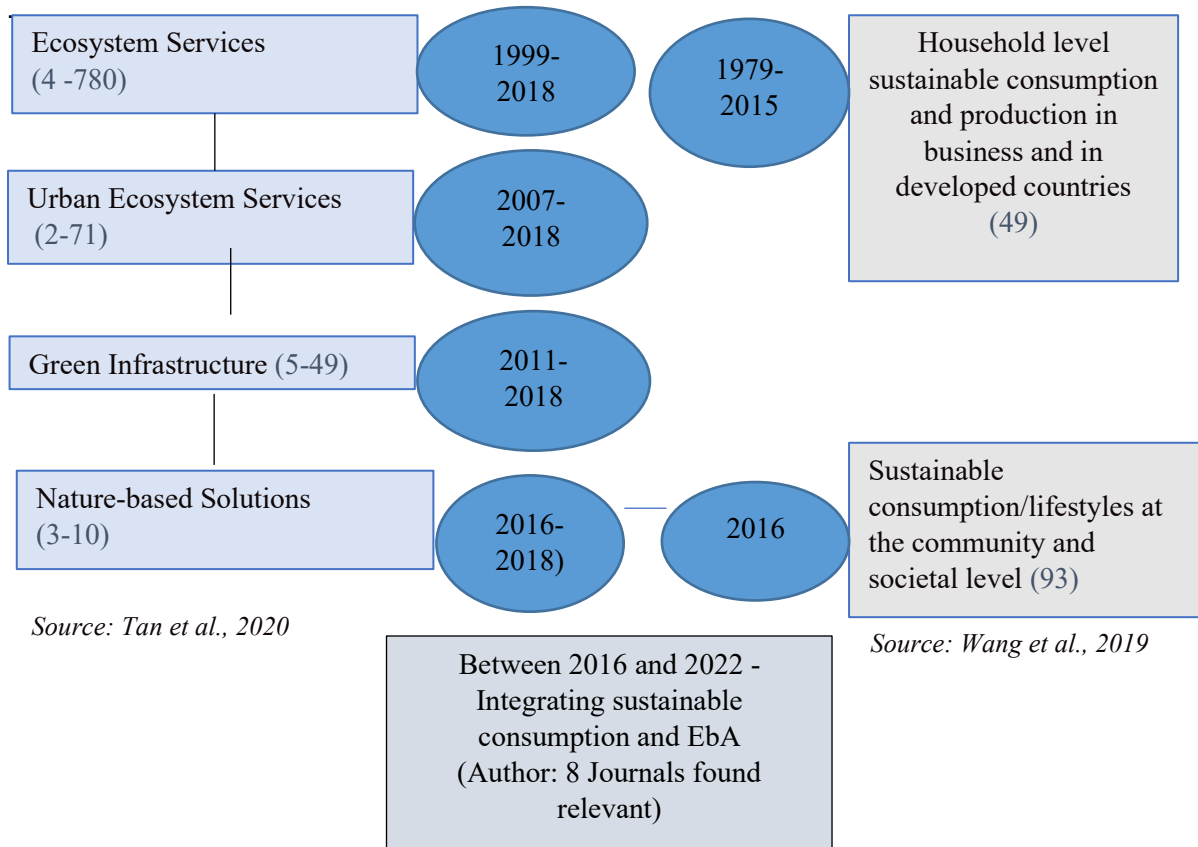
consumption, climate change in urban areas and climate adaptation practices mainly nature-based practices. Towards the end of the chapter, the context of Nepal has been presented.

When comparing the research studies on sustainable consumption and EbA presented in this chapter and even extending beyond, it was necessary to trace back to the 1970s, when the studies on sustainable consumption commenced. As early as 1979, studies on household-level consumption and production emerged, particularly focusing on businesses in developing countries. By 2016, around 49 articles were published. The concept of ecosystem services and related studies started in 1999, starting with 4 articles and culminating in 780 articles by the end of 2018. Similarly, articles on urban ecosystem services started in 2007 and until 2018, 72 were published. Articles featuring the keyword “Green infrastructure” were published in 2011 and until 2018, they reached from 5 to 49 (Tan et al., 2020).

Similarly, the concept of EbA started in 2011 and the NbS began to emerge around 2016. By 2018, a total of 10 peer-reviewed articles had been published. During roughly the same timeframe, a surge in interest surrounding sustainable consumption and lifestyles at the community as well as household level emerged with the publication of as many as 93 articles (Wang et al., 2019). This shows that the concept of sustainable consumption and NbS gained prominence after 2016. Between 2017 and 2022, 8 relevant articles were identified that intertwined sustainable consumption and EbA together. In the case of Nepal, studies on EbA began to materialise only after 2012, aligned with the commencement of the first EbA project in 2011 (Figure 4).

Theorising the findings made by various researchers on sustainable consumption proves to be significant. Studies have been conducted on various aspects of sustainable consumption such as the influencing factors, areas of sustainable consumption and recommendations made to promote sustainable consumption (Table 1). Some of the studies (Dorst et al., 2019; Zakaria et al., 2019) have also focused on the link between NbS and sustainable consumption. Despite the apparent link seen, sustainable consumption has not been recognised as an indicator of effective EbA or NbS practices, a connection that warrants further elucidation and reinforcement.

**Figure 4: Studies bringing together sustainable consumption and ecosystem-based adaptation**



Source: Authors construct based on Tan et al., 2020 and Wang et al., 2019

**Table 1: Research contribution towards the theory of sustainable consumption**

<b>Researchers</b>	<b>Contribution made</b>
Hertwich (2002)	Sustainable consumption should be the demand of the households and the production by households, for consumption purposes.
Holden (2004)	Institutional arrangements, individual preferences, available technologies, and policies all determine consumption pattern.
Shove (2014)	Sustainable consumption requires corresponding development in the social and technical regimes.
Holden (2005)	Consumption and sustainability are inversely related to each other: higher the consumption, lower the sustainability.
Tukker et al. (2008)	Shifting the demand of consumers to simpler and environment-friendly consumption and lowering demand for more modern and sophisticated materials are key towards sustainable consumption.
Zhao and Schroeder (2010)	Sustainable supply chain management can ensure sustainable consumption, especially of food.
Jackson (2005); Jaeger-Erben, Ruckert-John and Schafer (2015)	Sustainable consumption is more about consumption behaviour rather than only knowledge.
Atkinson et al. (2014)	Sustainable consumption is closely connected and understood as sustainable living.
Liu et al. (2016)	Sustainable consumption requires consumer buy-in. Therefore, their knowledge, awareness, opinions and preferences are pivotal.
Dorst et al. (2019)	Nature-based Solutions increases sustainability mainly in urban areas, as they also address social, economic and environmental issues.
Zakaria et al. (2019)	Individual ownership towards environmental protection promotes sustainable consumption.
Mathahru, Jain and Kamboj (2020)	The culture of sharing and economic activities taking place in the sharing economy plays a significant role in promoting sustainable consumption over individual ownership of resources.
Dawkins et al. (2021)	In order to have a wider acceptance of sustainable consumption by society, political executives should be active and place necessary institutional mechanisms.

*Source: Authors construct based on review of literature between 1992-2022*

## **CHAPTER 3: RESEARCH OBJECTIVES AND RESEARCH FRAMEWORK**

### **3.1 Statement of Problem**

Numerous studies in the past have explained that consumption patterns (e.g., Sharma, Nguyen and Grote, 2018; Liu et al., 2017) and climate change (Kabisch et al., 2017) are undergoing rapid transformations worldwide. These changes have direct implications for social, environmental, and natural components. The present statistics concerning pollution, resource constraints and global environmental degradation are largely attributed to the ongoing consumption behaviour (Dawkins et al., 2021). Similarly, understanding governmental initiatives aimed at measurement, learning and action to promote sustainable consumption provides insights into how these multiple factors may individually and collectively contribute to more sustainable consumption. Assuming that all goods and services are produced to meet consumer demands, individual purchasing habits and lifestyles can be deemed accountable for a substantial portion of the environmental impact arising from this producer-consumer relationship (Trott, 1997).

With the growing urbanisation and modernisation, lifestyles and consumption patterns have undergone significant changes, which directly impacts the availability of natural resources for future use (Kabisch et al., 2017). As the examples are set by the developed countries, the citizens in developing countries have started investing in larger houses and apartments, using sophisticated equipment in their daily lives, increasing flights and property ownership and larger consumption of meat whenever and wherever possible (UNEP, 2015). Research on the impacts of climate change on the lives and livelihoods of the urban population has started gaining momentum in recent years. However, such studies are relatively fewer in developing countries. When conducted, they are primarily focused on Asia, with research from Chinese cities dominating the field (Klopfer, Westerholt and Gruehn, 2021).

Huang and Rust (2011) have explained that (i) the poorer the countries are, the less affluent nations should consume, (ii) the more sensitive the global political climate is to economic inequity between wealthy and impoverished nations, the less affluent nations should consume, and (iii) if aid to poor countries is effective enough, then the more materialistic the society is, the more charitable aid it should give. Learning comes from practitioners'



involvement in action, as well as research into the actions that address these issues. Very few studies have been conducted on sustainable consumption in developing countries (Huang and Rust, 2011), including Nepal. Similarly, limited research (Groulx et al., 2017) is available regarding the relationship between household consumption patterns and the practice of EbA (for example). A study on sustainable consumption practices, while they are still manageable and can be mitigated (Chhetri, 2017), needs to be conducted. Most empirical articles on green purchasing are found to be dependent on consumers' self-reported attitudes and practices; findings from the observation of consumer behaviour by third parties have been less frequently reported (Joshi and Rahman, 2015), especially in the developing countries.

Nepal, one of the world's low-income countries, is undergoing rapid urbanisation and development. The haphazard urbanisation and rapid developmental activities have exacerbated the impacts of climate change. At the same time, Nepal is rich in biodiversity and various forms of natural resources, cultural diversity and indigenous heritage. While the food system in rural Nepal remains sustainable, it differs significantly from that in urban areas. The use of resources such as energy, water, food and other forms of environmental goods and services is moving towards unsustainability. Knowledge and awareness of people on sustainable behaviour and sustainable livelihood options are under-explored. This deficiency has resulted in inadequate prioritisation by the government bodies and limited proactive measures from the private sector and other stakeholders.

### **3.2 Research Objectives and Questions**

**Overall Objective:** The overarching objective of this research is to assess the role of sustainable consumption in enhancing the effectiveness of EbA in urban and peri-urban areas within the lowlands of Western Nepal.

#### **3.2.1 Research questions**

- i. How different is the consumption behaviour of people in urban and peri-urban settlements in Bheemdatt Municipality, and how have these changed in the past two decades?
- ii. What are the factors affecting consumption patterns and individual/household behaviour?

- iii. What are the consumers' inclination towards paying for green products (such as organic agri-products) and environmental services (recreational, mainly urban parks)?
- iv. What are the existing institutional mechanisms to promote/prohibit sustainable consumption in Bheemdatt municipality?
- v. What is the understanding and knowledge of people on climate change, sustainable consumption and EbA? What are the factors affecting this?
- vi. What kind of adaptation practices are in place both induced and autonomous?
- vii. How could the consumption pattern contribute to effective EbA in urban and peri-urban areas?
- viii. Can sustainable consumption be established as the indicator of EbA?
- ix. What is the difference in the consumption pattern, knowledge, and link of sustainable consumption with EbA in urban and peri-urban settlements?

### **3.2.2 Research hypothesis**

#### **Null Hypotheses:**

- There is no significant difference between the urban and peri-urban areas regarding the household consumption pattern.
- There is no association between the consumption pattern (food, transportation and recreation) and EbA.

### **3.3 Significance of the Study**

Government and non-government institutions have implemented development and environment-related interventions (programmes/projects) that influence people to change consumption behaviour directly and indirectly in Nepal. This research assessed the perception, knowledge, understanding and behaviour of people regarding sustainable consumption. The outcome of the research is expected to contribute to the commitment of GoN to the second NDC, and SDG 12 - Responsible Consumption and Production. The research will also contribute to SDG 1 - No Poverty by supporting inclusive economic growth and SDG 13 - Climate Action by making recommendations to address the challenges of climate change mitigation and adaptation. Hence, the findings will contribute to policy feedback for promoting a low-carbon and bio-based circular economy in Nepal's expanding urban and peri-urban areas.

Local knowledge, experience and examples are important, and observation-based climate knowledge is crucial to enhance the effectiveness of climate change adaptation science. For this purpose, more action research on agroecology, geography and adaptation exercises is essential, along with their dissemination on a global scale (Karki et al., 2022). Once the consumers realise the effects of global consumption inequity, they should be willing to consume less to reduce the inequity, as a matter of self-interest (Huang and Rust, 2011). It would be interesting to uncover the possibility of sustainable consumption in developing countries, even in situations where they are dealing with other pressing issues such as poverty, discrimination, violence, food security and inequality, among others. Such studies are even more relevant in specific cities in developing countries when conducted by researchers from the same country (Klopfer, Westerholt and Gruehn, 2021).

There is an important opportunity to guide the transition in consumption for emerging urban centres toward sustainability through policy settings and frameworks that privilege environmentally friendly and socially just products and services. One of the arguments of this research is that knowledge, awareness, and beliefs about the environment and climate change have a direct relationship with consumption patterns. A lifestyle approach that considers multiple factors influencing individual behaviour can better explain the sustainable consumer (Gust, 2004). With the help of efficient infrastructures and individual actions, sustainable lifestyles can play a major role in limiting the usage of natural resources, pollutant emissions and wastes, while supporting equitable socio-economic development and environmental protection (Hoque, 2014). A lack of knowledge about environmental issues reduces the likelihood of a person moving towards environmentally supportive behaviour such as the conservation of natural amenities. This research argues that much of such literature is required to validate these findings, including from the developing countries like Nepal. Additionally, this research contributes to developing a construct on cognitive dissonance, which works against addressing environmental issues (Hoque, 2014).

The study was conducted in Bheemdatt Municipality, located in Western Nepal. This municipality is one of the growing municipalities of Nepal, situated near the border with India in the Far-Western Region. The findings from this study regarding the promotion of sustainable consumption and EbA will help local government in creating an enabling

environment for responsible private sector investment, encouraging responsible consumption among urban/peri-urban inhabitants and reducing the risks associated with the impacts of climate change. This study also explored EbA practices that are being practised by the local communities in the municipality. Effective EbA requires sustainable consumption by the local population as one of its indicators – which is the main argument of this research. The indicators are the key pieces of information that represent the broader environmental, socio-economic, or climatic situation (GIZ, UNEP-WCMC and FEBA, 2020).

EbA practices should be designed and delivered after a detailed study and analysis of the prevailing socio-economic status, purchasing capacity, knowledge, and behaviour of the local people. This becomes more important in the urban areas, which is the centre of migrated population from various geographical areas and have different socio-economic background. In terms of sustainable development, EbA is a dynamic approach and incorporates the linkages among several other approaches, such as climate change adaptation, biodiversity and ecosystem conservation, and the generation of socio-economic benefits (Midgley et al., 2012). This research seeks to uncover the less explored area - the effectiveness of EbA - and if the sustainable consumption can be established as an indicator within this concept.

The recommendations stemming from this study will make valuable contributions to comprehending ‘How the linkages between urban and rural settlements impact the consumption pattern, why is it important to have a clear picture of the interaction between urban and peri-urban areas, and how consuming sustainably helps in making the adaptation practices to climate change effective - such as through EbA’. The findings will also open avenues for future research in other areas such as energy, water and other ecosystem services.

### **3.4 Theoretical Framework**

In this research, I have reviewed and incorporated the concepts and theoretical perspectives presented by previous researchers, which have guided this research in different ways and at various stages. Social and ecological concept and theories are related to human and the environment, and therefore understanding these theories are important in studies that have both human and nature-focused component. Initially, my attention was captured by the

AGW and human forcings besides the greenhouse gases theory. Both claim that human beings have the greatest influence on climate by clearing forests, irrigating deserts, and building cities (Bast, 2010). The closely associated factor to this is the human behaviour for the use of natural resources and environmental services, which is another area targeted by this research. De Molina and Toledo (2014) have explained how nature establishes limits to human behaviour, to which it sometimes reacts adaptively, other times developing solutions that change the scale or disappear.

This research acknowledges the substantial role of human practices in emissions and seeks to evaluate the hypothesis that eco-friendly behaviour can mitigate potential losses and damages arising from climate change. In this pursuit, the research integrates insights from landscape ecology theory, which enhances comprehension of environmental processes and patterns influencing habitats and species beyond the immediate locality (Simmons, 2004). The study also encompasses diverse settlement types within a landscape, encompassing rural, urban, and peri-urban settings, aligning with the research's focal points.

Due to globalisation and modernisation, the complexity of an urban ecosystem has escalated. This research has investigated the modernisation theory to understand the problem and conceptualise the research further. The modernisation theory asserts that urbanisation results from the introduction of new things and innovations within the society such as industrialisation, technological application, information penetration and cultural diffusion (Kasarda and Crenshaw, 1991; Smith, 1996). The lifestyle and consumption patterns largely change with modernisation, which has a direct impact on the use of environmental resources and services. Going further in detail, this research has studied the arguments put forth by theories on consumption such as the theory of practice, the VBN theory of environmentalism, and the theory of sustainable consumption.

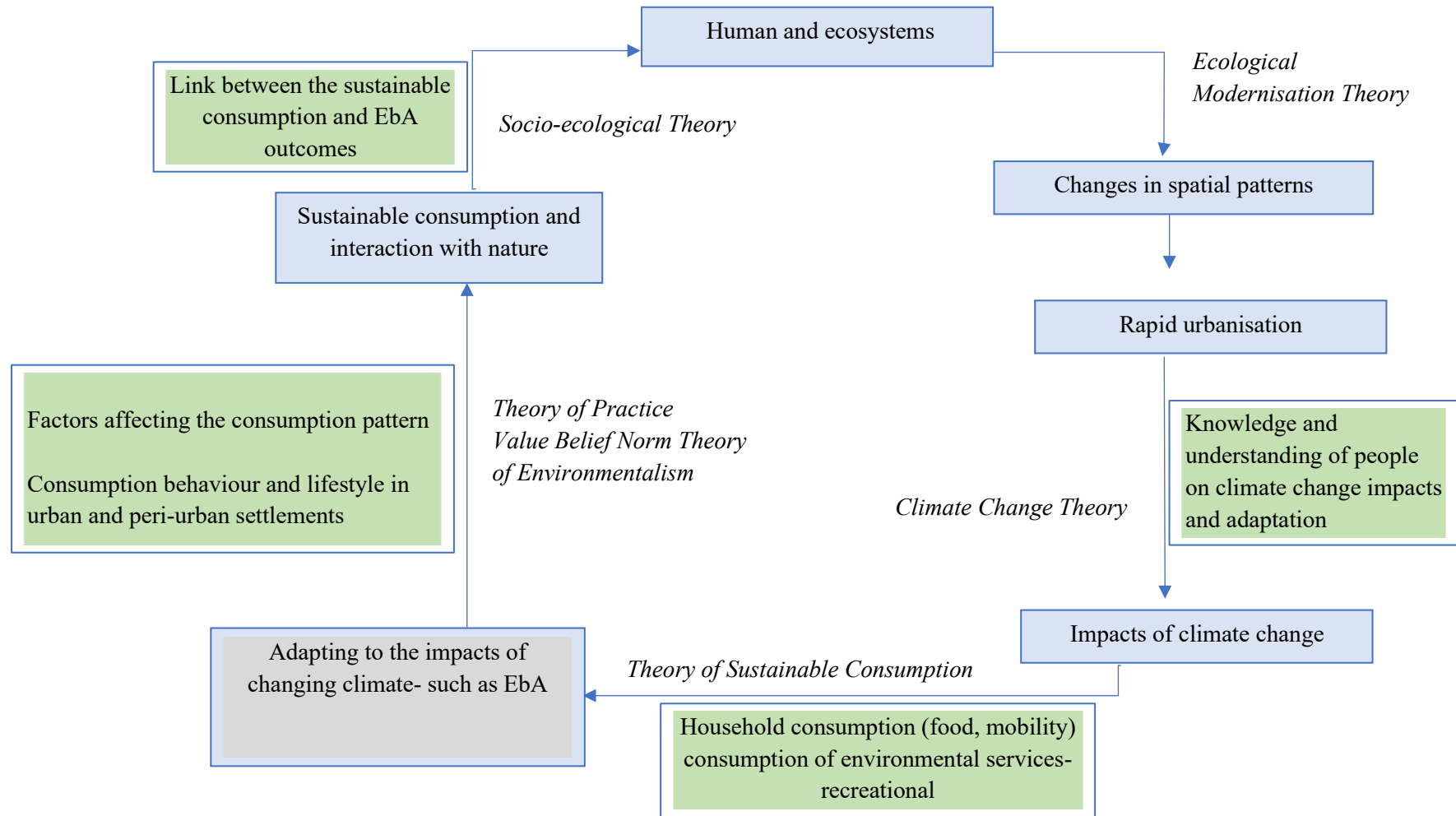
Within the **Practice Theory**, the insights provided by Corsini et al. (2019) have proven particularly important as they have provided an understanding of the dynamics of social norms, motivations and perception. Over time, the practice theory has evolved and gotten increasingly popular as it argues that people's behaviour and lifestyle are largely a result of the cultural and household level practices that have existed for many years.

When consumption relates to environmentalism, Stern et al. (1999) through the **VBN Theory** have highlighted that people consider this as a moral obligation and value to act in a certain way to protect the environment. This belief has been particularly considered important during the conceptualisation of this research. While moving further on environmentally sustainable consumption, the **Theory of Sustainable Consumption** (Van den Bergh and Carbonell, 1999) has been considered as it says that the total environmental impact of consumption is regarded to be determined by the combination of buying, use and waste behaviours, expenditures on various goods and services, and the technological characteristics of the products.

More specifically, I considered the concept introduced and promoted by Manfred Max-Neef (1987) regarding the fundamental needs of human beings, which are simpler and more limited compared to the wants prevalent in the current society. Dubey et al. (2016) have provided an analysis of the institutional set-up, the role of top management decisions and the power of participation in promoting sustainable consumption and production. They have further highlighted the strength of internal information sharing and reduction in behavioural uncertainty over external forces in promoting sustainable consumption and production behaviours.

The theoretical framework presented (Figure 5) for this study linking different theories is the departure point of my research. This research aims to build upon, test and contribute to the various arguments made so far, and contribute to strengthen the arguments related to the theories on sustainable consumption.

**Figure 5: Theoretical framework**



Source: Author's construct based on literature review

### 3.5 Conceptual Framework

The conceptual framework (Figure 6) is developed based on the literature review, the theoretical framework and my personal experiences working in the environmental protection and natural resources management sectors. Food insecurity, climate change, economic growth and social cohesions are the major issues of concern in urban and peri-urban areas of Nepal, where they are mainly associated with the production, consumption, and climate change adaptation practices (Lucertini and Giustino, 2021). Sustainability and sustainable development (Khan, 1995), as well as the principles of social, ecological, and environmental sustainability in development (Basiago, 1999), are closely connected with the concept of environmentalism. In this context, environmentalism broadly refers to a situation where the natural environment is protected and human interventions are reduced for the sake of the environment (Zelezny and Schultz, 2000).

The concept of sustainability, as highlighted by the Brundtland Commission Report 1987 says that the concept of sustainability has to be integrated and understood while setting the goals of economic and social development in all countries and has claimed that humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs (UN, 1987). Both terms- environmentalism and sustainability have brought in consumerism as a factor causing an impact on the environment. As early as 1971, Kotler, introduced the concept of consumerism as a social movement started by consumers on issues such as rising prices. This evolved with time into the businesses that consider the interest of the consumers, meaning that the consumers are powerful to make decisions on what and how they consume the available goods and services. The two theories, namely (i) Theory of Sustainable Consumption and (ii) VBN Theory of Environmentalism have explored various dimensions of sustainable consumption and the environmentally responsible use of natural resources.

The consumption behaviour of people living in urban is dependent on different factors like education, awareness, economic development, living standards, and social norms (Biswas and Ghosh, 2019). Factors such as environmental concern, environmental knowledge, attitude towards eco-friendly products, and consumers' intentions are the influencing factors of sustainable consumption behaviour (Karmokar et al., 2021). Similarly, efficient



use of resources, waste, infrastructure, access to services, availability of green and decent jobs and quality of life are the other factors influencing sustainable consumption (NEDA, 2020). Effective climate change adaptation practices, such as EbA, are reliant on factors encompassing human societies, ecosystems, economic considerations, policy, and institutional aspects (Reid et al., 2017). These practices play a pivotal role in restoring ecosystems, managing, and protecting biodiversity and ecosystems, and enhancing the livelihoods of communities dependent on natural resources (Reid et al., 2019).

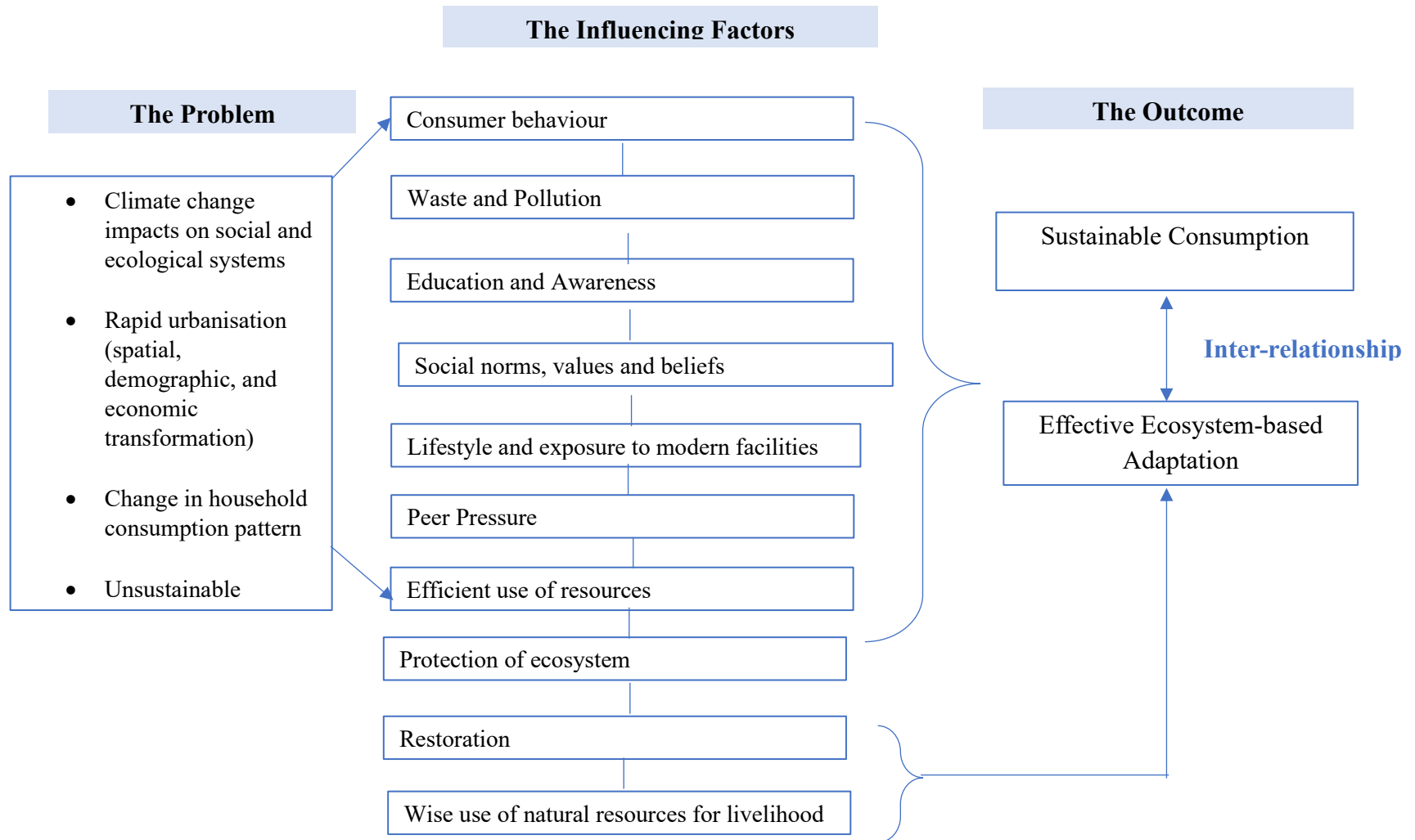
Consumption of resources depends on knowledge, attitude, and practices (Ghimire et al., 2019). The theoretical framework of the study is guided by various theories that collectively contributed to the whole cycle and stages associated with the human behaviour, climate change and its impacts, adaptation practices and sustainable consumption practices. Various research in the past have contributed to the studies on consumption such as focusing on areas such as food consumption, water and energy resources, means of transportation, lifestyles, recreational services, etc. (Simpson and Jewitt, 2019; Caeiro et al., 2012; Hoque, 2014). The major independent variables considered were age and sex, while numerous dependent variables such as education, knowledge, income, globalisation, etc. have been explored that contribute to the consumption pattern.

Van den Bergh and Carbonell (1999) have highlighted that the expenses each individual/household makes are associated with changes in lifestyle fashion, income change and availability of new products and influence from other cultures, which this study seeks to elaborate and further explore. The factors affecting the knowledge of sustainable consumption, the impacts of climate change and adaptation measures include education, access to digital technologies, affiliation with groups/networks and traditional practices, beliefs, norms, and values (Carrero et al., 2020). Such factors again differ from place to place and country to country, provided the priorities of each country and each geographical setting. This study considered these various variables to explore through empirical research.

This study was conceptualised to explore if there is any relationship between the consumption patterns and the use of EbA approaches; and if sustainable consumption can be established as an indicator of effective EbA in urban areas. This was mainly based on empirical data and available secondary information. Considering the individual and

household levels of consumption that can occur in many sectors and areas, this study has considered one sector each from urban ecosystem services: provisioning (food), regulating (means of mobility/transportation) and cultural services (recreation) (Wang et al., 2022). As such, the study seeks to contribute to previous studies and strengthen the initiative they have taken by uncovering the linkage between climate change, consumer behaviour and adaptation planning, specifically, EbA planning in the case of this research. At the same time, this research also seeks to contribute to the development and strengthening of the theory of sustainable consumption.

Figure 6: Conceptual framework



Source: Authors' construct based on literature review

## CHAPTER 4 RESEARCH METHODOLOGY

### 4.1 Study Area: Bheemdatt Municipality

#### 4.1.1 Rationale for selecting the municipality and the wards

Bheemdatt was selected for three reasons: (i) it is one of the young and growing cities in far-western Nepal; (ii) suffers annually from climate-induced disasters such as floods, landslides, and drought; and (iii); hosts geography from lowlands and links to Chure (mid-hills) and various ecosystems such as forests, urban centres, wetlands, agricultural lands, rivers, etc. It is adjoining the Shuklaphanta National Park, which also shares the border and conservation efforts with India. People in Nepal and India, therefore, depend upon the resources provided by the forests within the buffer zone of the park, because of which there is an ongoing human-wildlife and park-people conflict (Panta, 2018).

The municipality is situated downstream of the Mahakali River, and it faces annual floods that internally displace hundreds of people within the municipality. It also serves as a gateway to the far-western hilly districts, functioning as a service and market centre for those districts. This area, along with nearby municipalities, attracts hill migrants who move from the hills to the lowlands each year. Furthermore, although this municipality was planned with provisions for open and green spaces, these spaces are not well-managed. The municipality shares a border with India, and consequently, a significant portion of its food supply comes annually from India, largely inorganic. Having worked as a development practitioner in this area, I have gained insights into its needs, challenges, and risks over the years. Considering all the contexts and my familiarity with the region, I recognise the potential to transform this municipality into a sustainable and habitable area in the longer run. Despite this potential, there have been very few studies conducted in this area with a focus on urban centres. Motivated by these factors, I undertook this study in Bheemdatt Municipality.

Ward 4 and Ward 10 were selected based on field verification, observations, and consultations with key informants conducted at the beginning of the study. These consultations aimed to understand population demographics, environmental issues, people's lifestyles, consumption patterns, and observed differences between these wards. Bheemdatt is the largest municipality in Kanchanpur, comprising a total of 19 wards.

Therefore, the study focused on a single municipality. In any city, settlements and landscapes can possess both rural characteristics and natural ecosystems, resulting in significant non-urban administrative areas (Myga-piatek et al., 2021). Bheemdatt Municipality reflects this characteristic, incorporating rural and peri-urban areas, with only 16% designated as core urban. Ward 4 was chosen as the core urban area, while Ward 10 was selected as the peri-urban area connecting the chure hills in the north to rural and core urban wards in the south/southwest.

#### **4.1.2 Location/Boundary**

Bheemdatt Municipality is located in the Kanchanpur District of Sudurpaschim Province. It has Bedkot Municipality as the eastern border, Mahakali River as the western border, Dadeldhura District as the northern border and Shuklaphanta National Park as its southern border, which again borders India (Figure 7).

#### **4.1.3 Demography**

The total area of the municipality is 171.81 km<sup>2</sup> and consists of 19 wards. According to the household survey<sup>1</sup> of the municipality in 2022, the total population is 114,404 with a male population of 59,079 and a female population of 55,325. Similarly, the total number of households in the municipality is 21,540. The majority of the population are Brahmin and Chhetri followed by 18 other castes and ethnicity including Dalits and Indigenous groups (Tharus, Sunaha, Raute). There are 62.21% (65,073) of the independent population, working-age people between the ages of 15 and 64 years. In total, 9% of people are illiterate, followed by 7% generally literate, and a majority (31%) have a secondary level of education (Bheemdatt Municipality Profile, 2022).

#### **4.1.4 Socio-economic status**

There are a total of 4,531 houses equipped with piped tap water resources while 15,184 houses were reported as having tube well water facilities. Other sources of water facilities include spout water (155) and river streams (77). According to the 2018 Economic Census, there are a total of 4,610 establishments in Bheemdatt Municipality that are involved in various economic activities, employing 14,114 individuals (4,138 female) (Bheemdatt Municipality Profile, 2022).

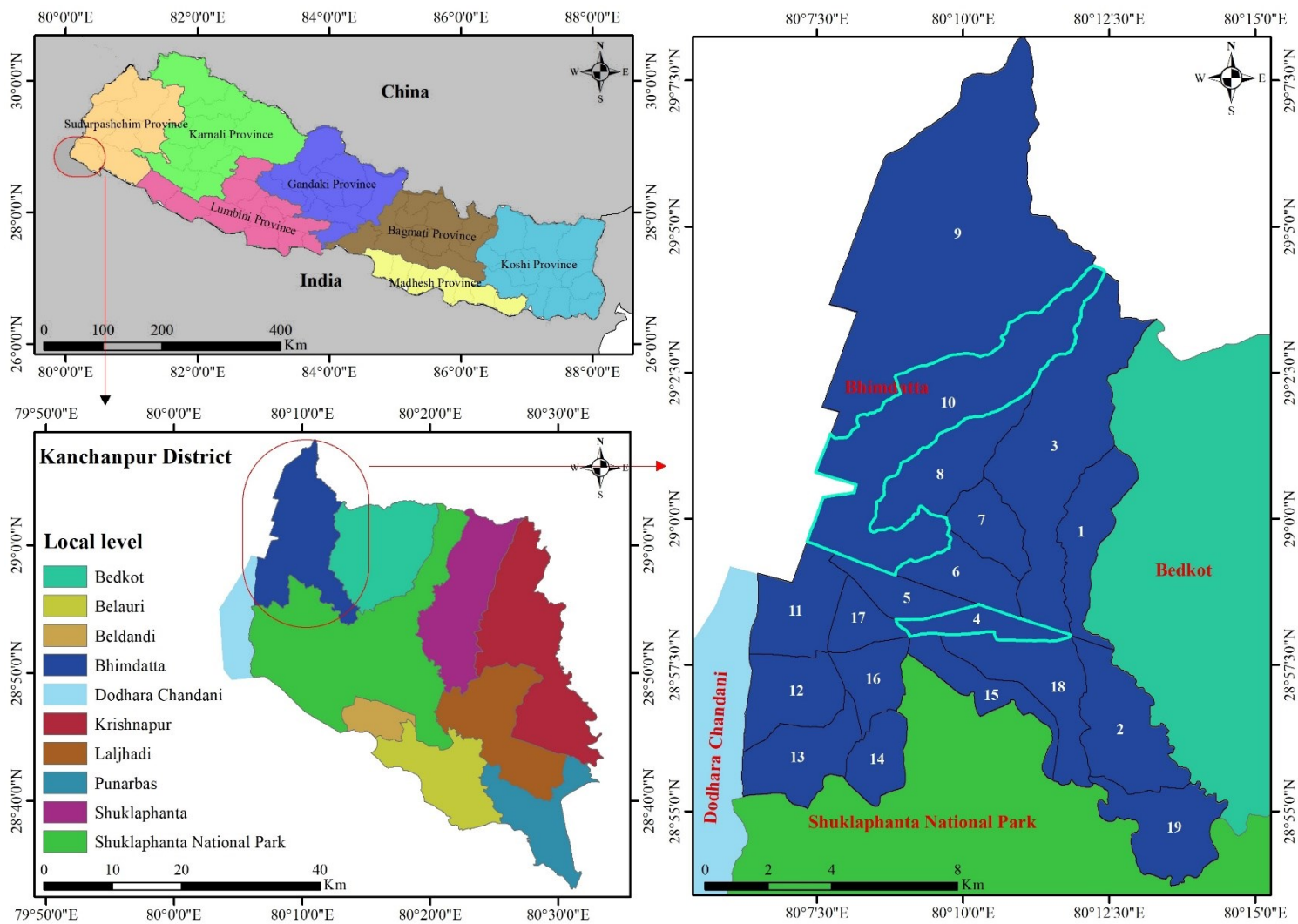
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<sup>1</sup><https://www.bheemdattamun.gov.np/ne/content>

**Figure 7: Map of Nepal. Boundary map of Bheemdatt Municipality, Kanchanpur District, Nepal**



*Source: Modified by author based on various open sources*



Source: Modified by author based on various open sources

#### **4.1.5 Land use**

The municipality has 58.94% residential area, 39.01% forest area and 2.5% urban area. The total arable land in the municipality covers about 11,950 hectares. Most of the land is flat with water flowing from north to south. Major market centres in the municipality include Mahendranagar Bazaar, Gaddachauki Naka and Brahmadev Bazaar. Likewise, major tourist destinations within the municipality are Shuklaphanta National Park, Dodhara-Chandani Suspension Bridge, Jhilmila Lake, Ranital and Kali Lake.

#### **4.1.6 Climate**

The municipality experiences a sub-tropical climate. The average minimum and maximum temperature during summer fluctuate between 35° C and 43° C and in the winter season, it is found in the range of 5° C to 19° C, with the relative humidity ranging from 84-87%. The estimated average annual rainfall is approximately 2,377mm (ADB, 2015). It is in the terai plain at an altitude of 91 to 108 metres above sea level. Generally, this region is characterised by the deposition of fine sediments like sand, silt, and clay (Dhakal, 2014). It has a nearly flat, gently sloping terrain with a boulder, hard formation, and shallow water level. Alluvial or loam, soft soil and calcareous beds together with colluvium deposits and thin soil layers mixed with gravel are predominant in the area (ADB, 2015).

#### **4.1.7 Geo-physical**

Bheemdatt Municipality is an emerging urban centre having *Chure* range in the north and the lower Mahakali watershed in the south. The municipality is vulnerable to the impacts of climate change, as evidenced by the frequent incidents of forest fires, flooding, and drought, which have increased and changed over the years. The natural drainage system is defunct, consequently causing waterlogging and flooding during the monsoon. Similarly, haphazard construction in the Chure results in landslides and erosion during the monsoons. The municipality accommodates eight community forests; however, the quality of these forests is degraded. These forests have been severely degraded due to overgrazing, over-extraction of forest resources, lack of scientific forest management, and inefficient protection measures against deforestation (Dhakal, 2014).



#### **4.1.8 Risks and hazards in Bheemdatt**

According to the Emergency Preparedness and Response Plan (EPRP), 2022/2023 of the municipality, disasters such as floods, mudslides, droughts, windstorms, cold waves, fires, wild animal attacks, lightning and road accidents are common natural hazards. These hazards occurred over a period of the last 30 years in the municipality. In recent times, domestic animals are seen all over the place (roads, agricultural lands) which has often caused damage to food crops as well as caused road accidents within the municipality.

The risk of earthquakes can never be ruled out. Furthermore, when looking at the historical timeline of disaster hazards in the municipality, it becomes evident that floods, fires, cold waves, storms, and wild animal attacks have been recurring hazards since the 1970s. Floods in the rivers and streams flowing from the North Chure Hills to the south have also caused significant damage in the municipality. Floods, soil erosion and inundation have affected farmlands causing the loss of crops. Climate-related impacts have led to an increase in the outbreak of various diseases in humans, crops and livestock. Although attempts have been made at the local level to reduce the impacts of disasters, effective planning and implementation of mitigation measures are essential for managing disaster impacts over the long term. Alongside various hazards, Bheemdatt is also experiencing urban sprawl, with most wards undergoing rapid and haphazard development. As a consequence, challenges such as environmental degradation, loss of open spaces, and increased pollution are becoming inevitable within the municipality.

#### **4.1.9 Open spaces and green parks**

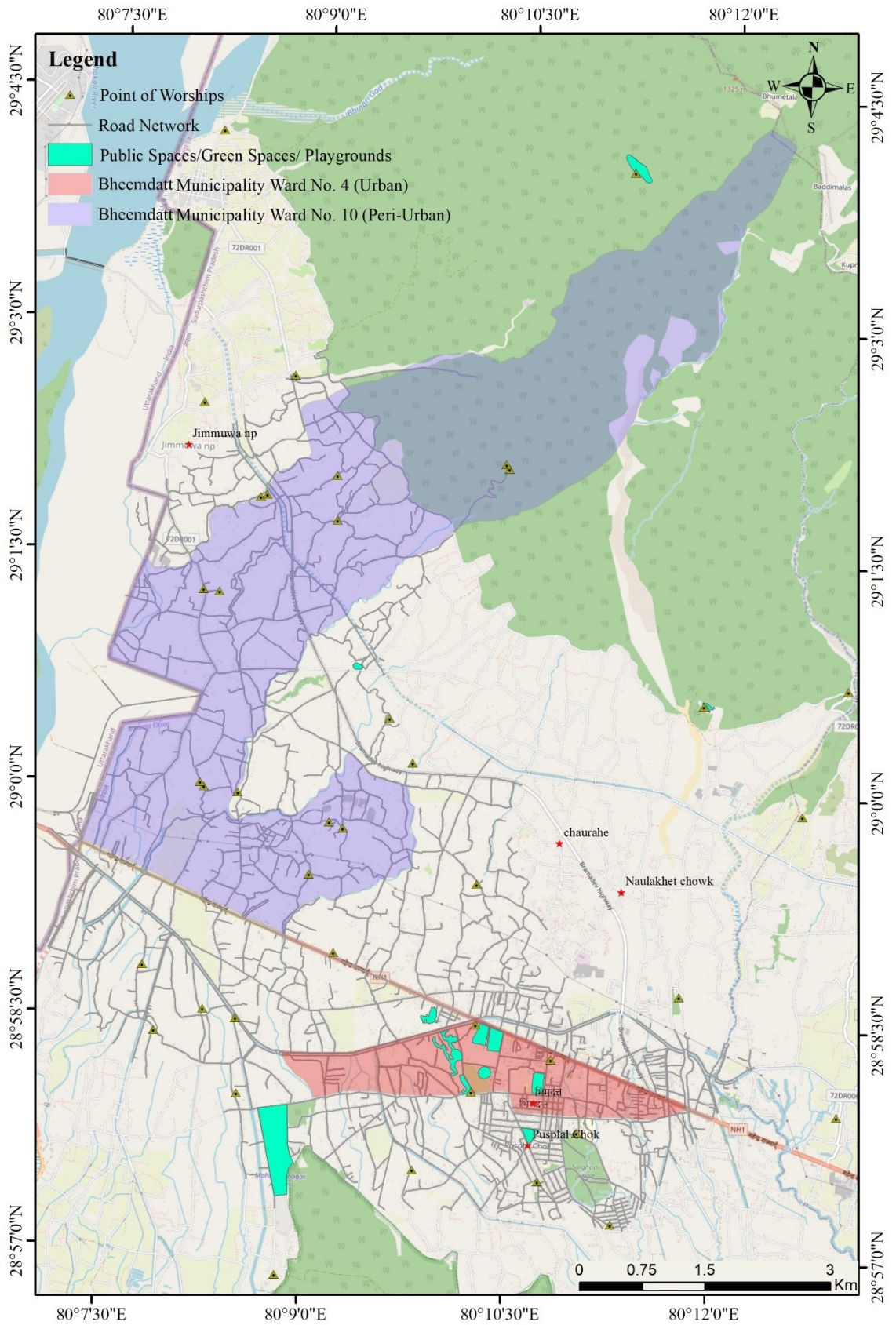
The preliminary list of open spaces based on the Sphere Standards was initially shared by the ward officials of both Wards No. 4 and 18, which serve as the two core urban centres of the municipality. A total of eleven open spaces were identified in Ward No. 4 while eight open spaces were identified in Ward 18, as listed by the ward officials. Following discussions with the municipal authority, a total of 19 locations in total were finalised as the most suitable open spaces for humanitarian assistance based on the standard selection criteria (minimum area 3500 m<sup>2</sup>), ease of access, availability of critical facilities, security, and environmental suitability and consideration of associated social and cultural values. Within this total, twelve suitable open spaces were identified in Ward 4, and seven open

spaces were listed in Ward 18. Some of the identified open spaces are also considered suitable for use as exit spaces during emergencies and humanitarian situations (Figure 8).

#### **4.1.10 Urbanisation in Bheemdatt**

Bheemdatt is one of the rapidly urbanising municipalities in the Kanchanpur District. In the current scenario, the increasing population in the municipality has started exerting pressure in aspects of infrastructural demand, housing, services, and urban resources such as open spaces and parks. In addition, settlements in the municipality are prone to recurring multiple hazards such as floods, mudslides, pollution, road accidents and fire. Given the presence of these underlying issues, disaster response and management are likely to become challenging. Different procedures such as developing gravel mining guidelines, the use of communication media, infrastructural development, and especially six-lane roads have taken place (Subedi et al., 2021).

**Figure 8: Green spaces in Bheemdatt Municipality**



Source: Modified by author based on various open sources

## 4.2 Research Approaches

This study applied a predominantly exploratory approach, primarily utilising a concurrent mixed research design. In the concurrent design, both qualitative and quantitative data were collected in a single phase to better understand the phenomenon and explore the issues. Mixed methods research, which combines quantitative and qualitative methods, is increasingly recognised as valuable because it can potentially capitalise on the respective strengths of quantitative and qualitative approaches (Östlund et al., 2011). Such combined quantitative and qualitative methods enable exploring more complex aspects and relations of the human and social world (Malina, Norreklit and Selto, 2011). I, however, conducted an expert consultation workshop almost 6 months after the initial data collection, which largely supported me in validating the findings and triangulating the data/information collected during the first phase.

I applied mixed research methods for this study as these deal with some relatively new concepts in Nepal, such as sustainable consumption and EbA; relying on only one method may not give an actual picture of the study areas. A mixed approach to information collection in studies related to consumption patterns has been applied by various researchers in the past (Juvan and Dolnicar, 2014). Molina-Azorin (2016) reviewed the existing literature to examine the use of the mixed method by environmental management and sustainability-related researchers and concluded that the application of mixed methods research facilitated and enhanced the interpretation of the results obtained to emphasize the practical implications of the study (Östlund et al., 2011).

Munoz-Pascual, Curado and Galende (2021) employed a mixed methods approach in their study to analyse the relationship between the use of information technologies and the adoption of environmental practices. Their findings revealed that the collaboration-oriented human resources system, organisational learning capability, and information technology system positively impact the adoption of environmental practices. Molina-Azorín et al. (2015) studied the effects of quality and environmental management applying the mixed method to triangulate information collected through the quantitative method. Similarly, Feola et al. (2015) applied a triangulation strategy, employing mixed research methods to facilitate open structured dialogues on assumptions, research questions and methods employed in the investigation.

#### 4.2.1 Methods and data collection tools

Data collection at the household level was conducted by using a structured questionnaire, pre-tested and a mix of open and closed-ended questions (Annex I). The questionnaires were administered on paper to allow more time for the interviewer to explain questions to the respondents and take notes. Similarly, the checklist for Focus Group Discussion (FGD) and Key Informant Interviews (KIIs) were developed and executed. Multiple tools were utilised based on specific question requirements (Table 2, Table 3).

*Table 2: Summary of data collection tools*

SN	Methods	Strategy/Procedure	Tools
1	KII	11 individuals/experts from the local level, unstructured open-ended 12-15 questions	Interview guideline
2	FGD	4 FGDs at the municipality and ward/community level, 6-10 persons in each FGD	FGD protocols
3	Direct observation	Two sites- urban and peri-urban, 4 transects	Protocol
4	Household interviews	136 households from peri-urban from Ward no. 10 and 135 households from an urban setting in Ward no. 4, stratified random sampling, structured close-ended 20-25 questions containing general information, knowledge on climate change, consumption behaviour, adaptation practices, attitude for willingness to pay ecosystem services	Structured questionnaires
5	Experts' consultation	As the final tool of data verification/validation, this expert consultation workshop was conducted with 20-25 experts	Checklist
6	Context analysis	Narrative and explanatory	Manual

*Source: Author's construct*

**Table 3: Data collection tools against the research questions**

<b>Research question</b>	<b>Data collection tools used</b>	<b>Information derived</b>
How different is the consumption behaviour of urban and peri-urban populations, how have these changed in the past two decades (mainly the natural resources)?	Household survey, FGD, KII	<ul style="list-style-type: none"> <li>• Consumption understanding and behaviour among the people in urban and peri-urban</li> <li>• Trends in natural resources in recent years</li> </ul>
What are the factors affecting the changes in consumer behaviour?	Household survey, FGD	<ul style="list-style-type: none"> <li>• Influencing factors on the consumption pattern</li> </ul>
What is the consumers' preference to pay for green products (such as organic agri-products) and environmental services (recreational, mainly urban parks)?	Household survey	<ul style="list-style-type: none"> <li>• People's preference to pay a certain amount to use green products</li> <li>• People's willingness to pay for urban green parks</li> </ul>
What are the existing institutional mechanisms to promote/prohibit sustainable consumption in Bheemdatt municipality?	Household survey, Documents review	<ul style="list-style-type: none"> <li>• Guidelines/Acts/Policies formulated in Bheemdatt Municipality that explain the consumption of resources</li> </ul>
What is the understanding and knowledge of people on climate change? What are the factors affecting this?	Household survey	<ul style="list-style-type: none"> <li>• Level of understanding and awareness of climate change and their impacts</li> </ul>
What kind of adaptation practices are in place - induced and autonomous? To what extent are the EbA approaches practised?	Household survey, FGD, direct observation	<ul style="list-style-type: none"> <li>• Existing climate adaptation practices including nature-based practices</li> </ul>
Can sustainable consumption be established as the indicator of EbA?	Content analysis	<ul style="list-style-type: none"> <li>• The link between the consumption and EbA</li> </ul>
How could it contribute to effective EbA in urban and peri-urban areas?	Content analysis	<ul style="list-style-type: none"> <li>• The link between the consumption and EbA</li> </ul>
How can we compare the consumption pattern, knowledge, and link of sustainable consumption with EbA in urban and peri-urban settlements?	Content analysis	<ul style="list-style-type: none"> <li>• People's consumption practices and behaviour, EbA practices in both urban and peri-urban</li> </ul>

*Source: Author's construct*

## Household survey

For the collection of quantitative data, the household survey was conducted as the primary data collection tool (Photo 1; Photo 2). The primary advantage of a household survey is to provide considerable discretion to the interviewer about the information from respondents. Structured interviews were complemented by several other methods such as a literature review to address the research questions (Sang et al., 2021). Household sample surveys have become a key source of data on social phenomena over the past 90 years, in which part of the population is selected, detailed data/information/opinions are collected, and are analysed/conclusions made to be applicable for the whole community (UN, 2005).



*Photo 1; Photo 2: Household survey, Photo credit: Bhumika Sunuwar*

## Focus group discussion

After the household survey, FGDs were conducted in both settlements, with two FGDs in each – one in the urban area and another in the peri-urban area (Photo 14). FGDs involve bringing together individuals with similar backgrounds or experiences to engage in a discussion about a specific topic of interest. This qualitative research method entails asking participants about their perceptions, attitudes, beliefs, opinions, or ideas and allows them to freely interact with other group members, typically numbering 8 to 12. In a similar vein, Reid et al. (2019) employed semi-structured interviews and FGDs in 2017 and 2018 in their case studies, allowing participants to express their perspectives in their own terms and yielding comparable qualitative data. As FGDs are less structured compared to household surveys, they provide an opportunity to ask follow-up questions to validate responses and gather deeper insights. Such discussions aid in comprehending shared learnings and practices, often derived from cultural norms (Schensul, 2009).

A total of four FGDs were conducted using the developed checklist. Some of these FGD groups were identified during the household survey, while others were pre-identified. FGDs were valuable for gathering specific information that did not necessarily have straightforward answers. For instance, topics like ‘opinion on sustainable consumption pattern in the community' and "understanding the EbA approach’ required nuanced insights. FGDs facilitated the collection of both qualitative and observational data, as the analysis of the information was intricate, and the subject matter discussion was somewhat technical (Nyumba et al., 2017).

### **Key Informant Interviews**

This research conducted 11 KIIs which included the representatives from the local government, academia, journalists, representatives of community groups and social activists, utilising the checklist (Photo 15). After the household survey and FGDs, KII were conducted individually to triangulate the information collected through the household survey and FGD and collect additional information that were otherwise not possible through the other tools. Such interviews can help extract information mainly from informed people who are also engaged in the subject of research. KII helped determine not only what people do but why they do it. They are excellent ways of documenting people’s reasons for their behaviour and people’s understanding or misunderstanding of issues (Kumar, 1989). Consultations with key stakeholders were also done at the beginning of the study to finalise the wards of the study.

KIIs are essentially qualitative interviews conducted using interview guides that list the topics and issues to be covered during each session. Such interviews are appropriate in situations where (i) descriptive information is sufficient for decision-making; (ii) understanding of the underlying motivations and attitudes of a target population is required; (iii) quantitative data collected through other methods need to be interpreted; (iv) the primary purpose of the study is to generate suggestions and recommendations; and (v) preliminary studies are needed for the design of a comprehensive qualitative study (Kumar, 1989). Although time-consuming and expensive, they provide a logical process for gaining a deeper understanding of the subject matter (Elmendorf and Luloff, 2006). For this study, the snowball method was used to identify the key informants that were in addition to the already identified informants. The snowball method is used where the research participants



recruit other participants for a test or study, and where potential participants are hard to find (Glen, 2022). It is one of the most popular methods of sampling in qualitative research, central to which are the characteristics of networking and referral, social networks to establish initial links, with sampling momentum developing from these, capturing an expanding chain of participants is crucial (Parker, Scott and Geddes, 2019).

### **Direct observations**

During the FGDs and households survey, transect walk or walk-through methods were used as direct observation (Photo 3; Photo 4). This tool was helpful to verify or strengthen the information shared by the people. Direct observation was especially useful in the context when the people did not understand the terminology used during the household survey and there was doubt about some of the information shared by them. For example, I was able to observe the storage and utilisation pattern of natural resources (Sapkota et al., 2019), particularly forest products; management of community forests, use of urban parks (Zari et al., 2019), use of electric scooters and maintenance of kitchen garden. The observation was done while applying all the other data collection tools – household survey, FGD and KII. In cases where the information given by the respondents did not match with what I observed, they were probed further. Notes were taken and photos were captured during the direct observation in the field. As I made several trips to the study area, I visited the same areas multiple times too, to confirm my observation. For example, I visited the same urban green parks during the survey and when I went to the municipality for the experts' consultation workshop.



*Photo 3: Natural resource utilisation in the study area, Photo by Author*



*Photo 4: Urban green park in the study area  
Photo by Author*

### **Experts' consultation workshop**

Once all the required data had been collected and processed further, an expert consultation workshop was conducted in April 2023, six months after the initial data collection through household surveys (September -November 2022). This workshop invited senior members from the local government, academia, journalists, influential individuals from Bheemdatt and representatives from the private sector (Photo 5). During the workshop, I presented the overall findings of the study followed by the discussion in plenary. The participants were then divided into three groups to discuss the current practices of sustainable/unsustainable consumption, the potential to promote sustainable consumption, and the relationship between consumption patterns and EbA practices.

The group discussion followed the World Café Method and therefore all three groups had an opportunity to provide inputs to various topics. At the end of the discussion, the participants presented their findings. Even after the wrap-up of the session, we discussed with some of the participants to share their experiences on the method and the research topic itself. This approach proved to be highly effective in terms of summarising and validating the research findings, thereby serving as a robust foundation for finalising the process of data collection and concluding the research findings (Sprujit et al., 2016; Chaudhary et al., 2022).



*Photo 5: Group discussion during experts' consultation workshop, April 2023*

*Photo credit: Mr Raj Kumar Sunuwar, NNSWA*

#### **4.2.2 Rationale for comparing the urban and peri-urban**

Internal migration from rural to urban areas is rapidly increasing in Nepal, which happens for several reasons. International migration and remittances have mainly influenced the migration from rural to urban areas (Chaudhary, 2020). Households that cannot afford to move to the core urban, tend to make their living in areas that are between urban and rural i.e., peri-urban. Peri-urban areas are characterised by mixed land use, intense flow of resources, people, and goods and services for the purpose of intermediary market functions (Dahal, 2023). In many situations, peri-urban areas are even more unplanned and haphazard that need urgent attention to avoid future urban challenges (Ahani and Dadashpoor, 2021).

Urban and peri-urban have many characteristics in common, yet have differences, that might need a separate planning approach for two areas to achieve better outcomes. For example, the management of urban ecosystems needs careful thinking on space, labour, water, and capital (Graefe et al., 2019).

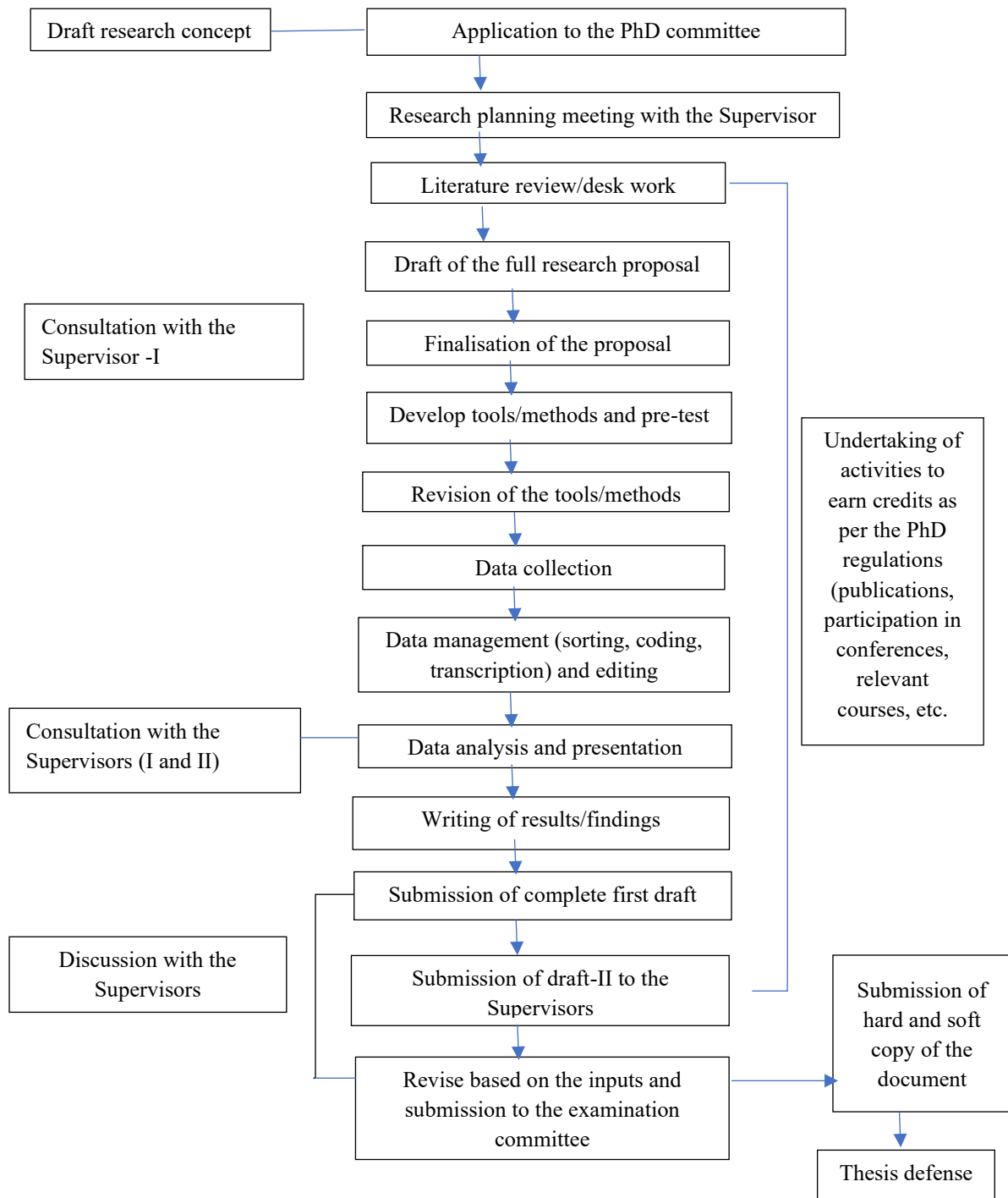
While the urban core can offer services such as education, health and jobs, the peri-urban can serve as the food supplier as well as a producer for the urban population. The consumption patterns and the carbon emissions can still be very different in these two settlements. Integration of the two structures is, therefore, important. The NUDS, 2017 of

Nepal has emphasized in establishing the linkage between the urban system in the mid and far western part of the country. The Climate Change Policy, 2019 also focuses on the need to design policies targeted for the core urban, rural and growing urban areas (GoN, 2019). This study, therefore, considered the comparison between the urban and peri-urban settlements.

### 4.3 Research Process

The research work was accomplished through a step-by-step process, from concept preparation to finalising the thesis (Figure 9).

*Figure 9: Research process*



Source: Author's construct

#### 4.4 Research Variables

The research variables were identified, and a group of questions were expected to be answered as part of the research. The selection of variables was done after a careful review of the previous studies, the variables chosen, and the findings driven. Variables are understood as the measurable characteristic of an individual or entity, which is measurable (Creswell, 2014). The different variables such as environmental concern, perceived environmental knowledge, and eco-friendly attitude determine consumption behaviour (Karmokar et al., 2021). The consumption behaviour depends on socio-demographic factors such as age, sex, family type, education, and family income.

Knowledge, attitude, behaviour, and practices were considered important in this research, which largely depend on education, awareness and implemented environment-related programmes. The potential association or linkages between consumption and EbA are contingent upon the availability of natural resources, ecological services and livelihood options; whereas human-centredness, harnessing nature's capacity to support long-term human adaptation, application of traditional and local knowledge, having a basis on the best available science and involvement of a longer-term transformative change are some of the indicators of effective EbA (Reid et al., 2019), and has been considered a part in this research.

#### 4.5 Sampling

For the quantitative data, the household survey using a structured questionnaire was applied. At a 95% confidence level, the total sample size interviewed for this survey was calculated to be 135 in Ward No. 4 and 136 in Ward No. 10 for the survey by applying the following formula proposed by Daniel (1999).

$$n = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)}$$

where,

n=sample size with finite population

N=Population size

Z= z statistical value for a level of 95% confidence=1.96

P= Expected proportion= 0.1 (10%)

D=Precision =0.05 (5% margin of error)

To include both urban and peri-urban populations, a stratified random sampling technique was employed. Stratification provides an opportunity for the proper representation of sub-groups and reduces bias (UN, 2005). A two-stage stratified random sampling was used for this study. The entire municipality was first divided into rural, peri-urban, and urban areas. This was then followed by simple random sampling in two settlements – one each in urban and peri-urban. Several researchers like Gupta et al., 2016 used a two-staged stratified simple random sampling method for household surveys to assess community knowledge, attitude, and practices.

#### **4.6 Reliability and Validity**

This research adhered to established scientific research tools and techniques. The application of mixed research methods and multiple approaches (e.g., statistical and design-based) of data collection reduces bias and, can provide a stronger basis for interpretation of findings and provide conclusions (Hammerton and Munafo, 2021). I used the tested methods and tools in the research. A structured questionnaire was developed and was pre-tested as well as revised before administering; and was mainly focused on the Knowledge, Attitude and Practices (KAP) (Ghimire et al., 2019; MdM, 2011). Guidelines and protocols/checklists were developed for FGD and KII. A series of discussions with the research supervisors and experts were done at various stages in the research process. Once the questionnaires were finalised, enumerators for data collection, as well as a lead field researcher were hired and trained for data collection. After the data collection, the information was verified, carefully screened, and missing information were rechecked and coded. The information was carefully entered into the SPSS system (version 29) for analysis.

Multiple sources of data and information were used to triangulate and validate the information collected. FGD, KII and experts' consultation helped me validate the information at multiple levels, identify gaps and administer the subsequent tools in a more professional manner. Where relevant, information was compared with the previous

research findings from the study area, Nepal, other developing countries, and occasionally even from developed countries.

## **4.7 Data Analysis and Presentation**

### **4.7.1 Content analysis**

The first analysis technique applied in this research is content analysis, which was used for qualitative data/information collected. Qualitative information collected through KII, FGD, experts' consultation and observations were used to identify and document the attitudes, views and interests of individuals and small groups or larger ones. Similarly, information collected through the household surveys were compared and validated through these techniques. This research followed a structured process, encompassing facets such as the type of information, focus of the analysis, categorisation of the information, identification of patterns, and interpretation (Taylor-Powell and Renner, 2003). Based on the questions, the available data were categorised on various themes: consumption, knowledge, behaviour, practices of respondents, adaptation practices, etc. (Drisko and Maschi, 2016).

### **4.7.2 Willingness to pay**

Pricing decisions or a decision about a new product is based on the assessment such as the customer's willingness to buy such product by paying a certain fee (Breidert, Hahsler and Reutterer, 2006). In the study, it informs that because of missing adequate knowledge of the customer's willingness-to-pay (WTP) for their products, companies fail to target the right consumers thereby increasing the risk to profitability and suitability of the product to that location. I applied the WTP Method to derive the willingness of the consumers for urban green parks.

The survey for calculating WTP was administered through a face-to-face questionnaire (household survey), which concentrated on the public awareness of ecological and health compensation (Zeng et al., 2016; Xiong et al., 2018) for the urban green parks in Bheemdatt Municipality. The survey of WTP and the analysis of influencing factors are of great help to the establishment of an ecological compensation mechanism.

The Contingent Valuation (CV) Method (CVM) was adopted to evaluate the WTP of residents (Zheng and Qin, 2009). CVM adopts the utility maximisation principle and builds



a fictitious market to obtain people's WTP for non-market goods. It is a unique method to evaluate the whole value, especially the non-use value, of environmental goods (Zheng and Tu, 2009). CV is conducted through a survey, whereby price tags are put on the environmental goods and services that are not yet on the market (Carson, 2000). This allows the customers to make a hypothetical economic decision with a visible market. According to Huang and Rust 2011), once the consumers realise the negative effects of global consumption inequity, people are willing to consume less to reduce the inequity; for this, the researchers developed and tested a formal model of the relationship between sustainability and consumption.

#### **4.7.3 Statistical analysis**

Quantitative data were analysed to summarise the data and inferential statistics to test the hypothesis (Rosner, 2016). A null hypothesis was designed to test the relationship between different variables. Comparison between two groups (urban and peri-urban) and correlation coefficient and significance tests were applied.

The data/information collected were analysed by using Microsoft Excel, and SPSS Version 29. Tables, graphs and charts were generated and presented as appropriate. Statistical analyses were conducted to derive conclusions against the pre-determined hypothesis. The major tests run through the SPSS include the Chi-square test, Z-test, Mann-Whitney- U, and Kruskal Wallis. Z-test was administered to compare two groups i.e., the knowledge and attitude of urban and peri-urban. Considering the non-parametric nature of the data, Mann-Whitney-U (Karch, 2021) and Kruskal Wallis test (McKight and Najab, 2010) were conducted as relevant.

#### **4.7.4 Triangulation of the data/information collected**

I used different methods and tools to obtain data as complementary data that validated the overall results. Multiple sources of information were used to triangulate and validate the findings, as well as increase the reliability. Triangulation can sometimes seem to be another term for mixed-methods research (Wilson, 2014). In this research, triangulation has been considered as an approach to validate the data/information collected from one source to the other, while the mixed method is the overall research approach including the data collection.

## 4.8 Research Ethics

I initiated the research process by building rapport, making several visits to the local communities, and gaining a comprehensive understanding of the context before proceeding to administer the questions for the household survey; the same approach was applied to FGDs and KIIs. Considering the power relationships between me and my enumerator and the research within the culture of the survey setting, efforts were made to make the enumerators to be ‘value neutral’, ‘non-judgmental’ or minimally standing aloof from the survey context while administering survey questionnaires. The name of respondents and their answers were kept anonymous and confidential throughout the data presentation and analysis phases.

This research strictly adhered to the ethical principles to be followed in social science and research. More specifically, it has taken the reference of the British Association of Social Workers (BASW) to take necessary action to ensure ethical principles in the proposed project. It has considered major principles as suggested by BASW (BASW, 2021): (i) upholding and promoting human dignity and well-being; (ii) respecting the right to self-determination; (iii) Promoting the right to participation; (iv) challenging oppression; (v) respecting diversity; (vi) Working in solidarity; (vii) being trustworthy; (viii) maintaining professional boundary; (ix) being transparent and professionally accountable; (x) assessing and managing risk; (xi) providing information to people affected by social work decisions; (xii) sharing information appropriately; and (xiii) using authority in accordance with the human rights principles.

I adhered steadfastly to the principles of inclusion, feminist principles, human rights, women’s rights, and survivor-centred approach, and did no harm during the entire study; the enumerators were trained accordingly too. The entire process was voluntary, and I ensured that all the aspects of data collection were respectful. I and the enumerators paid special attention to giving space to the participants so that they express themselves honestly. Furthermore, I ensured that none of the participants’ views were articulated bluntly without their consent. The respondents and key stakeholders involved in this study were also fully informed of the nature of the study, the study objectives, and the confidentiality of the data, at the beginning of data collection, where relevant. They were explained the potential benefits and risks of participating in the study well in advance. They

were also informed that they may skip any questions they did not wish to answer and were allowed to comment or ask any questions to the researchers. The informed consent form was written in simple Nepali language and was read out to the participants, and verbal consent was obtained.

As much as possible, I informed myself and the enumerators about the study, did the homework, maintained confidentiality, and ensured that the information given during the interview was original and not influenced by any other third party.

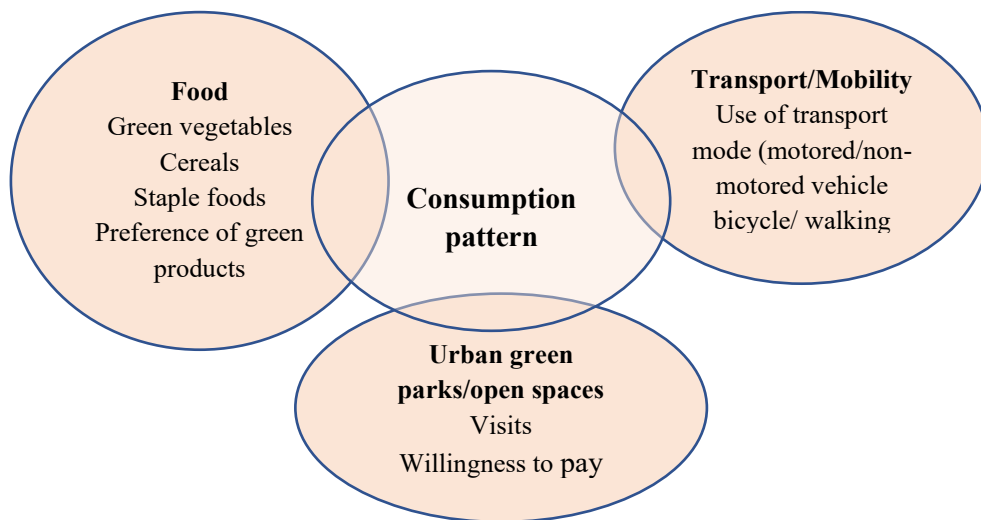
## CHAPTER 5 RESEARCH FINDINGS

### CHAPTER 5.1 CONSUMPTION BEHAVIOUR AND PATTERN IN THE STUDY AREA

#### 5.1.1 Introduction

This is the first of four chapters dedicated to research findings and discussions. Consumption behaviour and pattern is one of the main themes of the present research. The background information such as demographic, social and economic characteristics of the respondents has been presented briefly in this chapter. Various factors that influence people's decision to consume in a certain way and choose to consume specific products/goods/services over others are discussed. It has also presented how these factors influence the consumption behaviour and pattern of people living in urban and peri-urban settlements of Bheemdatt Municipality. To focus, three areas of consumption: food, mobility and use of urban green parks have been chosen. The three areas of consumption represent directly or indirectly the ecosystem services provided by the urban ecosystem: food- provisioning, mobility (transportation)- climate regulating (indirect) and urban green parks- recreational/cultural services (Figure 10).

*Figure 10: Areas of consumption studied*



*Source: Authors' construct*

Since the country underwent political restructuring in 2017, the Local Government bodies (753) established within the country were given full power and responsibility to develop their policies, rules, regulations, and programmes, and implement them. This chapter also analyses the various institutional mechanisms including policy frameworks, working sub-

committees and other mechanisms that are in place to influence the consumption pattern of the local people. Finally, the findings from the consumers' preference to pay for green food products, and the willingness to pay for improved services in the urban green parks are described.

### 5.1.2 Methods

Mixed research methods and tools were used. An extensive literature review was conducted, which was followed by the design of questionnaires for household surveys, pre-testing, and execution of the survey. Most of the information provided are generated through the household surveys, which were triangulated with the FGDs, KIIs and expert's consultation workshop. Areas that required only consultation with the local government, such as to understand the institutional mechanism entirely relied upon the review of documents from the local government and interview with them. Similarly, the result on willingness to pay was derived based on the data/information collected from the household surveys. The data/information were analysed using the SPSS software (version 29), where I also applied the relevant statistical tests. The statistical results were then compared with the information received through FGD and KII wherever possible.

More specifically, to analyse the willingness to pay for improved services in the green parks, I applied the contingent valuation method, and stated preference approach (Xiong, 2018; Rahmatian, 2005). An average willingness was calculated by applying the following formula:

$$WTP \text{ Mean} = \sum_{i=1}^N WTP_i / N$$

Where N is the number of samples,  $WTP_i$  is the summation of total payments made by all the willing households. The willingness to pay for urban green parks was also analysed statistically, mainly the association with different socio-demographic variables such as occupation, education, age, ethnicity, and involvement in networks using SPSS (version 29) and Excel.

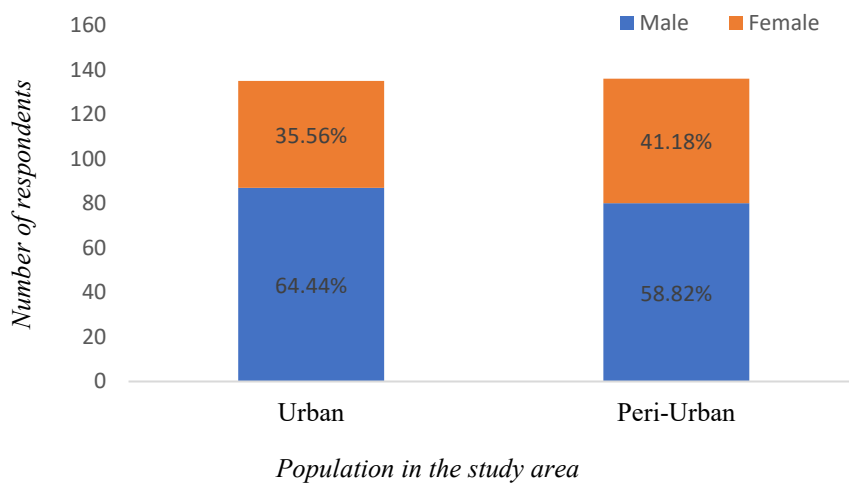
### 5.1.3. Findings

#### 5.1.3.1 Socio-demographic information about the respondents

##### Gender of the respondents

Of the total 271 households, 135 were from urban and 136 were from peri-urban settlements. Around 64% from urban areas and 59% from peri-urban areas were male respondents (Figure 11). While the average male-female ratio is 61:39, the male percentage being higher among the respondents could be, because the study was looking for the household head or the member of the household making the financial decisions. As Nepal is a patriarchal society, the major financial decisions are still made by men across the country.

*Figure 11: Male-Female population of the respondents*

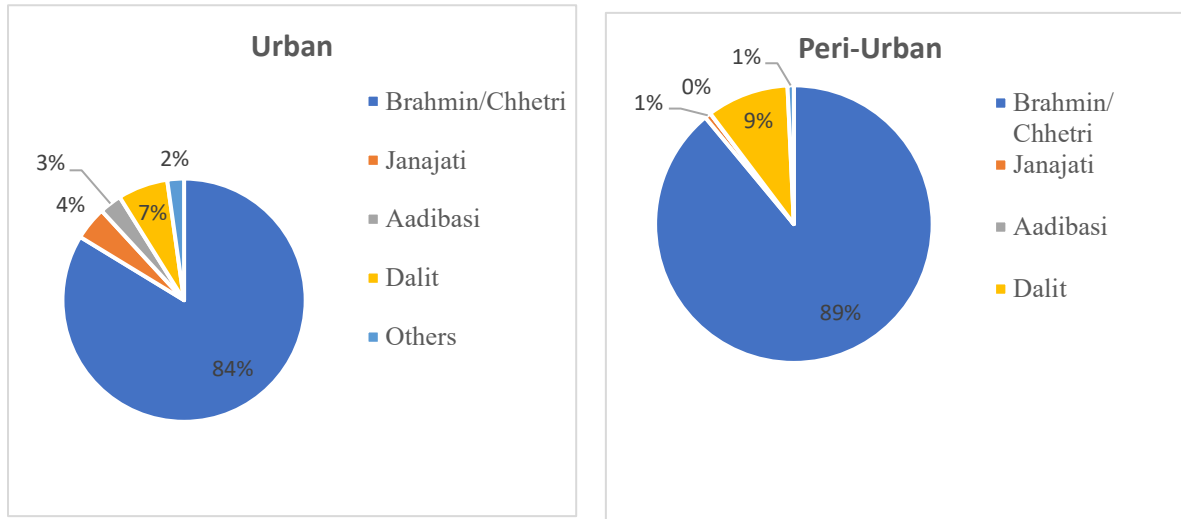


*Source: Household survey, September 2022*

##### Ethnicity of the respondents

Most of the respondents in the study area (84% in urban and 89% in peri-urban) were from Brahmin and Chhetri caste groups, which is the advantaged caste in Nepal compared to the others. This was followed by Dalits (7% in urban and 9% in peri-urban), Janajatis (4% in urban and 1% in peri-urban), Aadibasi (indigenous) including Tharu communities (3% in urban and 0% in peri-urban), and other ethnic groups (2% in urban and 1% in peri-urban) (Figure 12).

**Figure 12: Ethnic composition of the study area**

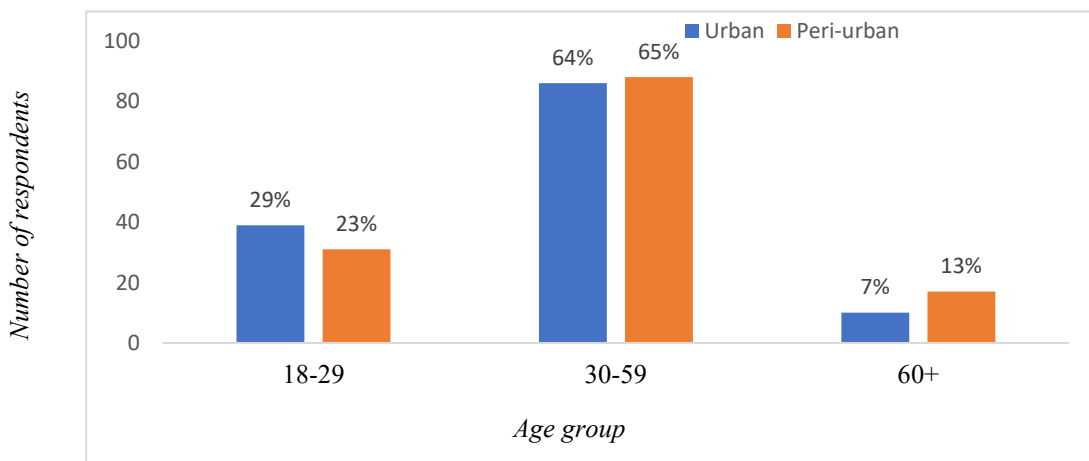


*Source: Household survey, September 2022*

**Age-group of the respondents**

The majority of the respondents (64% in urban and 65% in peri-urban) were household heads between the age group of 30-59. This was followed by the respondents between the age group of 18-29 (29% in urban and 23% in peri-urban) and above 60 years of age (7% in urban and 13% in peri-urban) (Figure 13).

**Figure 13: Age group of the respondents**

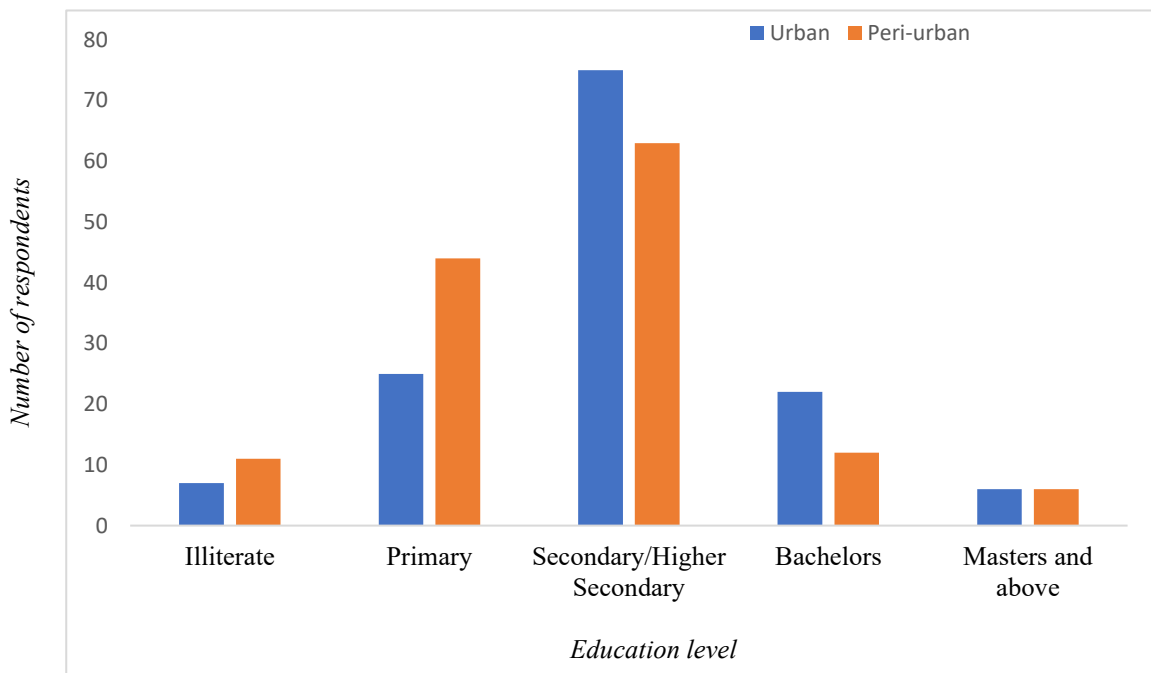


*Source: Household survey, September 2022*

### Education level of the respondents

In the study area, a higher percentage of respondents (55% in urban and 46% in peri-urban) had a high school level of education (10/10+2). The second highest was primary education, where 18% were from urban and 32% from peri-urban. Similarly, 16% of urban respondents had a bachelor's level of education while only 8% in peri-urban had this level of education. Surprisingly, a similar percentage of respondents (4% in both areas) had a master's level of education. In total, 5% of the urban and 8% of peri-urban respondents were illiterate (Figure 14).

*Figure 14: Education level of the respondents*



*Source: Household survey, September 2022*

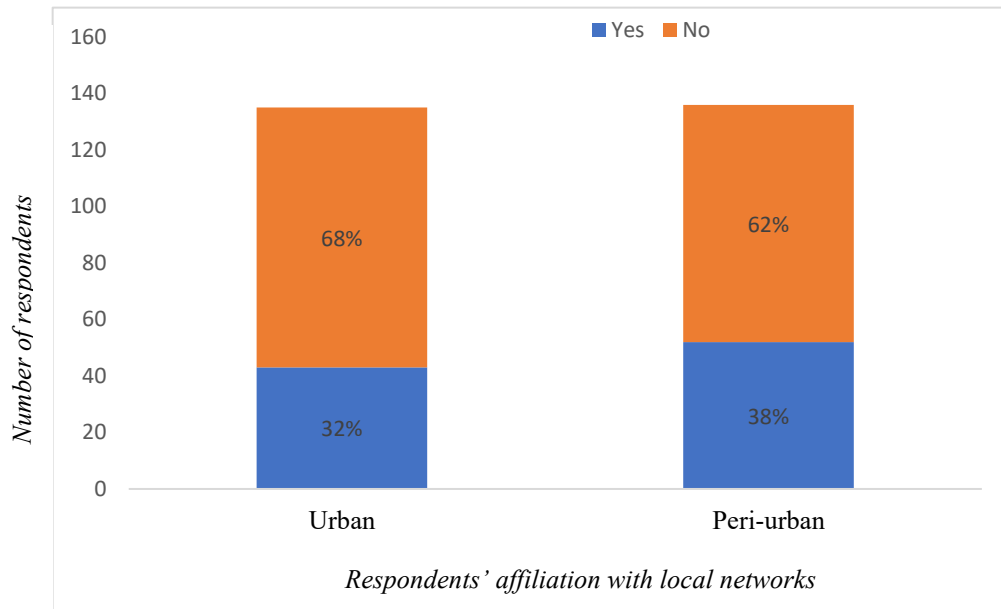
### Affiliation with the networks and associations

The association and networks of respondents were measured to understand the social bonding and their affiliations with community groups. Only 32% of respondents in urban and 38% of respondents in peri-urban had a membership with the networks and associations such as the community forest users' group, water users' group, right to food network, community disaster management community, etc. (Figure 15). While almost all the people in peri-urban settlements are associated with such groups (formal and informal) revealed through FGD, it was surprising to get the result on non-association during the household



survey. This result might have been influenced by who, in the family member, are involved in such groups. Many times, women members of the households are involved in such groups and for this study, most respondents were male.

**Figure 15: Affiliation of respondents with groups and networks**

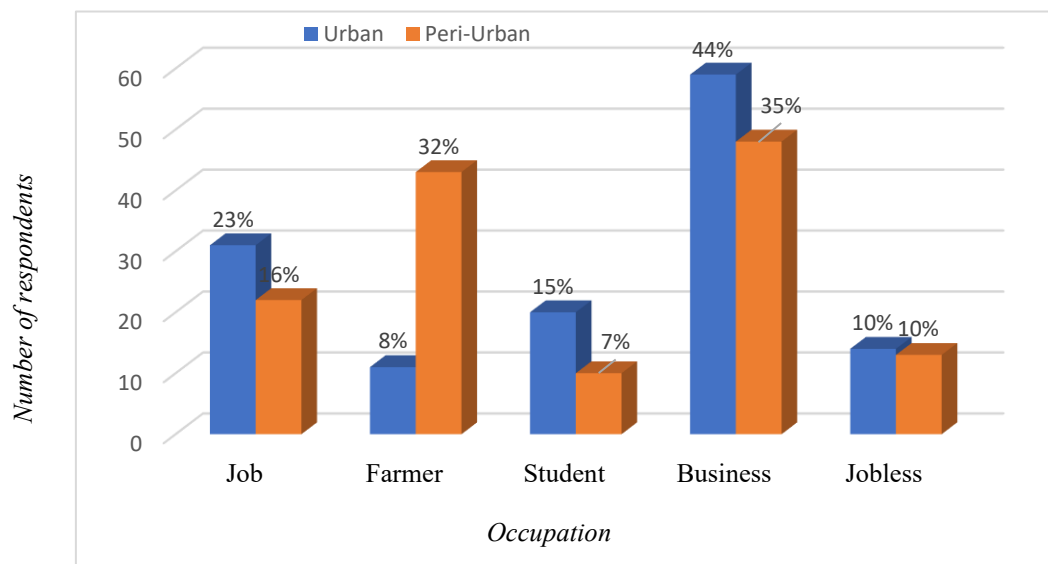


Source: Household survey, September 2022

### Occupation of the respondents

The business was the major occupation in the study area (44% in urban and 35% in peri-urban), which included small to medium enterprises. This was followed by job holders - both government and non-government (23%), students (15%), unemployed (10%) and farmers (8%) in urban areas. In the peri-urban, the business group was followed by farmers (32%), jobholders (16%), unemployed (10%) and students (7%). Even though unemployed, almost all the respondents were found to engage in farming activities, although they did not mention it specifically (Figure 16). While most of the youth population in the study area are away from home to bigger cities in Nepal or in India/Gulf countries for foreign employment, this was not reported in this survey as the household heads were interviewed and their own occupation was asked.

**Figure 16: Occupation of the respondents**



Source: Household survey, September 2022

### 5.1.3.2 Socio-economic information about the respondents

#### Average family size

Examples showing that Nepal is a highly patriarchal society can be seen even in the urban areas, especially when they are growing cities. In the study area, 86% of the respondents had male members as their household heads, while it was 88% in the peri-urban areas. The national data shows 5.5 as the average family size, which happens to be true in the study area too. Around 60% of the respondents in urban and 52% in peri-urban households have an average family size of 4-5, followed by 29% in urban and 33% in peri-urban having a family size of 6-8 (Table 4).

**Table 4: Average family size in the study area**

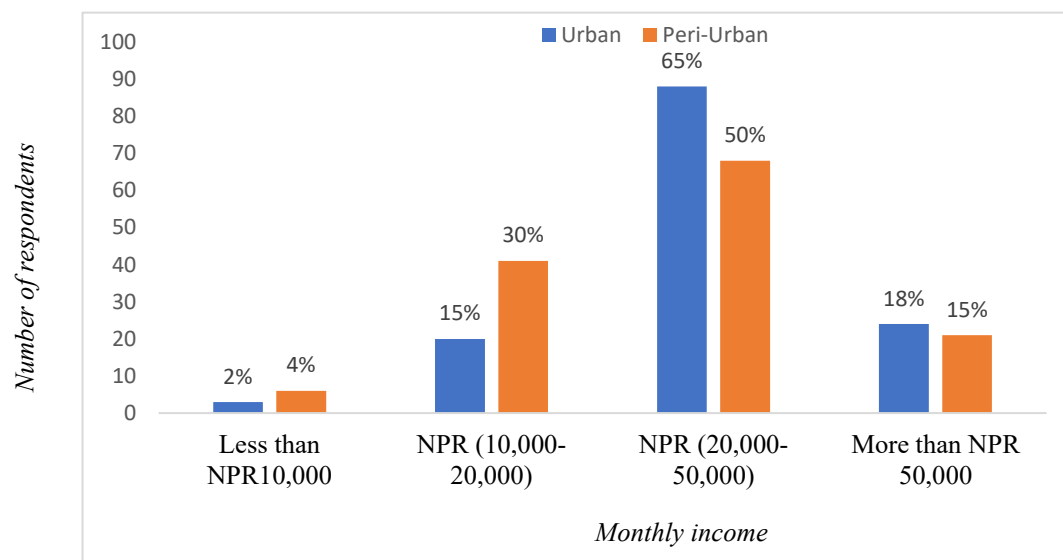
Average family size	Urban	Peri-urban
4-5	81 (60%)	71 (52%)
6-8	39 (29%)	45 (33%)
More than 8	15 (11%)	20 (8%)
Total	135 (100%)	136 (/100%)

Source: Household survey, September 2022

### Average monthly income of the households and their sources

The average monthly income of most households in the study area (65% in urban and 60% in peri-urban) have a monthly income of NPR 20,000-NPR 50,000 (EUR 151-EUR 353). In urban areas, this is followed by 18% of the households earning more than NPR 50,000 (EUR 353), 15% earning between NPR 10,000-NPR 20,000 (EUR 71-EUR 141) and 2% earning less than NPR 10,000 (EUR 71). Similarly in peri-urban areas, 15% of the population each earns more than NPR 50,000 (EUR 352), between NPR 10,000-20,000 (EUR 71-EUR 141), and 4% earn less than NPR 10,000 (>EUR 71) (Figure 17).

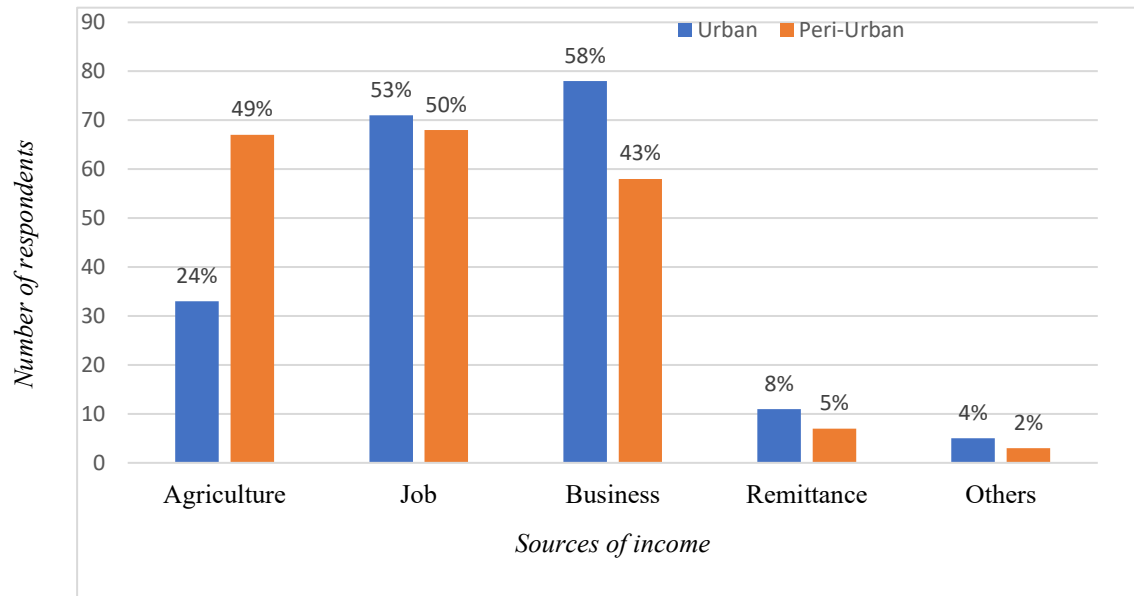
**Figure 17: Average monthly income of the households**



Source: Household survey, September 2022

The major sources of income in urban areas are business (58%), jobs (53%), agriculture (24%), remittance (8%), and other sources (4%). Similarly in peri-urban, the major source of income is job (50%), followed by agriculture (49%), business (43%), remittance (5%) and others (2%) (Figure 18). Businesses in the study area include small and medium-scale businesses, cloth shops, shops of utensils, etc. remittance includes the income sent by the household members mainly working in India and Gulf countries.

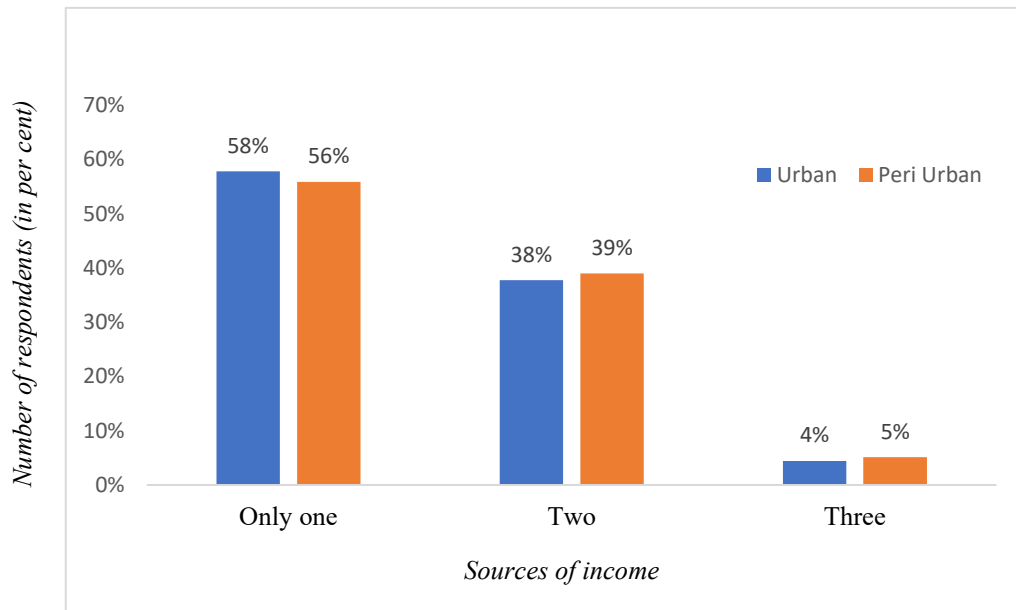
**Figure 18: Sources of income of the respondents**



Source: Household survey, September 2022

The households were, however, not fully dependent upon only one source of income, despite the majority having only one source (58% in urban and 56% in peri-urban). In total, 38% of respondents in urban and 39% in peri-urban settlements had two sources of income (Figure 19). Similarly, 4% and 5% of respondents in urban and peri-urban respectively had three and more sources of income. Households with multiple incomes are those who have either more than one family member earning, or the same members engaged in multiple activities part-time, such as farming, business, etc.

**Figure 19: Households with multiple sources of income**

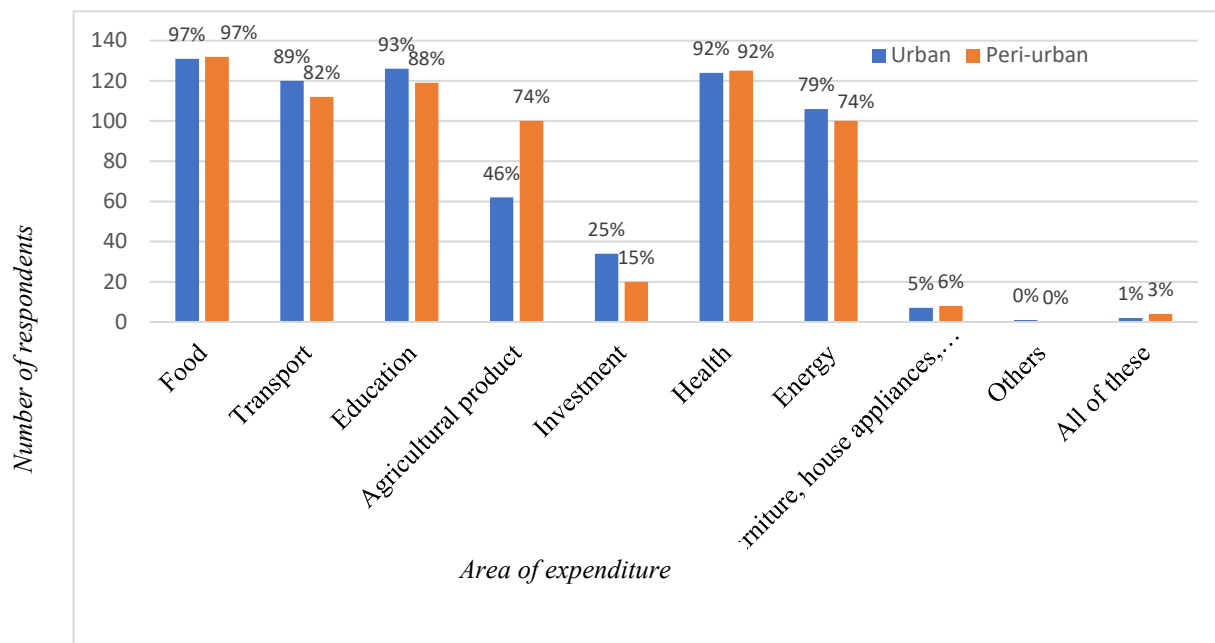


*Source: Household survey, September 2022*

### **Area of expenditure by the households in the study area**

The major areas of expenditure are food, transport, education, agriculture, investment, health, energy, and household appliances. Almost all the households spend money on food (97% each in urban and peri-urban). The remaining 3% did not say they spend on food as they grow their own food. The next highest area of expenditure is health (92%), followed by expenditure in education (93%), transportation (89%), and energy (79%) in urban areas. Compared to people in urban areas, people spend slightly less on education in peri-urban (by 5%), transportation (by 7% and energy (by 5%); while they spend more on agricultural products i.e., 74% compared to 46% in urban areas (Figure 20). Comparatively, there is more expenditure on agriculture in peri-urban because it comprises more agricultural land, it is linked with the rural area where most of the food is produced, and this serves as an intermediary area between urban and rural. Around 98% of the urban respondents expressed that they have a bank account in their own name, while the percentage was slightly lower (78%) in the peri-urban areas.

**Figure 20: Area of expenditure by the respondents**



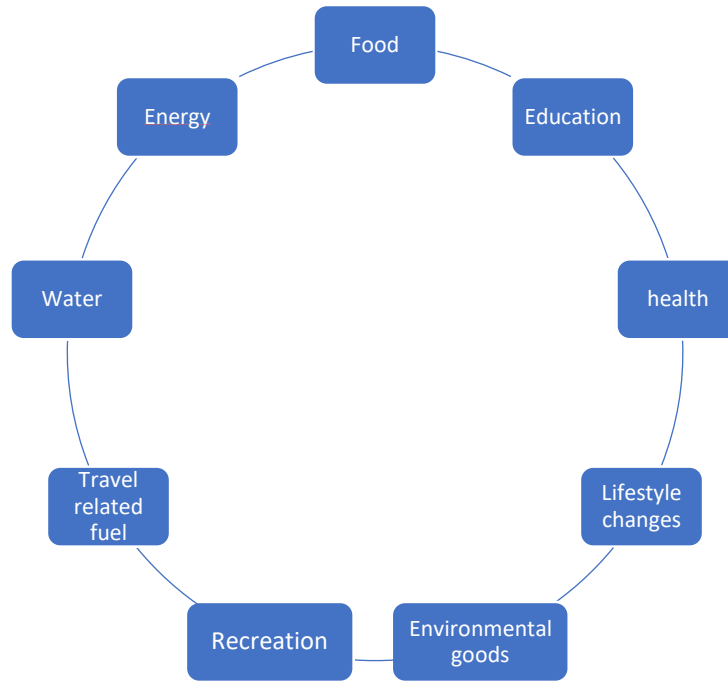
Source: Household survey, September 2022

### 5.1.3.3 Major household consumption sectors in the study area

The major areas of consumption by the individual household are food, energy, water, education, health, lifestyle changes, recreational services, environmental goods (such as forest goods), etc. (Figure 21). While the consumption associated with the lifestyle changes, use of recreational facilities and use of environmental goods were challenging to explore as an area of consumption, they were identified upon probing multiple times and providing explanations. Although the study principally focused on food, mobility, and urban green parks, all the major areas of consumption were initially explored.

The areas of household consumption are diverse, and therefore the researchers in the past have also researched in multiple areas, as identified above. Food consumption is one of the most common areas of research, where various dimensions associated with food consumption have been explored. For example, Gerbens-Leenes and Nonhebel (2002) studied the relationship between food consumption and the demand for agricultural land; Hasegawa et al. (2014) explored how adaptation to climate change is seen in the food consumption sector. Springman et al. (2016) investigated how dietary changes influence health and climate change co-benefits, and Simpson and Jewitt (2019) critically analysed the development of the WEF nexus as a framework for achieving resource security in various literature.

**Figure 21: Areas of consumption in the study area**



*Source: Household survey, September 2022*

The area of energy consumption has been equally explored in developing and developed countries. Malla (2022) assessed energy access and poverty in Nepal to see the relationship between consumption patterns and their environmental implications, which was also highlighted in the study area. Caeiro, Ramos and Huisinigh (2012) also agreed that most of the previous research focused on areas such as energy and waste. Amachher et al. (2007) studied joint production, and consumption of fuelwood and crop residuals in traditional households in Nepal. Liu et al. (2016) attempted to analyse from the perspective of green product availability and pattern of consumption, thereby exemplifying areas of innovation in consumption sectors such as food, energy, and mobility. Similarly, Groulx et al. (2017) assessed the relationship between consumer behaviour and adaptation planning in the face of changing climate and their impacts on the protected area in Canada, which is one of the indicators regarding people’s choice of visiting the park for recreation.

Regarding the use of recreational services mainly the urban green parks, Sahakian and Anantharaman (2020) argued that ‘Going to Parks’ should be considered as an area of consumption as it satisfies the needs of people. Jaung et al. (2022) in their study further

proposed that urban nature contributes as a nature-based approach to encouraging sustainable consumption and claimed that such relational value promotes pro-environmental behaviour by individuals. Lee and Kim (2015) in their study to check the attitudes of citizens towards urban parks for urban sustainability in the case of Gyeongsan City in the Republic of Korea, investigated various factors that influenced individuals' decisions to visit parks and reasons that deterred them from doing so. The common reason they found for people to visit parks is relaxation and walking, while the reason for not wanting to visit parks was improper park management. This way, recreational activities can be considered an area of consumption.

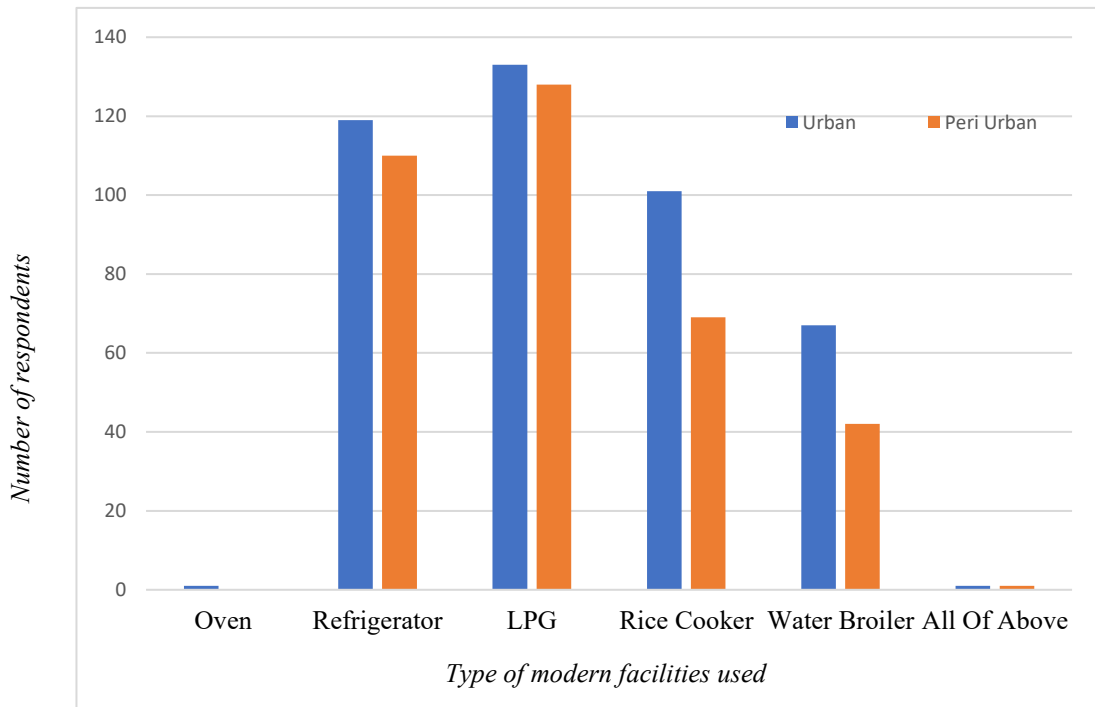
### **Use of modern facilities at the household**

This section of the chapter presents findings on the use of modern facilities within the three areas of consumption: food, mobility, and recreation. For food consumption, modern facilities include the use of appliances such as ovens, refrigerators, rice cookers, LPG gas, and water boilers. For transportation, use of bicycles, tricycles, rickshaws, public transport, etc. is considered traditional; while the use of cars, planes (where available), and motorcycles is considered modern. Similarly, for recreation, use of sophisticated/modern appliances, visit to the gyms, and owning modern equipment to exercise are considered modern. Visiting parks, open and green spaces for recreation, strengthening social capital and weight loss are still considered traditional.

From the total of 271 HHs interviewed, all the respondent households were found to use at least one modern facility in terms of food consumption. Within food consumption, people used ovens, refrigerators, rice cookers, LPG gas, water boilers, etc. Around 46% of the respondents in urban areas used 4 different kinds of modern facilities in terms of food consumption. Similarly, both in urban and peri-urban settlements, 28-32% of the households used at least three such facilities (Figure 22, Figure 23).



**Figure 22: Modern facilities used under food consumption**



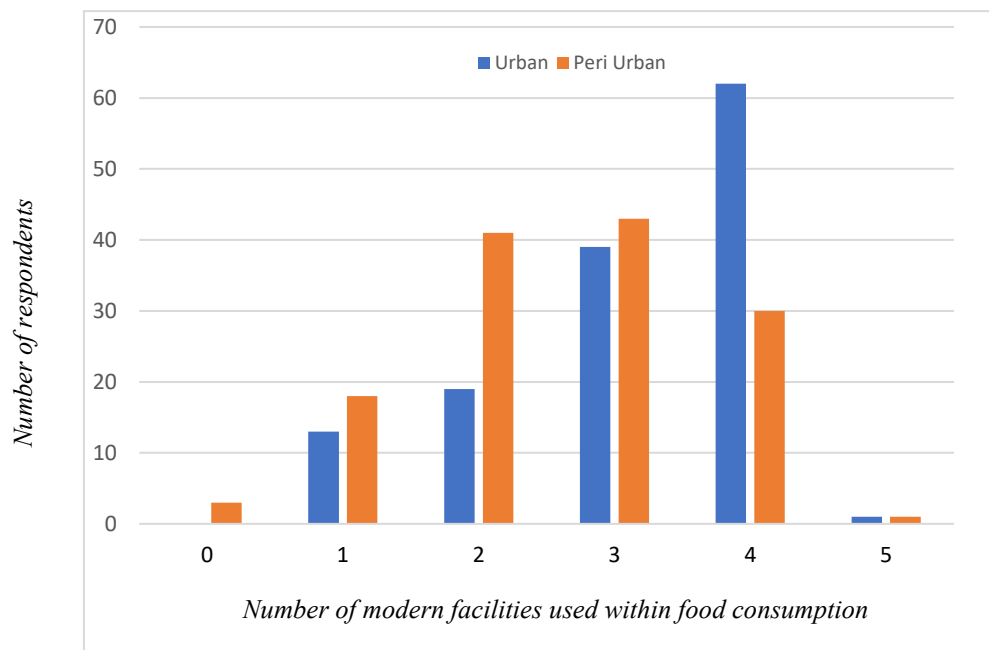
Source: Household survey, September 2022

Modernisation in food systems production, processing and consumption has gained interest in recent years. Green and Foster (2005) took the example of frozen peas to understand how modern the food system in the UK is. Baltruszewicz et al. (2021) through their study in Nepal, Vietnam and Zambia made an interesting conclusion that sustainable way of consumption does not require higher investment. Instead, richer households use less household energy as they move from the use of inefficient and traditional biomass-based fuels to modern ones such as gas and electricity.

The use of modern facilities in food consumption in developed and developing countries, however, differs largely. Developed countries such as the Europeans have bigger and more modern facilities such as commercial malls, chains of supermarkets and multiple choices of products/outlets available (Gracia and Albisu, 2001), which determines individual decisions on the choice of food. The uses of modern facilities are equally increasing in developing countries such as South Asia and Africa. This study is in line with the studies conducted in the urban centres of other developing countries. For example, A study conducted by Khonje and Qaim (2019) in urban Zambia indicates that the food environments in Africa are fast changing and the use of modern retailers such as

supermarkets, hypermarkets, and fast-food restaurants are increasing. Of which, the richer households are more likely to use such facilities compared to the rural ones. On the contrary, another study conducted in South Asia by Atanasova et al. (2022) concluded that fast-food outlets hugely influenced obesity mainly among female and poorer households, especially in Bangladesh and Sri Lanka. While this study was mainly focused on the use of modern household appliances for cooking and food storage, some of the findings were not comparable with the findings of the above-mentioned research.

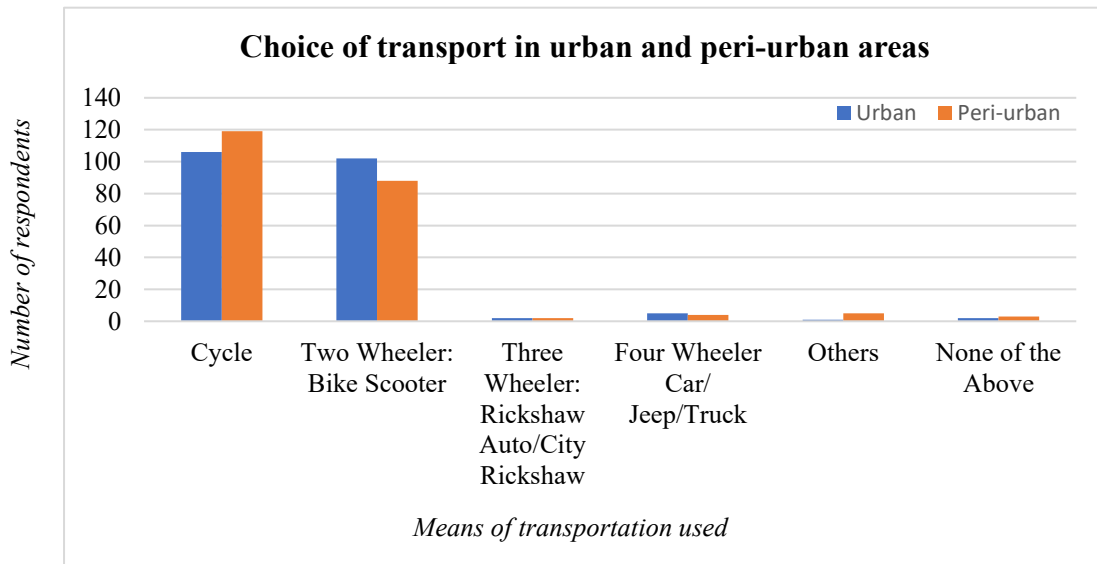
**Figure 23: Multiple modern facilities used**



Source: Household survey, September 2022

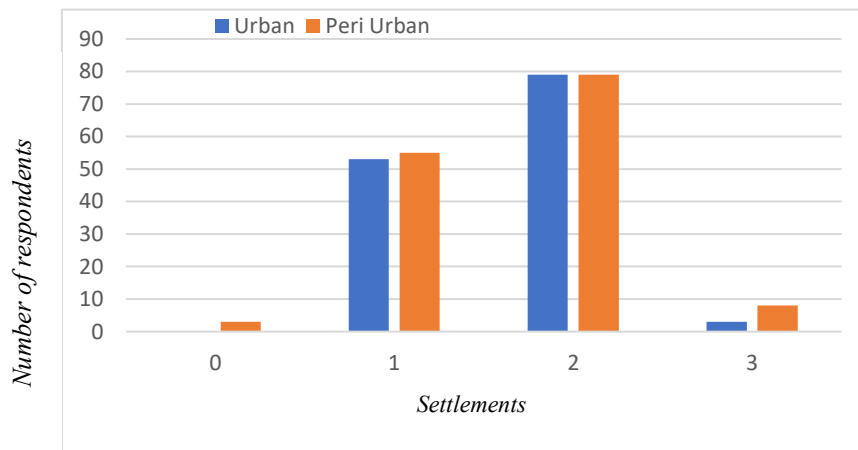
**Regarding the choice of mobility/means of transportation,** people used bicycles/tricycles, motorcycles/scooters, three-wheelers, Jeep/trucks, etc. The majority of households in urban and peri-urban (58%) had at least two means of transportation and made use of those as much as possible. 64% of the respondents in the urban areas said they prefer to walk if the destination is nearby, compared to 54% who stated their preference to walk in peri-urban areas (Figure 24, Figure 25).

**Figure 24: Choice of transport service in urban and peri-urban areas**



Source: Household survey, September 2022

**Figure 25: Multiple modes of transportation used**



Source: Household survey, September 2022

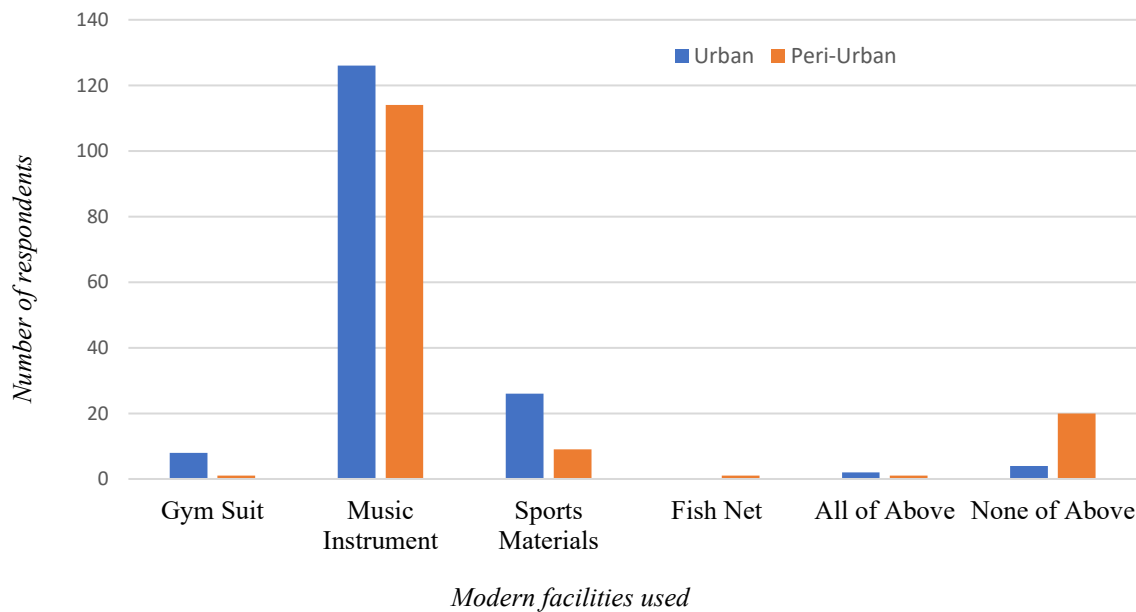
Faye et al. (2004) conducted a study regarding the structural challenges faced by landlocked countries including the mobility-related challenges. Our study identified fuel-consuming motorised vehicles as modern compared to those that do not consume fuel. Due to its topographical challenges, only limited parts of Nepal can promote zero-energy vehicles such as bicycles. This too, largely depends on the favourable policy environment, assured safety by the government, and the availability of appropriate lanes to operate such vehicles. This study complements the findings of Sohail, Maunder and Cavill (2006), who through their study in Sri Lanka, Pakistan and Tanzania concluded that public transportation could

be one of the most sustainable ways for mass transportation if operated well and the needs of all stakeholders including the low-income groups are catered.

In most cases, the public transportation in these countries is operated by small to medium-scale private sector entities who frequently function on their own terms and conditions. The findings from this study are partly in line with Ahmad and de Oliveira (2016) from India who concluded that the bigger cities with dense populations cannot cater for the zero energy transport facilities that require appropriate policy changes and infrastructures. As Bheemdatt is not a big city and still has land availability, there is a possibility to promote newer transportation facilities.

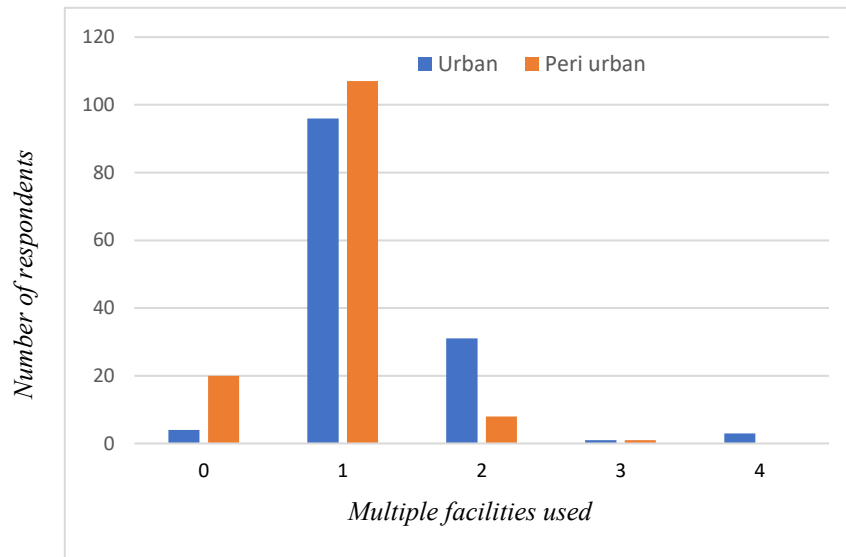
**For recreational activities,** people mainly used musical instruments both in urban (93%) and peri-urban (83%) settlements. In addition, 19% of respondents in urban areas and 6% in peri-urban also use sports; and 5% of urban respondents use gym facilities. In peri-urban areas, the study also found that 15% of the respondents do not use any modern facilities for recreational activities (Figure 26, Figure 27).

**Figure 26: Type of modern facilities used for recreation**



Source: Household survey, September 2022

**Figure 27: Use of multiple facilities for recreation**



*Source: Household survey, September 2022*

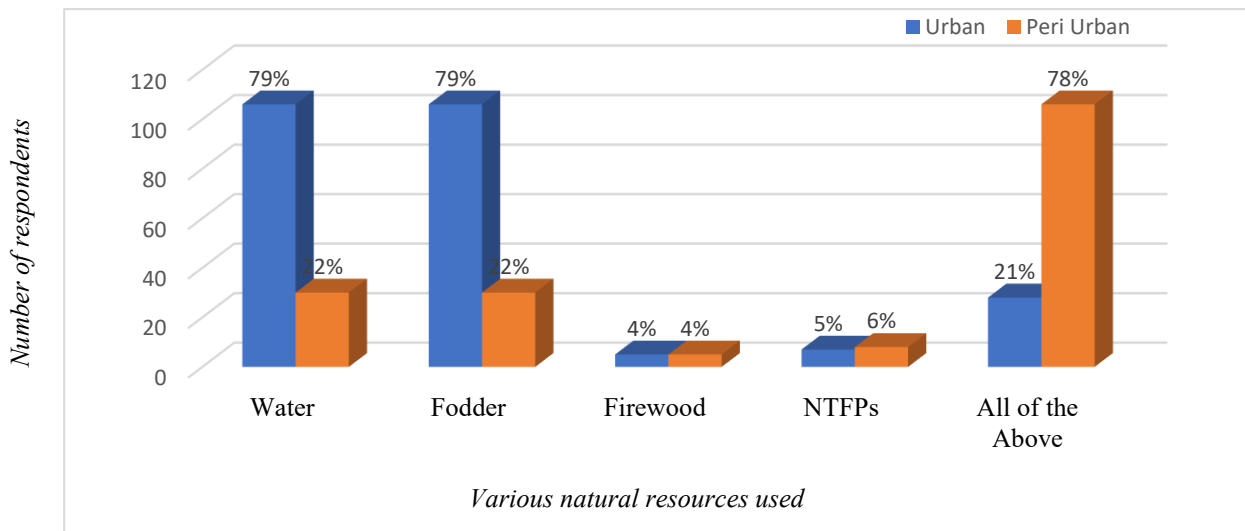
Recreation can take place in many forms and vary differently in developing and developed countries. Some of the studies in developed countries show that the use of urban green parks is increasing such as in Norway, mainly after COVID-19 (Venter et al., 2021). In my study area, the uses of musical instruments and events were found to be the most reported form of urban facility for recreation, which includes religious events too. In developing countries, another common form of recreation reported is the visit to urban green parks, protected areas, management of lakes, etc. wherever available (Lee and Kim, 2015; Baltruszewicz et al., 2021; Subedi et al., 2021), as they are cheaper. However, the use of parks was not considered a modern form of recreational activity in this study.

#### **5.1.3.4 Trend of resource consumption pattern over time**

Although Bheemdatt is one of the oldest cities in Nepal, it was less developed and less populated until very recently. Inhabitants were hugely dependent upon natural resources for their daily needs, as it is close to forest resources. This research explored if they are still dependent upon natural resources. The main natural resources/environmental goods and services used by the respondents include water, fodder, firewood, and Non-Timber Forest Products (NTFPs) (Figure 28). Around 80% of the urban population use mainly water and/or fodder from nature, while 78% of the peri-urban population use all forms of natural

sources. Most of the respondents (99% in urban and 96% in peri-urban) have expressed that the natural resource consumption pattern has changed significantly over time, and so has the availability of resources (Figure 28). The FGD and KII confirmed that the availability of firewood, fodder and NTFPs such as medicinal plants has reduced; and the water points have dried up in the current decade.

**Figure 28: Natural resources use in Urban and Peri-urban settlements**



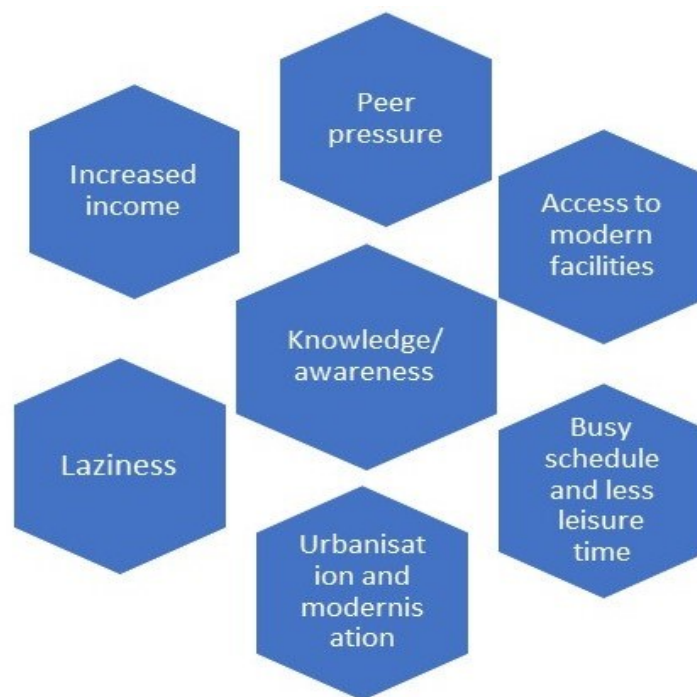
Source: Household survey, September 2022

These findings are in line with many other studies conducted globally, regarding the use of natural resources. The natural resource consumption pattern worldwide has taken a toll in the current decade and is mainly coupled with the economic performances of many nations. For instance, Zhang et al. (2020) conducted a study in China regarding the spatial pattern and temporal trend of decoupling resource consumption and environmental impact from economic growth. Gerbens-Leenes, Nonhebel and Krol (2010) compared the food consumption patterns for 57 countries and concluded that the prevailing economic development and the demand for food consumption put pressure on the limited natural resources that are available. Shao (2019) analysed the literature between 2007–2017 on the consumption trend in China and noted a reduced supply of available environmental goods and services compared to the demand. While the scope of this study was not to explore the demand versus supply of natural resources, it is hard to judge if the supply is decreasing (such as for NTFPs). It could simply be that the modern society is more dependent upon the available modern facilities than natural resources.

### 5.1.3.5 Trends of household-level consumption patterns

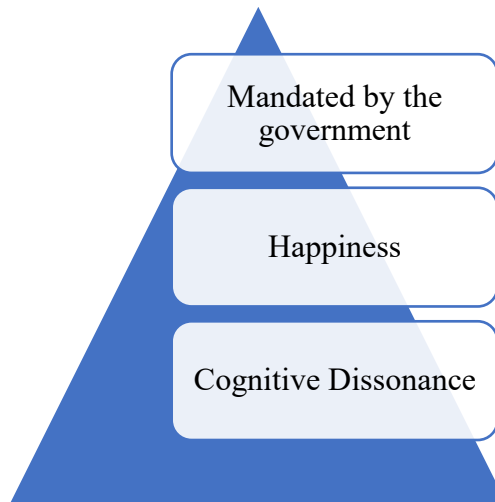
Around 99% of urban and 96% of peri-urban respondents reported that the consumption pattern in general has changed over time at the household level. The factors influencing overall consumption included (i) people’s lifestyle being more luxury-oriented, (ii) busy schedule of household members, (iii) availability of modern facilities, (iv) peer pressure, (v) increasing income, (v) laziness, and (vi) modernisation and urbanisation, in general (Figure 29, Figure 30).

*Figure 29: Factors affecting the consumption pattern in study area*



*Source: Author’s construct based on household survey and FGD*

**Figure 30: Additional factors affecting consumption pattern in other areas**



*Source: Author's construct based on literature review*

Most of these factors were also identified by the previous researchers, except for the laziness of people, which was not previously identified. Although studies in the past identified the happiness of individuals (Huang and Rust, 2011), cognitive dissonance and the mandate of the government (Hoque, 2014), as the influencing factors, this was not the case in the study area. Our findings complement the findings of Hoque (2014) and Carrero (2020) who indicated that lifestyle changes have a direct impact on sustainable consumption patterns. Hoque (2014) underwent a significant literature review to come up with a strong argument that awareness and knowledge are crucial to the adoption of sustainable practices. In their study, Lind et al. (2015) also investigated VBN Theory and found that both personal norms and situational factors determine the mode of travel chosen by an individual.

The FGDs (conducted between 21 September - 26 September 2022), and KIIs (conducted on various dates in October and November, 2023) further validated that the resource consumption pattern has largely changed in recent years (Box 1). In comparison to the previous two decades, globalisation has played an important role in consumption by households; for example, the trend of people travelling abroad has increased, the availability of digital technology has rapidly advanced, and the widespread use of social media has occurred. This might have influenced the consumption pattern.



***Box 1: Trend of changing consumption pattern in urban areas, as perceived by the locals***

There has been a huge difference in the consumption pattern between 20 years before and now. Today, modern facilities are available almost in every sector, which gives an option of luxury to people. Different varieties of food, means of transport, means of entertainment are available and people compete to use all of them as the status symbol. Earlier, people used to involve in agriculture, eat fresh organic food, travel by foot, and help each other and neighbours. In contrary, today people do not recognise their neighbours, they buy everything from the market and have started forgetting their tradition, rituals, and social barriers. Everyone has personal vehicles. They don't hesitate to spend for modern facilities and technologies.

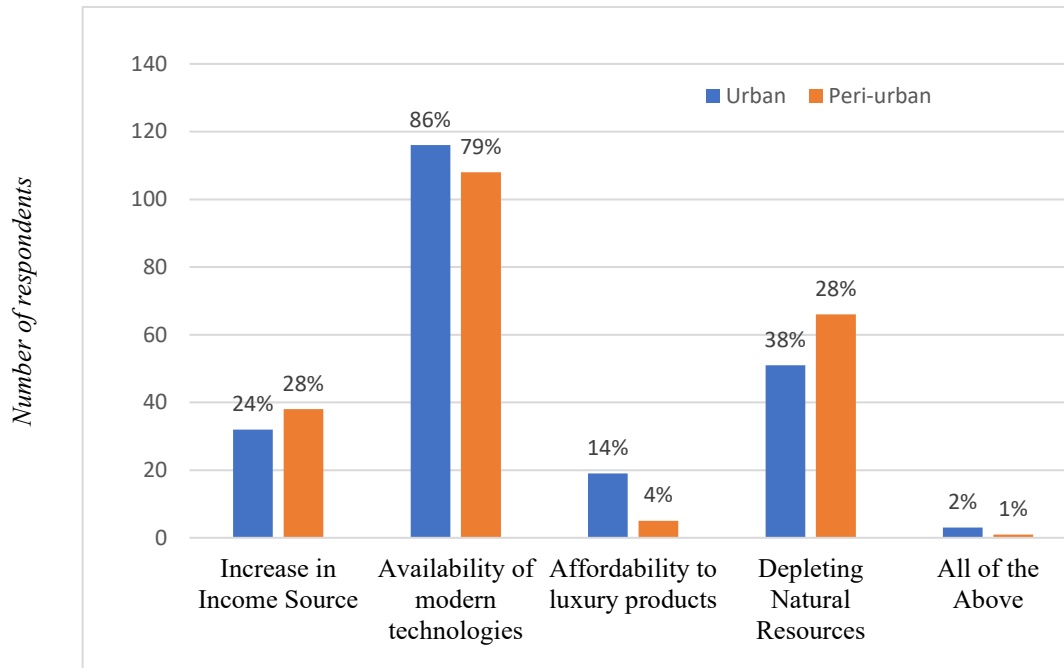
*Source: FGD, Bheemdatt-4, September 2022*

The following sections provide more specific information regarding the influential factors affecting the consumption areas that are of interest to this study: food, mobility, and recreational services.

**Food consumption**

The study identified four major factors to be the influencing factors on food consumption: increase in income sources, availability of more modern facilities, affordability of luxury products, and the depletion of natural resources. The majority of respondents (86% urban, 79% peri-urban) expressed that the availability of more modern technology and facilities in the market has influenced consumption patterns, particularly food consumption. The individuals are tempted to opt for more modern facilities, as they are available. The other reasons influencing the food consumption pattern include depleting natural resources (38% urban and 28% peri-urban) and an increase in household income sources (24% in urban, 28% in peri-urban) (Figure 31).

**Figure 31: Factors affecting changes in consumption pattern**



*Factors affecting the consumption pattern*

*Source: Household survey, September 2022*

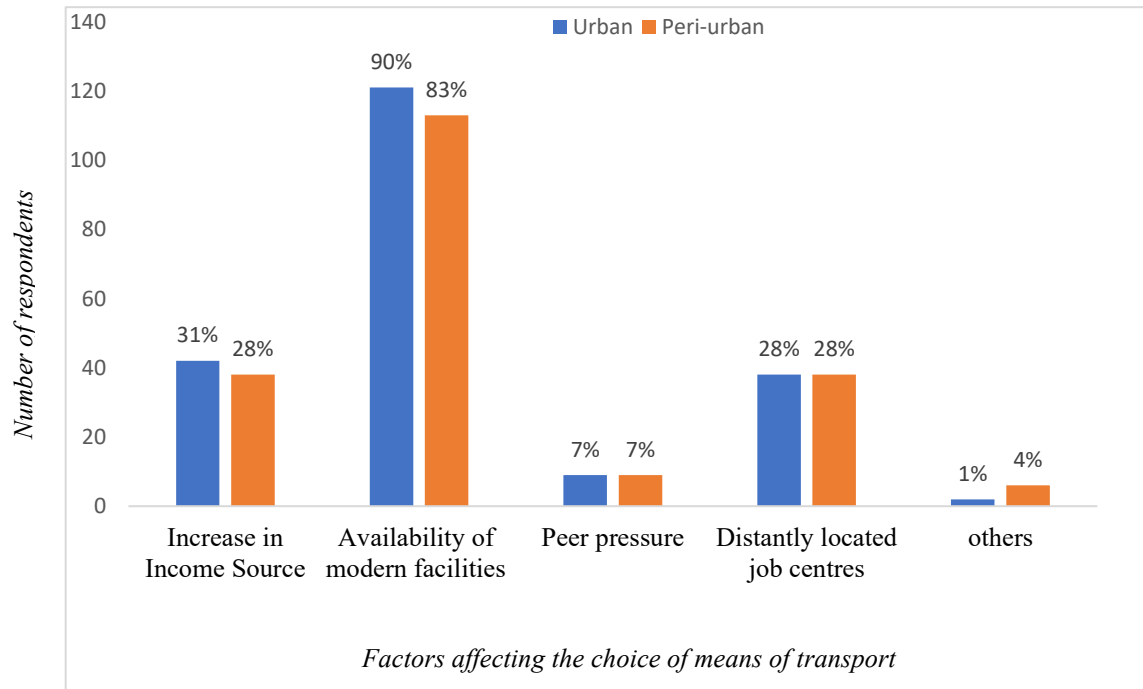
This finding is in line with the findings of many previous studies. Gerbens-Leenes and Nonhebel (2002), for example, considered changing lifestyle and the availability of modern facilities as one of the major influencing factors towards food consumption. Similarly, it also supports the findings by Huang and Rust (2011) and Liu, Oosterveer and Spaargaren (2016), who concluded that the increased food consumption by developed countries is a result of increased income and vice versa. The findings also support the report developed by UNEP where they acknowledge the intrinsic relationship between natural resources and food consumption and have recommended educational/awareness activities on the interrelationship between the two. Food is the largest area of consumption and expenditure in Nepal, and any products or services available in the market associated with food consumption draws people’s attention.

**Choice of mobility/means of transport**

Like food consumption, the availability of modern facilities was also found to be the major influencing factor for the respondents to decide on the means of transportation (90% in urban and 83% in peri-urban). The other factors were an increase in income (31% in urban

and 28% in peri-urban), distantly located jobs (28% each in urban and peri-urban), and peer pressure (7% each in urban and peri-urban settlements) (Figure 32).

**Figure 32: Factors affecting the choice of means of transport**



Source: Household survey, September 2022

These findings are slightly different compared to some of the previous findings. For example, Lind et al. (2015) found both personal norms, values and the prevailing situation to be the important factors in the choices people make for transportation. In their study, those who frequently walked and used bicycles for transportation were found to have a higher annual income when compared to those who frequently relied on private motorised travel modes. Similarly, Schneider (2013), in their study to improve the sustainable mode of transport through walking and bicycling, identified five strategies: (i) ensure awareness, (ii) maintain safety, (iii) address economic aspects, (iv) ensure recreation, and (v) encourage to make it a habit. Another study conducted by Muro-Rodríguez, Perez-Jimenez and Gutierrez-Broncano (2017) on consumer behaviour in the choice of mode of transport found payment modality as the principal influencing factor.

Since this study was conducted in far-western Nepal, where the urban centre is not densely populated, the job markets are often located at a considerable distance. This situation leaves people with little choice but to rely on the fastest available means of transportation.

Likewise, in Nepal, the population is highly community-oriented, often driven by a fear of judgment from their peers and society members. This dynamic frequently leads to situations where individuals opt for certain facilities or services without genuine necessity, affordability, or personal interest. This phenomenon aligns with Max-Neef's argument (Gasper, 2022) concerning human needs, highlighting how modern populations often exceed their fundamental requirements.

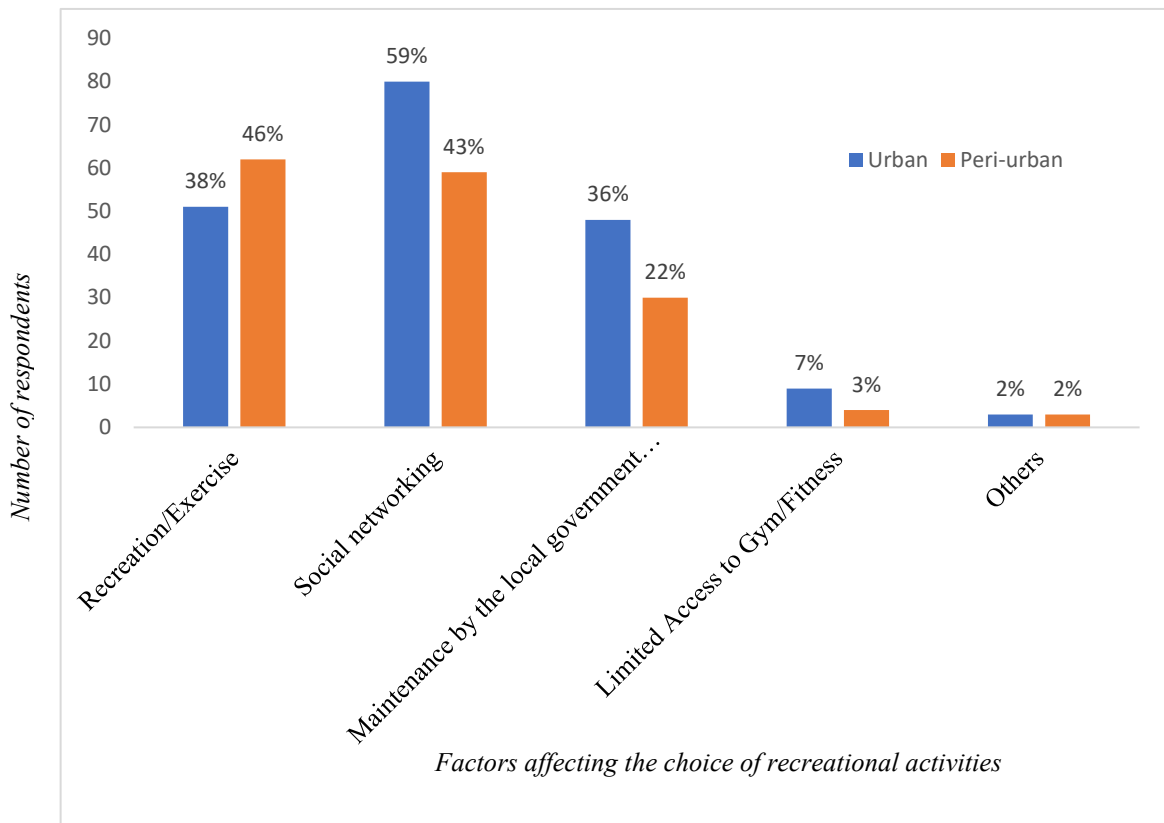
### **Choice of recreational activities**

Recreational activities have increased in recent days mainly in urban areas as life has become increasingly exhausting and busy. The major factors influencing the choice of recreational activity by individuals, and households include the desire to improve social networking (59% of respondents in urban and 43% in peri-urban), physical exercise (38% in urban and 46% in peri-urban), availability of well-maintained public places, and (36% respondents in urban and 22% in peri-urban), limited access to gym and fitness centres (7% in urban and 3% in peri-urban) (Figure 33). A small percentage of the population (2%) expressed that they use publicly available recreational activities to maintain peace of their mind and reduce stress and anxiety.

Nepalese people are social by nature and celebrate various cultural activities and functions together. These occasions serve as the major sources of recreation and entertainment for them. This study shows that social networking ranks as the top-most motive behind engaging in recreational activities. In addition, the availability of public infrastructures and parks that are well maintained and offer opportunities for physical exercise helps people make their decisions in this regard.

These findings support the findings of Poudel, Caffey and Devkota (2011) who indicated that the uses of recreation facilities are determined mainly by the environmental quality of the site, income, and travel time. However, the findings could not relate so well with one of the interesting studies conducted in Ankara, Turkey where the researchers found that the urban population tend to spend much of their time in-house and shopping malls would be the next destination if they decide to go out (Oğuz and Çakci, 2010). This is not the situation in Bheemdatt as there are very few such malls available in the closer vicinity. This can, however, be the situation in future with more rapid infrastructural development taking place.

**Figure 33: Factors affecting the choice of recreational activities**



Source: Household survey, September 2022

### 5.1.3.6 Citizen’s acceptance and commitment to choose sustainable consumption practices

#### Preference for the food consumption pattern

During the household survey, the respondents were asked about their eating habits and patterns, such as preferring restaurant food, growing and cooking their food at home, eating organic products, etc. The survey found that 78% of the urban respondents prefer eating outside (restaurant food) if possible, while only 32% of peri-urban respondents prefer outside food (Table 5). The preference to eat outside over cooking and eating at home is attributed to enhanced taste (as reported by 53% of urban and 46% of peri-urban respondents), time-saving convenience, and the associated sense of joy.

**Table 5: Preference for restaurant food**

Frequency of Eating outside	Never	Occasionally	Everyday	Most of the time
Urban	34 (25%)	72 (53%)	0 (0%)	23 (17%)
Peri Urban	54 (40%)	74 (54%)	1 (1%)	7 (5%)

*Source: Household survey, September 2022*

While the preference does not automatically lead to the practice, the respondents were asked about their practice of eating outside. Around 40% of the respondents in peri-urban compared to 25% of urban respondents never eat outside, while an identical percentage (53% in urban and 54% in peri-urban) of respondents eat outside occasionally (Table 6).

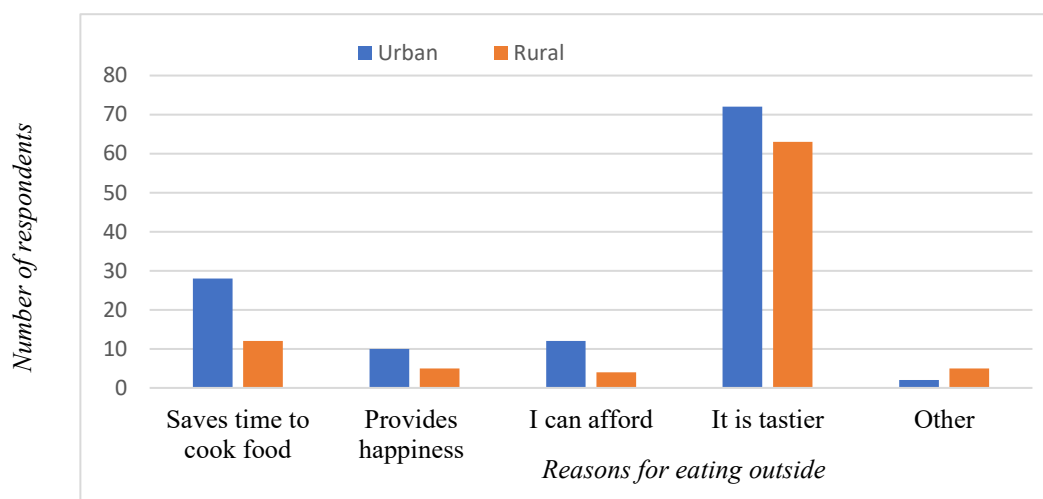
**Table 6: Frequency of eating outside**

Preference for restaurant food	Yes	No
Urban	92 (78%)	76 (82%)
Peri-urban	43 (32%)	60 (44%)
Total	135	136

*Source: Household survey, September 2022*

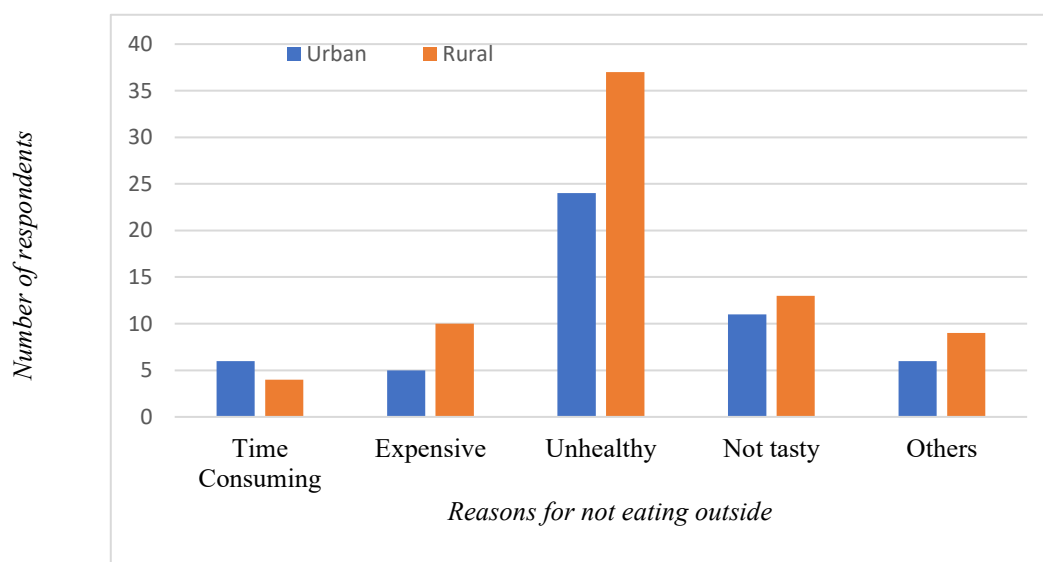
Among those who preferred not eating outside responded that the food outside is not tasty (55% of respondents in urban and 61% in peri-urban). The other reasons for not preferring to eat outside are: it is time-consuming, expensive, and other reasons that were not disclosed (Figure 34; Figure 35).

**Figure 34: Reasons for preferring to eat outside**



Source: Household survey, September 2022

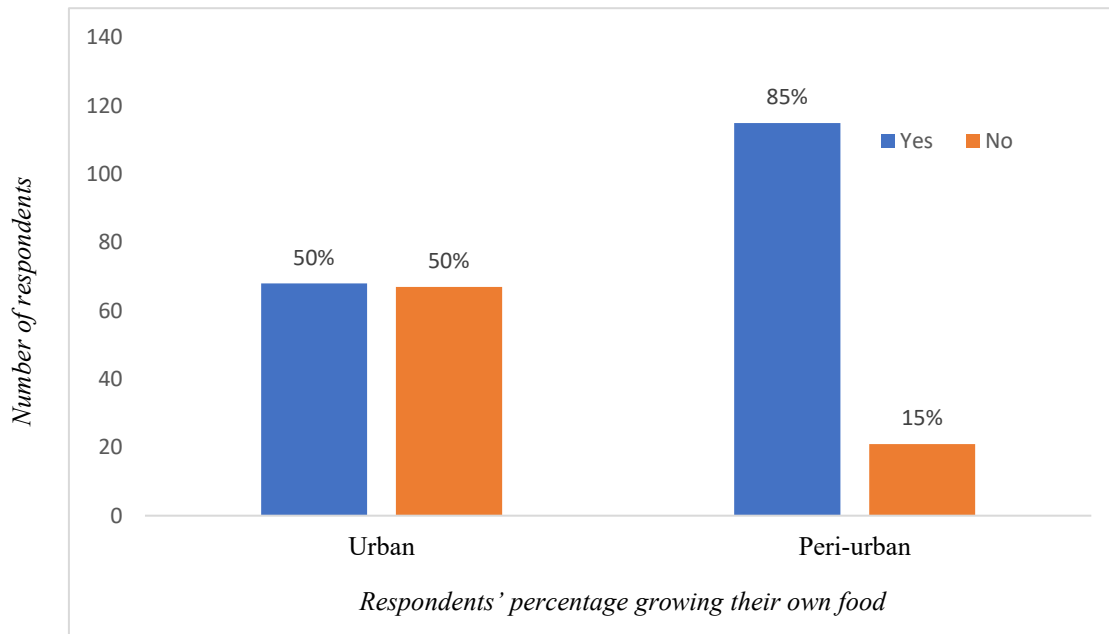
**Figure 35: Reasons for preferring not to eat outside**



Source: Household survey, September 2022

Of the total respondents, 50% of urban households grow their food, whereas 85% of peri-urban households grow food. When asked about those who grow their food, they were mainly found to produce green vegetables, food and staple crops. Around 61% of the households in peri-urban were found to produce all these three types of production (Figure 36).

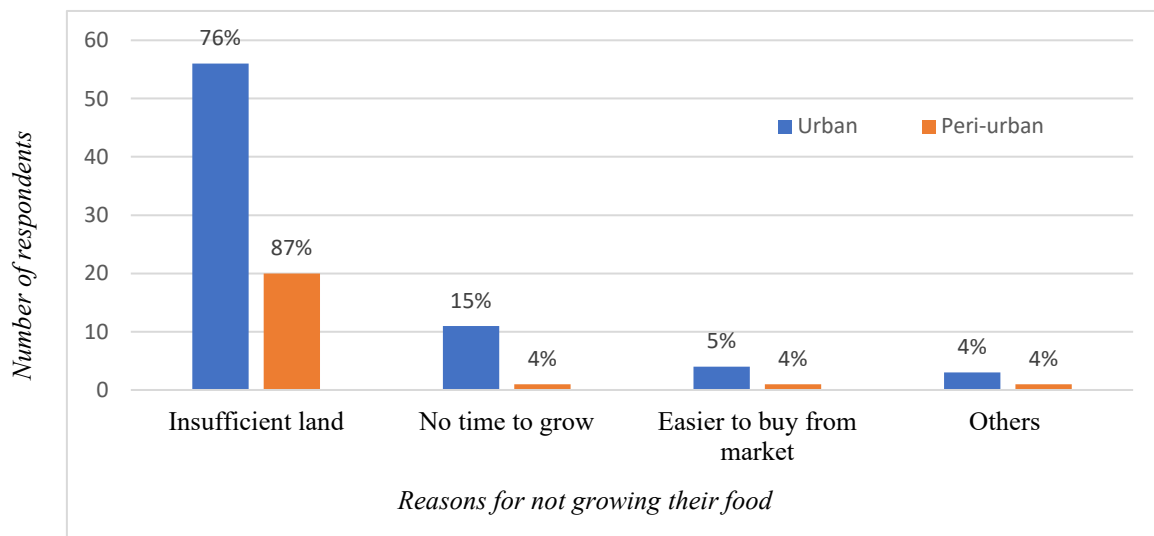
**Figure 36: Statistics on growing own food by the respondents**



Source: Household survey, September 2022

Respondents who did not grow their own food had either insufficient land (76% in urban and 87% in peri-urban), had no time to grow food (15% in urban and 4% in rural), or it was easier for them to buy from the market (Figure 37).

**Figure 37: Reasons for not growing their own food by the respondents**



Source: Household survey, September 2022



Urban centres in Nepal are mainly the jungle of brown infrastructures and are centralised in terms of services (including health and education), markets and facilities. As such, the available land is used mainly for buildings leaving less land for food production. This study did not assess the urban poverty level and therefore, having less land by the responders does not necessarily mean that they are poor. It can also mean that the responders came to urban areas only for income generation and vice versa.

Previous studies have explored multiple reasons for improving urban agriculture, such as reducing urban waste, improving urban biodiversity and air quality, and reducing the environmental impact related to both food transport and storage (Orsini et al., 2013). Knowledge of the population about such co-benefits could also be the reason for practising and non-practising urban agriculture or simply producing their food, which was however not reported in our study. Bista, Joshi and Yadav (2022) in their study in Bheemdatt confirm that the practice of home gardens and the species diversity in the gardens depend upon the education level, farming history of the household and gender. They found that female household heads are more attracted towards maintaining the diversity in home gardens.

### **Preference to pay for green products**

In both the urban and peri-urban settlements, the respondents were initially asked if they knew the concept of green products. Of the total respondents in urban, 77% of respondents answered positive responses, while only 69% in peri-urban did so. The respondents were also asked about their preferences regarding purchasing green foods, use of environment-friendly modes of transport (such as electric vehicles, cycles, walking, etc.) and use of urban green parks for recreational activities.

### **Food**

Of the total respondents, 77% reported that they are aware of the concept of green products in urban areas, while it was 70% in peri-urban areas. The households were then asked what their incentive would be to buy the green products. Based on the options provided to them, the majority of the respondents (41% in urban and 33% in peri-urban areas) expressed their preference to buy the products and even pay 15% higher, if the product is organic (Table 7).

**Table 7: Preference to pay for green products**

<b>Preference to pay for such green products</b>	<b>Pay 15% more for organic</b>	<b>Buy product if subsidised</b>	<b>if the price is less than other available product</b>	<b>If I know the health and environmental benefits of the product</b>	<b>others</b>
Urban	54 (41%)	25	16	37	1
Peri urban	39 (33%)	15	29	29	6

*Source: Household survey, September 2022*

The FGD (25 September 2022, Gobariya, Bheemdatt-4) also revealed that people are willing to pay higher prices if that is affordable to them; the definition of affordable is however, quite vague as it differs from household to household. Residents in peri-urban areas specifically were found to be less aware of the benefits of green and organic products. While in urban centres, people were ready to pay the premium prices for green products if they can be assured that the available product is safe and if the government also recognizes that. At the same time, the urban population is also a mixture of populations with varying incomes, the preference to pay more for green products was not common. The majority still expressed their interest in buying such products if they were at least the same price. The problem in the study area is that all the green vegetables and food of daily use come from India at a much cheaper price, and some of the locals even reported that they exchange their produce with Indians to earn marginal benefit, which clearly shows a lack of knowledge and awareness on the green produces.

### **Statistical analysis on preference to pay for green products**

The chi-square analysis, at 95% confidence level shows that there is no association between preference for pay for green products (food) in peri-urban areas with the socio-demographic status of the respondents - gender, education level, age group, involvement in groups/networks, ethnicity, and monthly income. However, in urban areas, association with the education level ( $p= 0.045$ ,  $n=135$ ,  $df=20$ ), and income level of the respondents ( $p= 0.004$ ,  $n=135$ ,  $df=15$ ) was observed to be significant. This result might have been observed because a greater percentage of the respondents in urban areas also reported that they would buy green products if they knew about the health and environmental benefits (37 responses) and if the products were subsidised (25 responses). Similarly, more than 50% expressed their interest in buying if the product was organic.

These findings contribute to and support some of the findings of the previous research while questioning the conclusions derived by others. For example, the present findings agree to some extent with the results presented by Biswas and Roy (2015) from their study in India, who found that people's preference to buy green products was largely influenced by their culture, socio-economic background, peer-sharing, knowledge, and the price of the products. They recommended that raising awareness and disseminating knowledge about the environment as well as the health benefits of the available products can be an important way to increase the popularity of such products. This must be linked with the institutional provision of subsidies and incentives on the products. In my study, however, no such linkages with the culture were observed.

On the contrary, with a focus on the monetary aspect, a study conducted by De Medeiros et al. (2016) in Brazil presented the significant role of perceived value in shaping individuals' purchasing decisions for green products. They concluded that the people are willing to pay a 10% premium for green products, and if people value the ecological appeal, monetary value is of less significance; this is not exactly the case in Bheemdatt, as most of the decisions are linked with the monetary value in the community. A similar study conducted by Kong et al. (2014) concluded that the green corporate perception, eco-label, and green product value as perceived by the people has a positive influence on green purchase behaviour, while green advertising and packaging had no significant value. In my study area, the need to establish a clear link between awareness-raising activities and health/societal benefits of using green products was observed.

Shi and Jiang (2022) assessed the willingness to pay a premium price for green products if the reference group plays a part in that. Their study concluded that reference groups can significantly influence the larger population on their willingness to pay when it is combined with environmental awareness initiatives. This could also be relevant in the case of this study, as the role models or community can be very effective in influencing a wider targeted public. Moreover, Maros et al. (2021) from their study in Slovakia confirmed the dependency between the purchase of locally grown food and household income and concluded that the constant awareness raising to reduce food waste initiatives, focusing on new habits integrated into the lifestyle is vital.

### **Preferences to use environmentally friendly mobility choices**

The means of transportation chosen by the respondents differ significantly in recent years compared to the past, as shared by the respondents. The FGD (25 September 2023, Gobariya, Bheemdatt-4) revealed that people in peri-urban areas walk and use bicycles to nearby locations compared to the urban population. This behaviour can be attributed to factors such as reduced traffic congestion, lower pollution levels, and the presence of more open spaces and agricultural fields in peri-urban environments. Simultaneously, there is a growing trend where nearly every household possesses at least one motorbike, primarily utilised by the youth. This surge can be attributed to peer pressure and the wide availability of diverse motorbike models in both the Nepalese and Indian markets.

As presented earlier in this chapter, households in both the urban and peri-urban have at least two means of transportation. The electric scooter was found quite popular in the study area, as the government introduced subsidies for the electric scooter. This was, however, considered old-fashioned by the youth population owing to the model of the scooter. In order to test the association between the socio-demographic variables (education level, age, gender, occupation, involvement in networks/association) and people's belief in "being a change agent in reducing the impacts of climate change by shifting the mode of transport", I performed Man Whitney U (gender and involvement in networks/association) and Kruskal Wallis test (education, age, occupation). The statistical analysis did not show any association within the variables at a 95% confidence level.

The choice of means of mobility may differ significantly in developed and developing countries, as well as the type of community that is under research. In this study, the choice of bicycles or electric scooters as the means of transportation is not associated with their environmental value, but rather the practicalities associated with people's lifestyles. Awareness raising and behavioural change activities are, therefore, vital to encourage such means of transportation for the co-benefit humanity can harness. The situation in the developed countries can be slightly different, however. For example, in a study conducted by Tarigan (2019) in Norway, people with pro-technology attitudes supported the use of electric vehicles, if they met the expectations of people in terms of safety, cost and comfort; the cost factor being significant even in the developed country.

In some countries, people are aware of and are willing to pay higher for carbon reduction technologies, such as in Korea; but that does not apply when it comes to the use of electric vehicles for some factors such as driving range, charging stations and comparatively higher prices. The experts' consultation workshop conducted for this study also confirmed opportunities to promote sustainable modes of transportation provided the enabling environment by the government such as subsidies for electric vehicles, development of appropriate infrastructures, maintenance of greenery to encourage cycling in urban areas, etc. (Box 2).

***Box 2: Promoting sustainable mode of transportation is possible***

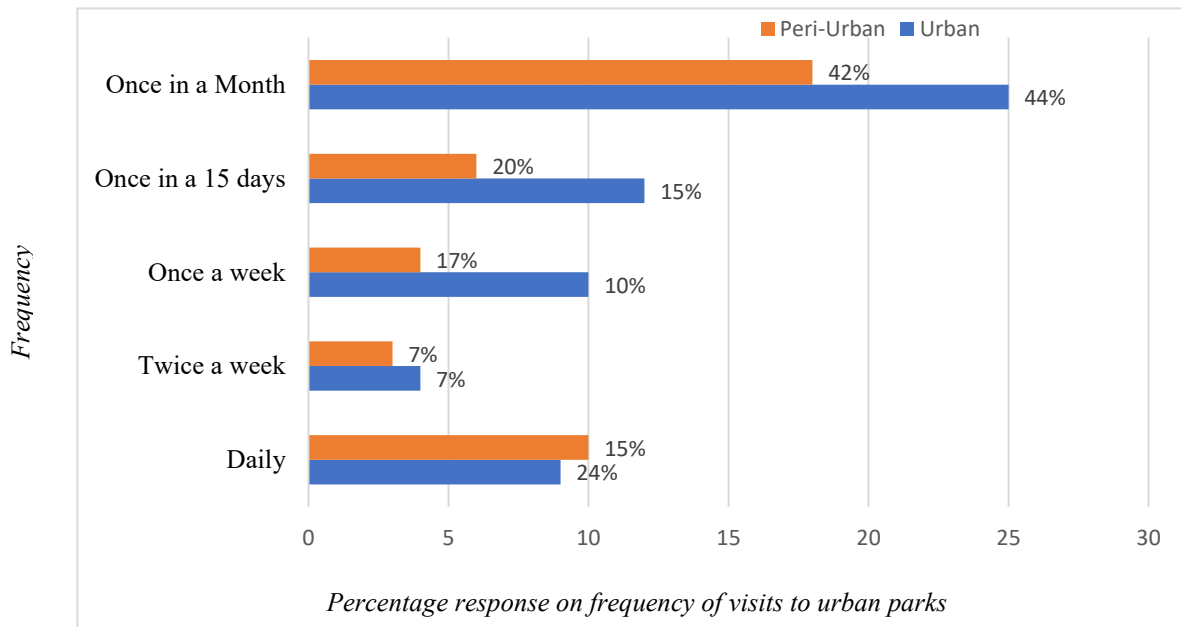
To promote sustainable mode of transportation, mass transportation/public vehicles should be promoted and managed, which also includes management of the footpath. Charging stations for the electric vehicles should be promoted and informal settlements in the public places must be managed properly. As the people are not much aware on the co-benefits of sustainable mode of transport, they should be made aware and the government should also introduce favorable schemes, and policies to encourage the public on this.

*Source: Experts Consultation Workshop, Bheemdatt Municipality, April 2023*

**Use of urban green parks as recreational services**

Of the total respondents, only 44% in urban areas reported that they are using the urban green parks for various purposes, while it was only 29% in the peri-urban areas. Of those who visited or said yes, the highest percentage in both areas (urban-44% and peri-urban-42%) visited parks only once a month, followed by once every in 15 day (urban-20%, peri-urban-15%), once a week (urban-17%, peri-urban -10%), twice a week (urban-7%, peri-urban-7%) and daily (urban-15%, peri-urban-24%) (Figure 38). The majority of the respondents (88% in urban and 99% in peri-urban) who said “No” to the use of urban green parks, gave the reason that there are no such parks near their house to visit. The experts' consultation workshop informed that many such parks are less organised and are used by drug sellers/drug addicts and therefore, less safe to use for recreational purposes.

**Figure 38: Frequency of visits to urban green parks**



*Source: Household survey, September 2022*

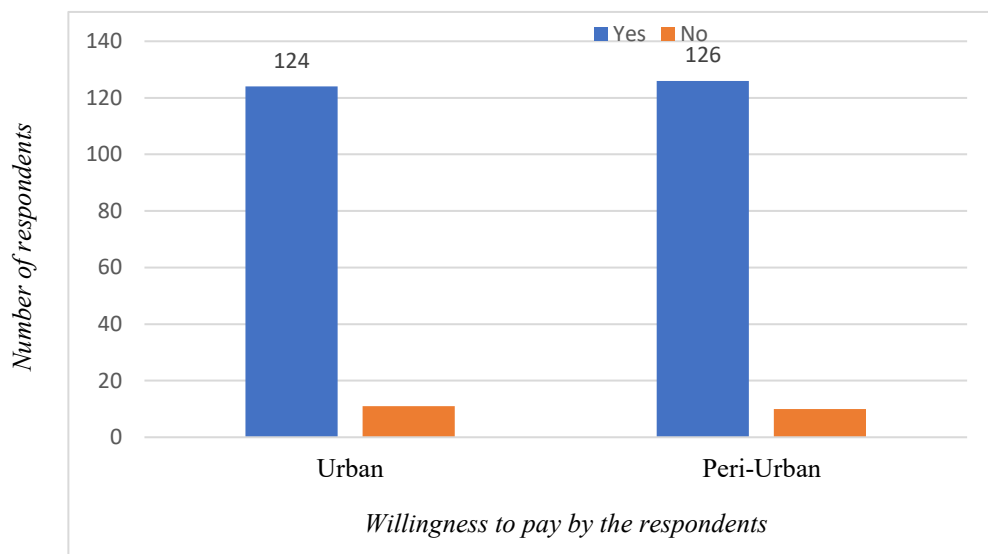
Among the respondents in urban areas, 24% of respondents visited the park daily, followed by 7% visiting twice a week, 10% once a week, 15% once in 15 days and 44% once a month. Similarly in peri-urban areas, 15% visited daily, 7% visited twice a week, 20% once in 15 days and 42% once a month. The reasons for the people to visit the park included daily exercise and walking, social networking, refreshments for the kids and elderly, etc.

These findings complement the findings from many of the previous findings saying that people visit urban green parks, especially for the aim of networking, physical workouts, attaining peace of mind, etc. The use, however, depends on multiple factors such as their maintenance, availability of other attractions in the neighbourhood such as café/restaurants, and toilets within the park (Aspinall et al., 2010). Ho et al. (2005) in their study concluded that the visit to parks largely differs from one ethnic group to the other; however, the reason for visiting the park is mainly for social reasons over solitary. The important factors for these groups to visit the parks were identified as availability of parking, litter-free facilities, instruction boards, and safety and security, which is also the finding of this study.

### Willingness to pay for improved services in urban green parks

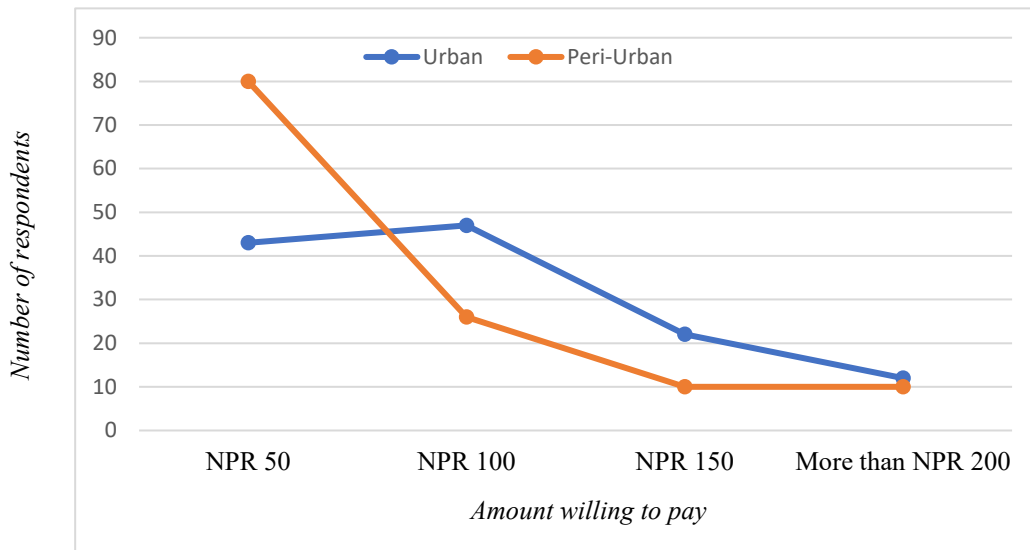
Most of the respondents (92%) in both urban and peri-urban settlements expressed interest in paying premium price for the improved parks and green open spaces in their neighbourhood. The study also found that they had a limitation on their willingness to pay. Among those who were willing to pay, the majority in urban areas were willing to pay NPR 100 (EUR 0.68) while the majority in peri-urban were willing to pay NPR 50 (EUR 0.34) for such services. The average payment roll is NPR 50 (EUR 0.34) being the lowest and NPR 150 (EUR 1) being the highest. Both in the urban and peri-urban, respondents were willing to pay more than NPR 200 (EUR 1.36) is negligible (Figure 39; Figure 40).

**Figure 39: Willingness to pay for improved urban green parks**



Source: Household survey, September 2022

**Figure 40: Amount willing to pay for improved urban green parks**



Source: Adopted from Bista, Bogati and Gruehn (2023)

The average willingness to pay was calculated to be NPR 101 (EUR 0.69) in urban settlements while it was NPR 80 (EUR 0.54) in the peri-urban.

Some of the factors that influenced the WTP include cleanliness and maintenance by the government or local clubs, facility of toilets/dustbins and playground for children, and if the park is within walking distance. The result indicates that citizens are willing to pay and therefore, the government should prioritise investments in such activities not only to enhance the quality of life of their citizens, but also to enhance the value and demand of Bheemdatt as a preferred area to live.

The chi-square test on the various socio-demographic variables shows that there is no association between people's willingness to pay and the socio-demographic status in the peri-urban areas. In urban areas however, an association between the education (p-value=0.001, n=135, df =4) level and age group in terms of willingness to pay (p-value=0.000, n=135, df =4) was observed (Table 8).



**Table 8: Association between socio-demographic variables and willingness to pay**

Socio-demographic variables	P-value (chi-square test)	
	Peri-urban	Urban
Occupation	0.386	0.266
Involvement in Networks	0.426	0.312
Education	0.110	<b>0.001</b>
Age Group	0.076	<b>0.000</b>
Gender	0.556	0.474
Ethnicity	0.720	0.856

*Source: Data analysis of household survey*

The Kruskal Wallis test, when performed within the group of various education levels regarding the visit of urban green parks, the distribution of frequency of park use is the same across categories of education level ( $p=0.219$ ,  $n=60$ ;  $df=4$ ) and age group ( $p=0.548$ ,  $n=60$ ;  $df=2$ ), shows that the frequency of visit to the parks is the same among all categories, and there is no difference.

In most cases, various factors such as age groups, educational level, employment status and income level are influential in terms of the willingness to pay for environmental services by citizens (Dinda and Ghosh, 2021). With rural areas in Nepal undergoing rapid urbanisation and experiencing the challenges posed by unplanned infrastructure development, there is a growing eagerness among people to learn about the concept of parks and open spaces. People are willing to pay for park services under the condition that these services are managed by an entity, whether it be the local government, private sector, or community groups. This management approach ensures that amenities and facilities are consistently updated, the parks are maintained in a clean state, and they continue to bring happiness to visitors.

In the study area, as well as in cities of varying sizes all over the world, including developing countries, there is a growing recognition of the importance of green spaces and parks. These areas are increasingly valued as they directly contribute to the overall quality of people's lives (Kalfas et al., 2022). The findings from this study are in line with many other similar studies across the world. The major influencing factors for this are the people's awareness and knowledge of global environmental problems and the benefits of

green spaces. Song et al. (2015) in their study in China identified the major reasons to visit urban parks to be physical exercise and leisure activities, and they concluded that income and education level are the main influencing factors, while all other factors appeared to have less significance.

Idris, Hoque and Susanto (2022) in studying WTP for the preservation of urban green space in Indonesia, showed that most of the visitors were willing to pay for the environmental preservation, which however, should be accompanied by awareness raising campaigns about the co-benefits. Some past studies have also shown that awareness of environmental preservation leads to incremental payment for the services received. For example, a study conducted by Halkos et al. (2022) concluded that visitors who have paid the entrance fee before are willing to pay more; and demographic factors such as gender, age and income influence an individual's WTP for nature conservation. Other factors such as the motivation of an individual, distance from the park and length of stay in the parks were also found to have a statistically significant effect on individuals' decisions.

Findings from this study complement the findings from other studies conducted within Nepal. Some of the examples can be presented here, such as Lamsal et al. (2016) who studied WTP for entry fees in Ghodaghodi Lake Complex, one of the Ramsar sites in Nepal, found that the natural area is visited if the natural environment is well-preserved and if the basic infrastructures are maintained. An interesting finding from their study was that younger people are more likely to visit such sites and male members of the society compared to females were more likely to visit, attributed to gender norms in the Nepalese society. This study, however, did not provide such evidence of more male members visiting the parks compared to female members.

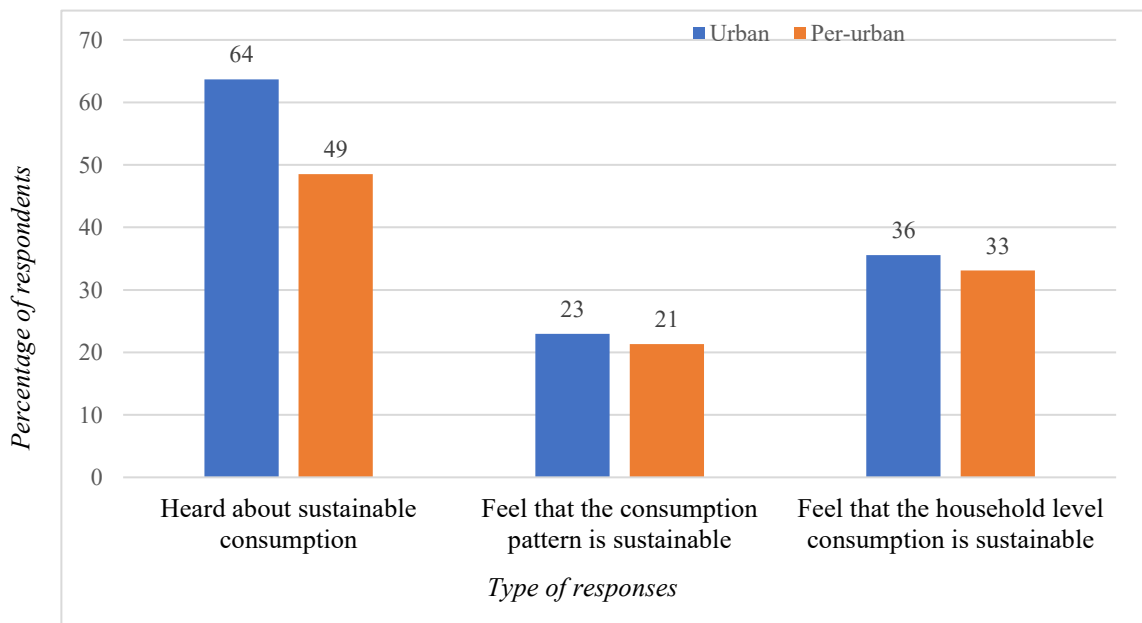
A study conducted by Pokhrel (2019) in the capital city of Nepal, Kathmandu, indicated that the city experiences high population density and lacks sufficient urban green spaces. The research highlighted that the availability of urban green spaces in Kathmandu is significantly below the global average. The WTP was much higher and influenced by different factors such as park quality, proximity to the place of residence, employment status of visitors and average stay hours in the park. As part of their study, a recommendation was made to the local government that innovative modalities to promote green spaces should be promoted in close coordination with other stakeholders such as the

private sector. In Bheemdatt, open spaces and parks were available, but they were not well-maintained. The concept of involving the private sector was not much discussed during consultations.

**Perceived knowledge of locals on sustainable consumption – in urban and peri-urban**

In order to establish a baseline on the level of understanding the citizens have, respondents were asked, during the household survey if they knew about the concept of sustainable consumption in both the urban and peri-urban settlements. From the total respondents in urban areas, 64% expressed that they have heard about the concept of sustainable consumption, while only 23% felt that the consumption pattern is sustainable at the community level and 36% felt that it is rather more sustainable at the household level. While only 49% of the peri-urban have heard about the concept, 21% felt that it is sustainable at the communal level, and 33% felt that it is rather sustainable at the household level (Figure 41). This result shows that the sustainable consumption pattern at the community level is less sustainable compared to the household level.

*Figure 41: People's perception of sustainable consumption*



*Source: Household survey, September 2022*

The FGDs confirmed that the understanding of the term “sustainable consumption” is relatively poor among the people in the study area. Similarly, the idea of sustainable consumption practices is also not widely understood at the community level, except for

community forests. Community forests, managed by the group of people in the community, are more formalised and institutionalised; therefore, they have established rules, regulations, and punishments for non-compliance. The use of natural resources provided by the community forests is more sustainable. The same is not true in the use of other resources: for example, use of common spaces, national forests, wetlands, etc. People tend to become more conscious, where they own the resources such as at the household level. The key informants also suggested that awareness, orientations, and training at various levels might enhance the understanding and adoption of sustainable consumption practices at the community level too.

Previous researchers have explored how pro-environmental behaviour determines sustainable consumption and how the policies and guidelines introduced on sustainable consumption as well as the green products/green environment influence pro-environmental behaviour. This study's findings complement the previous findings which emphasize pro-social behaviour having an influence on pro-environmental behaviour and vice-versa (Kadic-Maglajlic et al., 2019). Pro-environmental behaviour comes from the knowledge and awareness of the need for environmental protection, and loss and damage potentially caused because of the reverse situation. Often, pro-environmental behaviour is also reflected in terms of consumption of natural resources and household consumption.

Findings from this study are also in line with the findings of Haron, Paim and Yahaya (2005) from Malaysia, who concluded that most of the respondents they interviewed had knowledge of the environmental impact although they were not very familiar with the standard terminologies. Similarly, the knowledge of people was directly related to their education level i.e., the higher the knowledge and education, the higher the awareness of environmental impact and sustainable consumption. At times, this situation is not always true as highlighted by Markulla and Moisander (2012), where they found a conflicting dilemma among the citizens when they end up with unsustainable consumption while trying to boost the economy, despite being educated.

A similar finding was also presented by Thøgersen and Schrader (2012) through their findings about realising sustainable consumption knowledge into practice, where they gave examples of highly aware and educated people who did not have a smaller environmental

footprint. Therefore, it would be too early to say that the awareness would automatically result in sustainable consumption practices. A step-by-step intervention is required starting from awareness, orientation, training, policies and guidelines, and a reward system for promoting sustainable consumption practices on the ground.

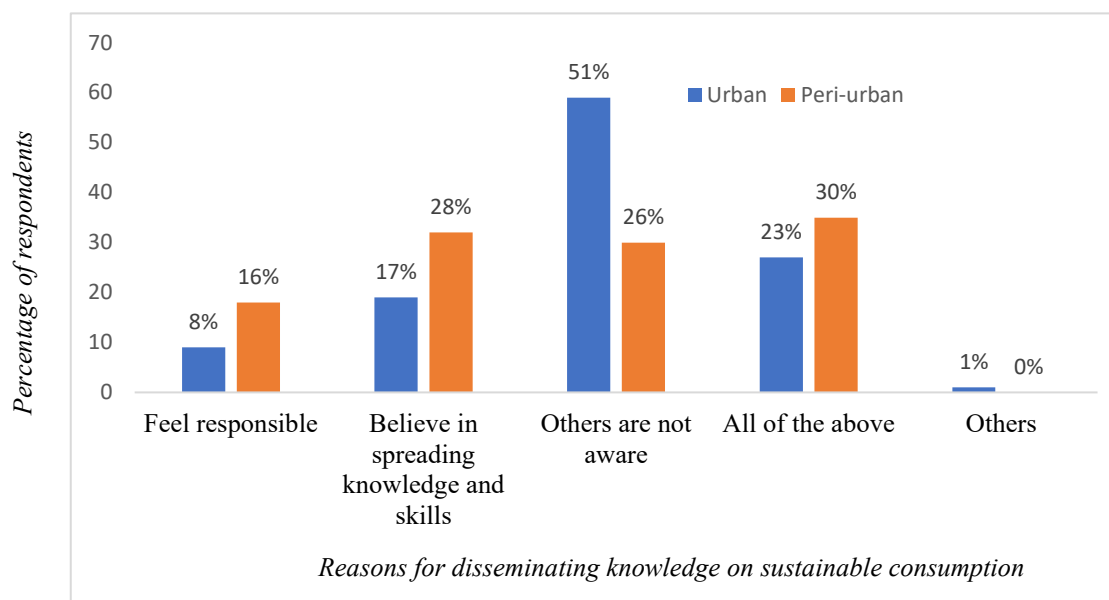
### **Peer-power for sustainable consumption**

Many studies on consumption primarily concentrate on examining how consumption patterns have evolved over time, exploring the societal-level factors that drive such changes, and investigating the individual motivations that lead to shift in consumption patterns. In countries like Nepal, where the social practices, norms and values determine the strength of social capital and communal/individual practices, influence by family members, local leaders and peers play a crucial role. This study, therefore, explored the gravity of influential activities on sustainable consumption by peers.

When inquired about the respondents' willingness to share their knowledge with their family, friends, and peers, a comparable percentage of respondents (79% in urban and 80% in peri-urban areas) expressed their readiness to disseminate the information they hold. The primary factors motivating them to do so encompass: (i) a sense of responsibility and accountability, (ii) a belief in the value of spreading knowledge and skills, (iii) recognition that others lack awareness, (iv) a combination of the aforementioned three reasons, and (v) other factors such as personal interest in enhancing one's own education (Figure 42).

The FGDs identified this as one of the most effective means to disseminate knowledge on sustainable consumption, raise awareness and help peers understand the concept. As the majority of the households are associated with one or more social groups, they participate in monthly meetings and sharing events; this provides everyone with an opportunity to share and understand new concepts in a simple language. Many times, the formal training/orientations do not provide a comfortable forum for all kinds of people (mainly the vulnerable such as women) to speak up and ask questions; thereby capacitating only those who are already smarter and more knowledgeable.

**Figure 42: Individual influencing factors to disseminate knowledge on sustainable consumption**



Source: Household survey, September 2022

There have been several studies to identify and analyse various forms of consumption patterns in urban areas, especially in developed countries. In agreement with UNEP (2015), which highlights that a push to sustainable consumption can lead to innovation and wise use of existing resources, this study was considered quite relevant in the context of Nepal. Understanding individual consumption behaviour is not that easy, as they are deeply guided by multiple social and institutional contexts (Jackson, 2005). My finding on the effectiveness of peer pressure regarding sustainable consumption is in line with Goldsmith (2015), who provided various examples of influences one can have on people around them and seek suggestions from them. Before making any sort of decisions, such as in new areas, people are engaged in consulting, seeking solutions, and getting feedback from old friends and family members.

### **Association between the consumption areas and socio-demographic factors**

To substantiate the information collected through KII and FGDs, a chi-square test was performed to measure the association between various demographic variables with the area of consumption (food, choice of mobility and recreation). In peri-urban settlements, this study found an association between occupation and choice of mobility ( $p=0.009$ ,  $n=136$ ); a significant association between occupation and recreational activities ( $p=0.018$ ,  $n=136$ ); and a significant association between education and mobility ( $p=0.017$ ,  $n=136$ ) (Table 9).

People in peri-urban have little choice when it comes to moving to urban areas for employment, businesses, and educational activities, as such services are more centrally located in urban areas. Similarly, depending on the type of occupation one holds, the need for time available for recreational activities is also important to determine. For example, small and medium-scale entrepreneurs are so busy dealing with their businesses that they find less time for recreational activities. In urban areas, the result found was comparatively different. There was a significant association between gender and food consumption ( $p=0.017$ ,  $n=135$ ); income and food consumption ( $p=0.039$ ,  $n=136$ ), income and recreational activities ( $p=0.023$ ,  $n=136$ ); and knowledge on sustainable consumption and mobility ( $p=0.002$ ,  $n=136$ ) (Table 10).

The FGDs conducted on 22 September 2022 (Gaddachaur, Bheemdatt-10) confirmed the association between gender and food consumption as male members of the households are more likely to be away from home and work elsewhere, which gives them the choice to eat outside/in restaurants. Similarly, those who make financial decisions at the household level can decide their own food consumption behaviour. Similarly, another FGD conducted on 24 September 2022 (Bhagatpur, Bheemdatt-4) also provided an interesting finding that recreational activities are a luxury that not every household can have, especially in a low-income country like Nepal and an underperforming area in terms of the Human Development Index (HDI) such as Bheemdatt.

When one steps out of the house for most recreational activities, it involves costs in terms of transportation, meal expenses, entry fees and time spent; all combined are directly related to the individual and household income. The association between the knowledge of sustainable consumption is also relevant when linked with the choice of mobility, mainly in urban areas. In the study area, being the lowland, bicycles and tricycles are very common to be used as the mode of transport. The environmental co-benefit of the same, compared to motored vehicles is less known. Therefore, awareness-raising activities combined with the reward system can be fruitful.

**Table 9: Association between socio-demographic factors and consumption in Peri-urban area**

Socio-demographic factors affecting consumption	Food	Mobility	Recreation
Occupation	.549	.009	.018
Education	.515	.017	.108
Gender	.589	.212	.559
Age group	.091	.068	.793
Income	.662	.854	.891
Social networks/groups	.799	.324	.917
Knowledge of sustainable consumption	.081	.073	.146

*Source: Data analysis of household survey*

**Table 10: Association between socio-demographic factors and consumption in Urban area**

Socio-demographic factors affecting consumption	Food (P-value)	Mobility (P-Value)	Recreation (P-Value)
Occupation	.302	.792	.362
Education	.474	.252	.591
Gender	.017	.101	.329
Age group	.202	.606	.758
Income	.039	.326	.023
Social networks/groups	.789	.675	.238
Knowledge of sustainable consumption	.540	.002	.439

*Source: Data analysis of household survey*

### 5.1.3.7 Institutional mechanism to promote sustainable consumption

Enabling the environment is key towards the sustainable development of any country. When the behaviour and practice of the people is concerned, it becomes even more crucial. The consumption behaviour of people is largely affected by the structures and rules around the person, as the agencies/structures relate to the societal structures (Pekkanen, 2021). In this section, I present the existing institutional structures that can potentially promote the concept of sustainable consumption in Bheemdatt.



**Formal and Informal groups/networks/associations:** As presented earlier in this chapter, 32% of respondents in urban and 38% in peri-urban areas are associated with some sort of group/network and association. Such associations include women’s groups, cooperatives, youth clubs, community forest user groups, water user groups, disaster management committees, youth resilience networks, etc. Despite many development organisations and even the government agencies in Nepal promoting community-led efforts to manage natural resources (community forests, water, disaster preparedness and management), this percentage is low presented through the household survey.

When asked during the FGD conducted in the study area, almost all the households were found to be associated with one or more such groups. The results received through the household surveys are mainly because the household heads themselves might have not been active members of the associations. The regular and frequent meetings of these groups provide an opportunity for the members to discuss relevant issues, clarify their understandings and resolve the issues they face. Therefore, this is a very effective institutional structure that can potentially play an effective role in promoting sustainable consumption.

**Structure within the local government:** Several structures within the local government system are responsible for promoting the concept of nature conservation and environment-friendly practices directly and indirectly. The Environment, Natural Resources and Disaster Risk Management (ENDRM) sub-committee is one of such kind, which is mandated to promote environmental protection and reduce the impacts of disaster risk in the municipality. The Municipal Disaster Management Committee (MDMC) also exists to deal with various kinds of disasters, including climate-induced disasters such as floods and droughts. The committee can discuss and make proposals to the local government in favour of pro-environmental behaviour and the promotion of NbS to reduce the impact of disasters.

**Legal frameworks including the relevant policies at a local level:** After the federal structuring in 2017, the local governments have made efforts to develop several acts, policies and guidelines that contribute to the promotion of sustainable consumption practices. While many of such documents do not specifically mention the term “Sustainable Consumption”, the intention is to promote such consumption practices. Several acts and

policies such as the Environmental Protection Act, Natural Resource Management Act, Electric Rickshaw Promotion Act, among others (elaborated in the next chapter – Chapter 5.2) have been developed by the local government authority. Similarly, the concept of “Green Fund” has been established to promote green enterprises led by the citizens in the municipality, to which the individuals or groups of individuals can apply and receive funding to start the initiative. The local government has also developed the “Local Agro-enterprise Promotion Action Plan, 2019”, which focuses on promoting homegrown food, organic food and agro-enterprises that promote local varieties from the municipality. Another action plan “Local Health and Sanitation Action Plan, 2019” focuses on the right of citizens to live in a clean environment and focuses on the roles and responsibilities of the state and non-state actors, including the citizens to keep the environment clean. Provision of punishment has also been made in case of the violence of rules in maintaining a clean environment.

The respondents in the study area, however, did not know of any such institutional mechanisms and structures which promote sustainable consumption, while they believed the local government should be responsible to promote and encourage sustainable consumption. This can be one of the many reasons, that might have undermined the importance of sustainable consumption and practice at individual and household levels in the study area.

**Major legal frameworks at the Provincial level:** Bheemdatt Municipality falls under Province 7 (Sudurpaschim Province) of Nepal, all the legislative frameworks and major decisions made at the provincial level apply to all the local units too. As such, this study tried to explore if there are any major decisions to be made in terms of promoting sustainable consumption in the province. Some of the major provincial-level frameworks and action plans include those related to (i) provincial-level forest management, (ii) use of water-related resources (sand, stones), and (iii) provincial-level tourism development and management. None of these frameworks and action plans specifically mention the efforts required at individual consumption practices, rather communal and group efforts to protect the environment.

Action Plan on Industries, Commerce and Consumers, focuses on the need to promote local products throughout the province, identifying pocket areas for production and supporting each district to specialise in one product. The action plan also acknowledges the right of consumers to be able to choose products that are of high quality and cost-effective. This, however, does not mention specifically the need for sustainable consumption or the availability of environment-friendly products.

The finding from this study revolves around the fact that the concept of sustainable consumption is less known to the citizens in the study area. Where the concept of sustainable consumption is in practice, it is without knowing the concept and understanding the co-benefits of sustainable consumption. At the same time, the institutional mechanism is not developed to the extent that promotes sustainable consumption at the individual and household levels. Therefore, all the findings generated can only establish the baseline and open opportunities for future research by researchers and interventions by the policy makers/development activists. My findings could then, only assume and be inclined towards the findings of Pekkanen (2021), who discussed reaching a common point between institutional and practice theory. They claimed that sustainability is better achieved when the institutional regulations are combined with the practice; whereby they supported the argument of the practice theory in terms of increased use of consumption-centric studies (Corsini et al., 2019).

My findings also agree with the recommendation made by Spangenberg (2014), that the socially unsustainable underconsumption, which is observed in developing countries must be addressed, while the environmentally unsustainable overconsumption in developed countries must be stopped. For this to happen, the institutional mechanism must be strengthened, combined with knowledge dissemination efforts and further studies to see the results.

#### **5.1.4 Chapter Summary and Conclusion**

This chapter started with the presentation of socio-demographic characteristics of the respondents mainly the gender, ethnicity, age, education, affiliation with the networks/association and occupation. The majority of the respondents of this study were male, represented the Brahmin/Chhetri communities, within the age group of 30-59, had a

secondary/higher secondary level of education, were affiliated with community groups and networks, and had business as their occupation. Similarly, the average family size was 4-5 members, had an average monthly income of NPR 20,000-NPR 50,000 (EUR 153 - EUR 384). The major areas of consumption by the individual household in the study area include food, energy, water, education, health, lifestyle changes, recreational services, environmental goods (such as forest goods), etc.

As justified well under the theoretical framework section, three areas of consumption were chosen for this study: food, mobility, and urban green parks. This chapter explored the type of modern facilities within these three areas of consumption. Around 46% of the respondents in urban areas used 4 different kinds of modern facilities for food consumption which are mainly the oven, refrigerator, LPG, rice cooker and water boiler. Similarly, under mobility, people prefer motorised vehicles to commute, while there is a huge potential and willingness of the population to adopt non-emitting mode of transport such as bicycles, rickshaws, electric vehicles, etc. This suggests that some initiations from the government side are required to create a favourable environment for the population to maximise the utilisation of sustainable mode of transportation.

Musical performances are still the major sources of recreation that are considered modern by the public. People still consider the use of urban green parks as the traditional method of recreation. The major factors affecting household consumption in these three areas include increased income, peer pressure, knowledge/awareness on sustainability/climate change/sustainable consumption, access to modern facilities, affordability, and business. Of these, knowledge and awareness could be prioritised to encourage people towards sustainability.

This chapter also explored people's preference for restaurant food over home food, frequency of eating outside and the reasons for their preferences. Furthermore, the study assessed the preference to pay for green food products. More than 70% of the respondents (41% in urban and 33% in peri-urban) reported that they are willing to pay for green food products. The use of sustainable mode of transportation such as electric scooters, bicycles, tricycles, etc. was common in the study area. However, they are considered traditional and old-fashioned mainly by the youth population. This chapter also presented findings on the WTP for urban green parks. Most of the respondents (92%) in both urban and peri-urban

settlements expressed interest in paying the premium price for the improved parks and green open spaces in their neighbourhood. Some of the factors that influenced the WTP include cleanliness and maintenance by the government or local clubs, facility of toilets/dustbins and playgrounds for children, and if the park is within walking distance.

The concept of sustainable consumption is still new and therefore, deriving the findings was quite challenging. From the total respondents in urban areas, 64% expressed that they have heard about the concept of sustainable consumption, while only 23% feel that the consumption pattern is sustainable at the community level, and 36% feel that it is rather more sustainable at the household level. The chapter went further to explore the gravity of influential activities on sustainable consumption by peers. The chapter also explored the institutional mechanisms that might have influenced the sustainable consumption pattern. Some of them include affiliation of the households with formal/informal networks/associations, the existence of committees/sub-committees at the municipal level, and legal frameworks at the local and provincial levels.

The findings indicate that the respondents have no intention to practice unsustainable behaviour. They would be willing to practice a sustainable way of living if they are efficient, the government creates an enabling environment to promote such practices and the local people have enough knowledge about the impact of climate change and the need for sustainable consumption. The following chapter, therefore, presents findings on the knowledge of people on the concept of sustainable consumption and climate change, knowledge on nature-based climate adaptation practices, the existing practices on EbA and if there are any associations with the socio-demographic variables.

## CHAPTER 5.2 LOCAL KNOWLEDGE AND UNDERSTANDING ON CLIMATE CHANGE IMPACT AND GREEN ADAPTATION PRACTICES

### 5.2.1 Introduction

Awareness and knowledge are the key factors in promoting adaptation measures (Reid et al., 2017), and are also the influencing factors in sustainable consumption practices. Building on the findings from the previous chapter, this chapter seeks to explore the awareness, knowledge and understanding of people on environmental protection, the impact of climate change and green adaptation practices. While the first chapter of results presented the sustainable consumption patterns and influencing factors that determine consumption behaviour, this chapter discusses in detail the level of awareness and knowledge people have on the impact of climate change and what sort of adaptation practices have they practised.

The vulnerability analysis conducted by the GoN in 2021 estimates the climate-induced disaster-related human causality between 1971 and 2019 to be 64, which accounts for 65% of all disaster-related deaths (except road accidents). The GoN has considered adaptation to climate change to be the key national priority, as reflected in the NDC to the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). The recently launched NAP and the NAPA (2021-2050), sets out longer-term adaptation strategic goals for 2050, medium-term priority programmes for 2030 and short-term priority actions for 2025. This guides Nepal to better integrate actions and strategies to address climate risk and vulnerability in development planning and implementation at the local, provincial, and federal levels (GoN, 2020). In addition, the Climate Change Policy-2011 (revised in 2019), NAPA (2010), LAPA (2011), etc. have put climate change adaptation and mitigation at the forefront of the agenda and are related to sustainable consumption and adaptation.

The GoN has also declared 2018–2028 as the ‘Energy Decade’ and has envisioned sustainable development of the energy sector through the development and expansion of hydroelectricity and renewable energy, which is one of the major areas of household consumption. The Renewable Energy Subsidy Policy (2016) provides subsidies on various Renewable Energy Technologies (RETs) including solar water lifting, solar irrigation,

biogas, gasifiers, waste to energy and productive end uses. Therefore, I intended to assess the relationship between the knowledge and awareness of people on climate change and if they have been reflected in their behaviour such as the adoption of sustainable consumption patterns and the use of green adaptation practices. Furthermore, I also studied the existing legal frameworks and efforts of local government in climate change adaptation.

### **5.2.2 Methods**

Results under this chapter have been presented mainly based on the household survey, FGD, and KII. Experts' consultation workshop including the government stakeholders, academicians, and development practitioners was organised to validate the results. Similarly, a review of existing policies, frameworks and official documents of Bheemdatt Municipality was conducted to understand what already exists, and to discuss if this has been communicated appropriately to the people. For the literature review, available journal articles, book chapters and published reports of relevant organisations were also reviewed. The search engine used was Google Scholar and the relevant documents of three decades i.e., 1992-2022 were referred and reviewed.

As I collected the data by using a stratified random sampling method, and the data were not a normal distribution, the parametric test was not possible. Hence, I applied a non-parametric test: Pearson's Chi-Square, to analyse the quantitative data. Where possible, I also applied the Mann Whitney U and Kruskal Wallis H tests to see if there are any differences within the categories with the dependent variables. The statistical tests and the general results derived from the household survey were then triangulated with the qualitative information from FGDs, KIIs and experts' consultation workshops. Information collected through the household surveys was analysed using SPSS (Version 29) and MS Excel.

### **5.2.3 Findings**

#### **5.2.3.1 Awareness and knowledge of people on climate change**

Sustainable consumption is a behaviour that is practised by an individual, community or society considering the environment in mind. Therefore, I consider that people's knowledge and awareness about the environment, natural resources and climate change is an important factor to consider. Out of the total respondents (271; urban-135, peri-urban-136), 81% of

respondents in urban and 71% in peri-urban expressed that they knew about climate change (Table 11).

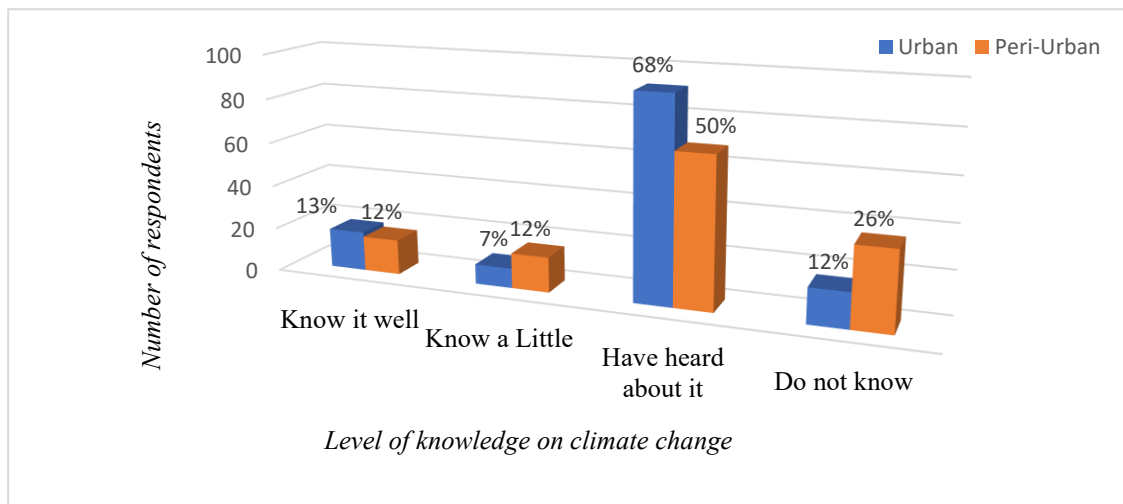
**Table 11: Knowledge of respondents about climate change**

Knowledge of climate change	Yes	No
Urban	110 (81%)	25 (19%)
Peri-urban	97 (71%)	39 (29%)

Source: Household survey, September 2022

In urban areas, 13% of respondents expressed that they knew climate change well, 7% knew a little, 68% heard about it and 12% didn't know about climate change at all. In the case of peri-urban areas, 12% of respondents knew about climate change well, 12% knew a little, 50% had heard about it and 26% did not know about it (Figure 43).

**Figure 43: Responses regarding the knowledge of climate change**



Source: Household Survey, September 2022

In order to measure the understanding level of the respondents, probing questions were asked. They were asked if there have been any changes in the climatic conditions mainly the rainfall, flood, landslide, and drought. In total, 95% of respondents in urban and 87% of respondents in peri-urban reported that the off-season rainfall has increased in recent days. Similarly, 84% of urban and 87% of peri-urban respondents also noted a high increase in drought in their areas (Table 12).



**Table 12: Knowledge of people in terms of changes in climate conditions in recent years**

Climate condition have changed in recent years	Rainfall		Flood		Landslide		Drought		Overall %	
	Urb.	Per-Urb.	Urb.	Per-Urb.	Urb.	Per-Urb.	Urb.	Per-Urb.	Urb.	Per-Urb.
Off Season	128	119	4	29	0	4	114 (84%)	119 (87%)	95	87
Heavy	3	11	20	21	6	5	0	0		
Thin	4	5	11	13	0	4	0	0		
No	0	0	88	65	103	109	21	0		

*Source: Household survey, September 2022*

### **Statistical analysis on the association between knowledge of climate change and socio-demographic variables**

Upon testing the association between various socio-demographic variables for both urban and peri-urban areas; a significant association of knowledge on climate change was found with some independent variables (gender, age) with dependent variables (occupation and education) (Table 13) in urban areas. In peri-urban areas, the association was observed only with the level of education.

In the case of urban areas, 87% of male members answered that they knew about climate change, while only 70% of female members knew about it. Similarly, regarding the age groups, respondents within the age group 18-29 had the highest result in terms of their knowledge on climate change (95%), followed by the age group above 60 (80%), and the age group 30-59 (76%). The occupation also determined the knowledge of respondents on climate change. Students were among the groups who had the highest knowledge of climate change (100%), followed by jobholders (state and non-state, salaried, 94%), farmers (82%), and jobless individuals (43%). The statistics also revealed that the education level of respondents is directly related to the knowledge of climate change- the higher the level of education, the higher the level of knowledge on climate change i.e.,

education level master and above - 100%; bachelor and secondary/higher secondary level- 86%; primary level-72% and illiterate - 40%.

In the case of peri-urban areas too, the knowledge of climate change was directly related to the education level- i.e., the higher the education level, the higher the knowledge on climate change. This was, however, not true for the primary level of education, as the people who reported to be illiterate had higher knowledge (54%) on climate change compared to those who had a primary level of education (52%). Urban residents were generally found to have higher levels of exposure. They are well-connected with the services and information and are well-networked. This could be the reason why respondents in urban areas have a higher level of knowledge on climate change, but within a certain demographic category – men, students, youths and educated.

**Table 13: Association of knowledge on climate change with the socio-demographic variables**

Socio-demographic variables	P value		Remarks
	Urban (n=135)	Peri-urban (n=136)	
Gender	<b>.018</b>	0.257	Significant association found in the urban area
Age	<b>.036</b>	0.396	Significant association found in the urban area
Ethnicity	.705	0.784	
Occupation	<b>.000</b>	0.333	Significant association found in the urban area
Education	<b>.002</b>	<b>0.001</b>	A significant association was found in both urban and peri-urban areas

*Source: Data analysis of the household survey*

Male members of society participated in various events, are better networked, and have higher education levels compared to women; this could be the major reason behind male members of society having a better knowledge of climate change. Similarly, the younger age groups go to school and have environmental studies in their curriculum which makes them better aware of climate change related knowledge. While the expectation would have been that both the urban and peri-urban areas had similar results in terms of the association of demographic variables with climate change, only education level was found to have an association in peri-urban areas.

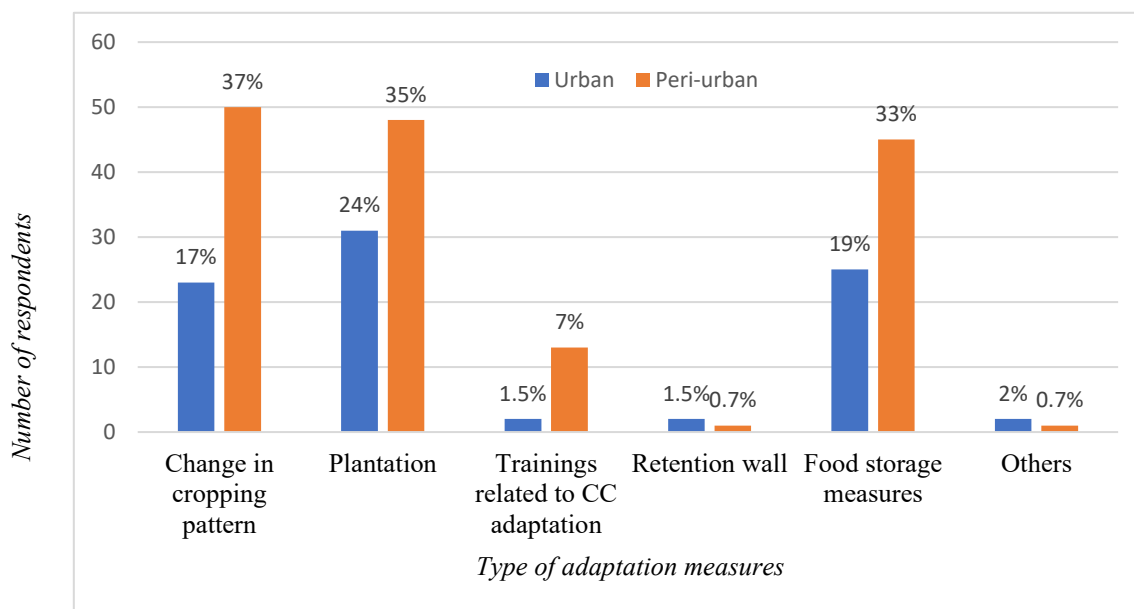
These findings complement the findings from Obayalu, Adepoju and Idowu (2014) who revealed that the factors affecting the choices of farmers on climate change adaptation include the age of the farmers, gender of the household head, years of education, years of farming experience, household size, farmers information on climate change, among others. Similarly, it also complements the findings from Rousell and Cutter-Mackenzie-Knowles (2020) who acknowledged the effectiveness of engaging youths in climate-related education so that they understand the scientific, social, ethical, and political complexities of climate change.

### **5.2.3.2 Coping with the impact of climate change through adaptation measures**

The respondents were then asked if they have done anything to cope with the situations that arose because of climate change. To those, who did not understand climate change, they were explained about the impact of climate change. The majority of the respondents (65% in urban and 54% in peri-urban) were found not to have any practices to adapt to climate change, while a smaller percentage (35% in urban and 46% in peri-urban) were found to have at least tried something. Those who practised climate adaptation practices had changed the cropping pattern, planted trees, received training on climate change adaptation, built retention walls, maintained food storage to cope with food scarcity, among others (Figure 44).

Although during the household survey, only a few respondents reported on climate change adaptation practices, the FGDs in peri-urban settlements (mainly in Bheemdatt-10) revealed that many innovative practices have existed in the area such as changes in cropping patterns, multi-use water systems, artificial ponds to deal with water scarcity, traditional food storage container, maintenance of natural sheds- trees in the compound and agri-fields, etc. Therefore, the responses to the household survey could have been much higher if it were conducted with the same respondents and after the FGDs, as FGDs provided opportunities to explain the concept and potential adaptation practices to climate change.

**Figure 44: Responses on the adoption of adaptation measures**



Source: Household survey, September 2022

### 5.2.3.3 Sources of knowledge and skills on climate change adaptation

When the respondents were asked about the sources of climate change adaptation knowledge, a majority (46%) in urban areas had learned from the others, and 39% in peri-urban areas had practised them traditionally and culturally. Only a very small percentage (2% in urban and 8% in peri-urban) had gained knowledge from the training provided by the government agencies (Figure 45).

Households that are members of community level groups/associations get an opportunity to participate in training/orientations provided by the government and non-government organisations. However, not all of them remember who provided the training, rather they remember the discussion they had in their groups. Therefore, the response was focused on “learned from others”, which is positive in a way that peer learning is much influential in the study area, as it was also presented in the previous chapter regarding the knowledge on sustainable consumption.

The peri-urban population represents both the urban and rural settings. When it represents the rural characteristics, more agricultural field, farming population and stronger social capital is observed. As such, more traditional and cultural practices are also in existence, that are pro-environmental and climate-adaptive in nature such as the use of food grain

storage containers. Traditionally, such containers were in practice not because they were climate adaptive per say but offered an opportunity to store food for a longer period without destroying the flavour and quality. It also prohibits potential theft as they are mainly underground and cheaper, and no fancy containers were available in the market.

#### 5.2.3.4 Perceived changes in climate-induced disasters in recent years

The majority of the respondents also noted that climate-induced disasters mainly landslides, floods and fires have increased in recent years (Table 14). There was an increasing misunderstanding and knowledge on whether a certain type of disaster is climate-induced. The responses were received after explaining what climate-induced disasters are. I also observed a distinct disagreement among the members of FGD, where some of the respondents did not agree that climate change has induced or increased these disaster events, while others believed that the patterns of such disasters have indeed changed. For example, pre-monsoon floods, higher frequency of fire incidences induced by heat, and landslides incidences in the Churiya ranges.

*Table 14: Changes in climate-induced disasters*

Climate-induced disaster/Changes	Landslide		Flood		Fire	
	Urban	Peri Urban	Urban	Peri Urban	Urban	Peri Urban
Increasing	107	94	107	92	36	56
Decreasing	19	23	19	28	25	40
No change	9	19	9	16	30	31
Total	135	136	135	136	135	136

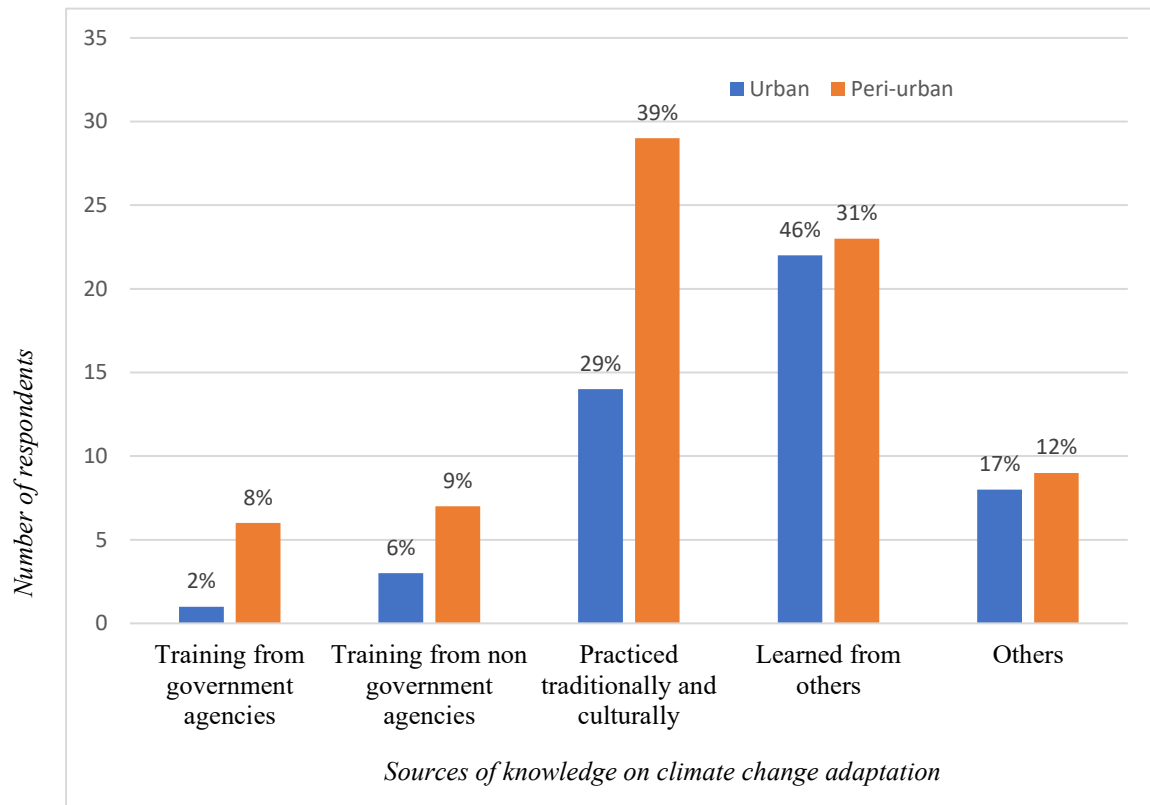
*Source: Household survey, September 2022*

#### 5.2.3.5 Knowledge of nature-based solutions to climate change, and Ecosystem-based Adaptation

The concept of NbS is comparatively new in Nepal, although one of the approaches – EbA is a more common and older concept. This study, therefore, used the concept synonymously to explore the knowledge of people on natural adaptation practices. Of the total respondents (135 in urban and 136 in rural areas), the majority (79%) of respondents in peri-urban areas

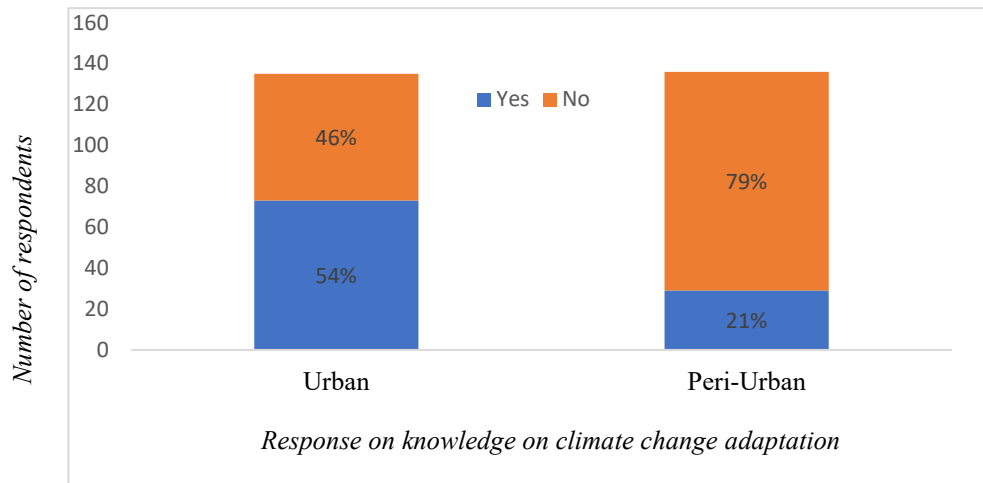
did not know what the NbS to climate change and what EbA is. The situation was, however, better in urban areas i.e., 54% of respondents knew about the concept. Upon explaining what EbA is, the majority of the respondents in both areas responded. Of these 92% and 85% of the respondents in urban and peri-urban areas respectively expressed that they have not practiced any sort of EbA practices. At the same time, 89% of the respondents in urban and 75% in peri-urban agreed that EbA can be an effective practice to reduce the impacts of climate change (Figure 45, Figure 46).

**Figure 45: Sources of knowledge on climate change adaptation**



Source: Household survey, September 2022

**Figure 46: Knowledge of respondents on natural solutions to climate change adaptation**



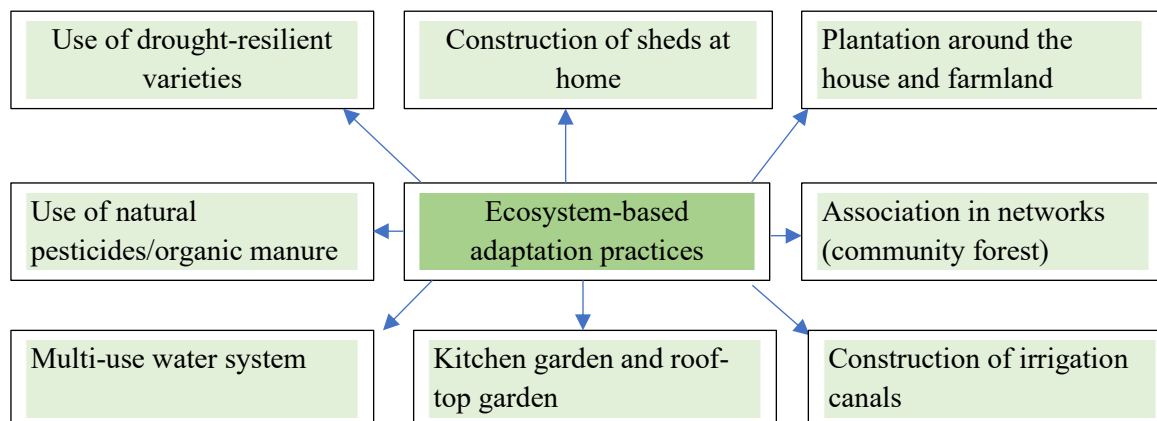
Source: Household survey, September 2022

Contrary to the responses received during the household survey, the FGD and KII revealed that the EbA practices are in existence both in the urban and peri-urban areas. Mainly in peri-urban areas, many activities related to adaptation were observed. The communities, however, did not know, if it was called EbA. Similarly, the practice was not so common in the urban settlements. Some of the autonomous practices observed and reported at the community level include plantation, change of seed varieties including the drought-resilient varieties, artificial boring, food storage good for a year, plantation around the house and agricultural land, community forestry activities, construction of irrigation canal, among others (Figure 47).

The legislation and policies promoted by the GoN require the people to practice EbA and many times, such practices are subsidised. The concept of community forestry and the government's priority to increase forest cover, for example, has been in existence for four decades. The cost-effective natural methods to cope with the impacts of climate change were being practised traditionally and differently by various ethnic groups, as also explained in the previous section.

While it was observed that the study area had few open spaces and parks, they were not well maintained. Some houses had trees planted in their compound as well as kitchen gardens, which were in practice for many years, and not necessarily as a result of knowledge on climate change adaptation.

**Figure 47: Ecosystem-based adaptation practices in the study area**



*Source: Adopted from Bista, Gruehn and Sunuwar (2023)*

This result is in line with the study conducted in various other countries, including the developed countries. Even in countries like Germany (Wamsler, Brink and Rivera, 2013), the local government representatives did not understand the concept of EbA and ecosystem services. Alternative terminologies such as ‘landscape-based adaptation’ or ‘green and blue infrastructure’ were rather commonly used terminologies by these authorities in decisions about land-use planning. Similarly, Brink et al. (2016) in their review article on urban EbA concluded that the research on urban EbA is very fragmented and as few as four articles focused on urban areas used the term EbA, while the other articles only used terms that are contributing to this area. However, the component of urban EbA is frequently used in urban planning initiatives.

### **5.2.3.6 Knowledge of EbA practices promoted by the local government**

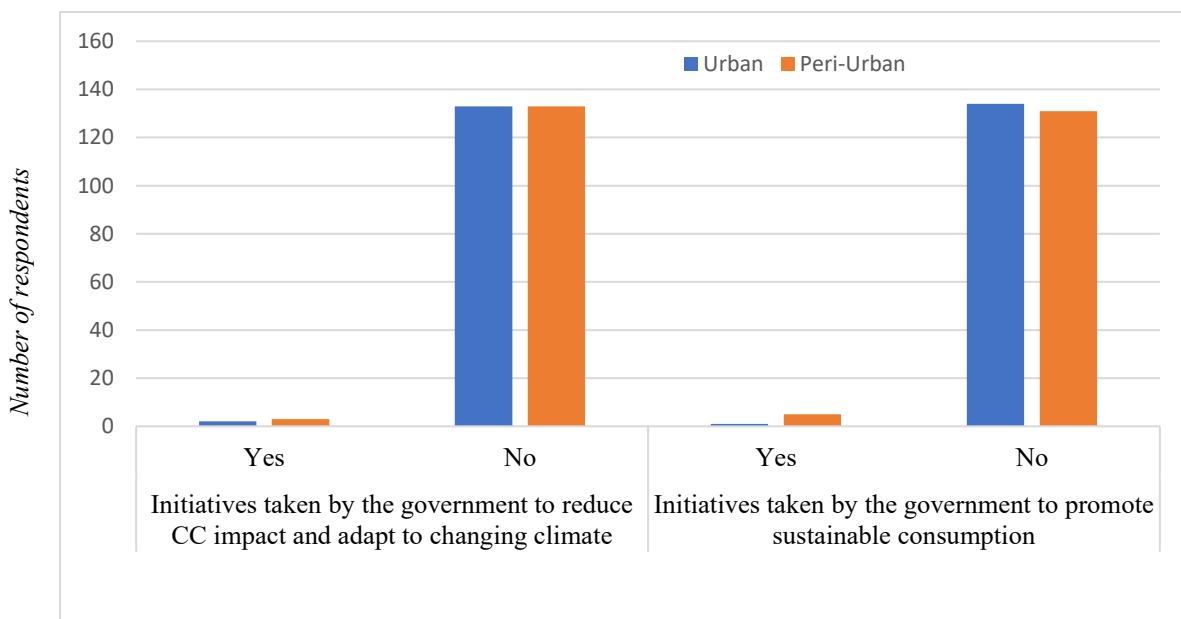
More than 95% of the respondents expressed that they were not aware of any such initiatives taken by the local government to promote EbA (Figure 48). More than 95% (98% in urban and 97% in peri-urban) of the respondents were found to be unaware of the initiatives taken by the government to reduce climate change impact. A similar percentage (98% in urban and 96% in peri-urban) also expressed that they did not know about any initiatives taken by the government to promote sustainable consumption.



Few active individuals and the key informants, however, were found updated and informed about various activities promoted by the local government on climate change adaptation and natural methods to deal with the impacts of climate change. Many members expressed their views about the legislations and guidelines developed by the government to deal with various kinds of natural hazards in the municipality, the new acts for nature and environmental protection and local adaptation practices to reduce loss and damage due to climate change. These members were also aware of the projects implemented by the non-government organisations such as the database on disaster-vulnerable communities, mapping of open spaces within the municipality, and establishment and management of parks in close coordination with the private sector.

This shows that only a few segments of the community, i.e., those who have access to information and are influential, are aware of the various practices promoted by the local government. The key informants also noted that the government should advertise more and raise public awareness of the existing plans, policies, programmes, and climate adaptive practices that the households/individuals should promote.

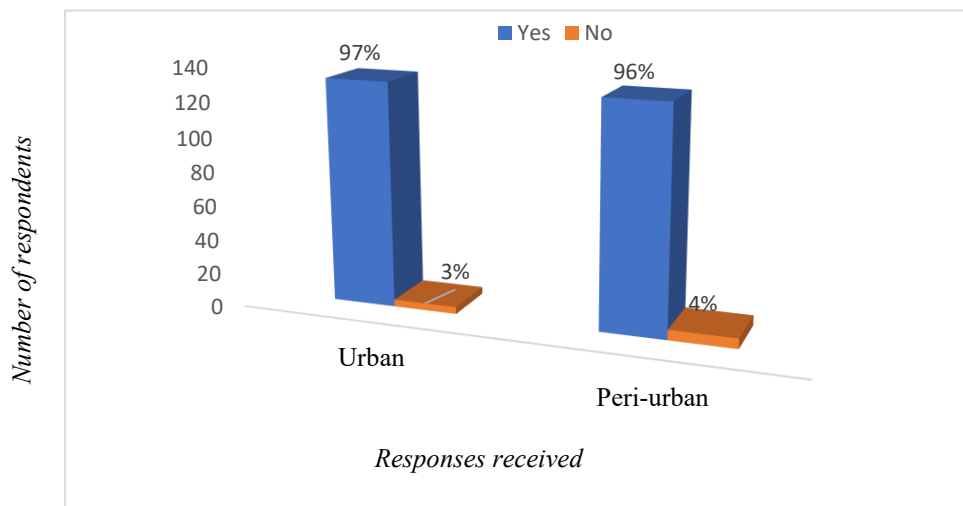
**Figure 48: Initiatives taken by the government on climate change adaptation and sustainable consumption**



Source: Household survey, September 2022

The majority of the respondents (97% in urban and 96% in peri-urban) also opined that the local government should be responsible for promoting activities to reduce the impact of climate change (including natural methods) and promote sustainable consumption, mainly in terms of introducing appropriate policies, programmes and institutional mechanisms at the governance level; and orienting the citizens regarding the same (Figure 49).

**Figure 49: Preference of the locals to make the local government responsible on policies and mechanisms**



Source: Household Survey, September 2022

### Statistical analysis on the association of knowledge of EbA with socio-demographic variables

The Chi-square test to check the association between the knowledge of EbA and socio-demographic variables reflected that there is no relationship with any of the independent variables in the urban area (Table 15). In peri-urban areas, however, there was an association observed with the education level. Many independent variables were found to be associated with the knowledge of climate change, which was not the case with the knowledge of EbA, although climate change and EbA are closely related. The result given by this analysis is quite contradictory as the population in peri-urban areas is largely influenced by their peers in terms of practising climate adaptive practices and their practices are mainly coming from their tradition and culture, rather than their education. At the same time, no association found between the education level and knowledge of EbA in urban is unrealistic, as education has a direct association with climate change. This indicates that the term “EbA” is newer to the respondents compared to climate change and therefore,

despite the practices being in existence, the expected association was not observed or reported.

**Table 15: Association between knowledge of respondents on the EbA and socio-demographic variables**

Socio-demographic Variables	P value		Remarks
	Urban (n=135)	Peri-urban (n=136)	
Gender	0.730	0.193	Significant association found in an urban area
Age	0.553	0.760	Significant association found in an urban area
Ethnicity	0.705	0.904	
Occupation	0.396	0.905	Significant association found in an urban area
Education	0.152	<b>0.012</b>	Significant association found in peri-urban area

*Source: Data analysis of household survey*

This study builds on the findings and recommendations made by Rayan, Gruehn and Khyyam (2021) from their study in Pakistan that the “Participatory Planning Approach” is much more effective in engaging community including indigenous groups in promoting urban spaces and green parks and filling the knowledge gap on existing on climate uncertainties. Involving communities applying the concept of a learning lab to NbS such as in Germany, could be effective in Bheemdatt as a clear gap of interface is observed between the local government and citizens regarding the understanding and promotion of NbS/EbA. This study complements the findings of Woroniecki et al. (2019) who emphasized the need to inform people about EbA; so that they can extract the full benefits from nature by applying EbA as an approach to climate change adaptation.

### **5.2.3.7 Awareness of the local government on climate change and sustainable consumption**

Knowledge and understanding of citizens on any subject matter are directly dependent on the authorities/decision-makers in their area. Therefore, the level of knowledge and understanding of the local government authorities in Bheemdatt was studied. This was administered mainly through the KIIs (interviews with the authorities at the municipality and the selected wards) and experts’ consultation workshops. The understanding of climate change was observed to be basic among the local government representatives, except for

the Environmental Officer in the municipality (a designated position in the municipality who has a mandatory degree in Environmental Sciences) (Box 3).

***Box 3: Local government should be responsible***

The Local Government should identify the starting point for the promotion of the concept on sustainable consumption. Private sector plays an important role and should be recognised by the government authority. The consumers' association in the municipality should be invited to the discussions on sustainable consumption. Similarly, the guidelines and policies of the municipality should be revised to ensure that the sustainability aspect mainly on consumption should be prioritised.

*Source: Experts' Consultation Workshop, Bheemdatt Municipality, April 2023*

Local people mainly related their knowledge of climate change to disaster events such as floods, droughts, fires, off-seasonal weather events, etc. While they were aware of the impact climate change can pose, very little knowledge was observed regarding the mitigation of and adaptation to climate change. During the experts' consultation workshop, some local leaders expressed their understanding of sustainable consumption and confirmed that this concept should firstly be owned and promoted by the local government (Box 4).

The development of policies, plans, programmes, etc. is not sufficient to ensure effective practices until awareness and knowledge of the implementing bodies and their capacity to make people as well as other concerned stakeholders understand the importance of these documents that play a much effective role in the longer run. These findings support the study of Bates et al. (2013) in Australia, who highlighted that the government bodies not being able to interpret their own policies and engage multiple stakeholders can act as a barrier to receiving support from other forums/networks and citizens in implementing them.

***Box 4: Understanding of local government on climate change and its impact***

The local government has started applying sustainable development policy while executing development interventions and economic development activities. These include planting trees on the side of the road thereby promoting eco-road and eco-parks. Programmes on the use of green energy, sustainable farming, proper drainage management, use of bio-degradable products, various interaction and awareness sessions using different media sources on sustainable use of resources are also being promoted. Several policies, acts, regulations, and guidelines have been developed by the local government which includes huge acknowledgement on the impact of climate change and recommendations on the appropriate mitigation measures (including the EbA practices such as green infrastructures in the cities, management of wetlands and forest ecosystems, etc.)

However, the concept of sustainable development is still a new concept and has not been promoted by the government. Limited knowledge of the government bodies on sustainable consumption can be one of the reasons for this.

*Source: KII, Bheemdatt-10, October-November, 2022*

The concept of joint actions for climate change adaptation has also been highlighted by Regmi and Bhandari (2013), in their study from Nepal where they noted that the government bodies have not been able to engage other important stakeholders in the policy and strategy-making process and the decision-making process has been mainly centralised, leading to an ineffective climate change adaptation practice. Often times, as a result of a lack of climate awareness, scientific knowledge brokering and poor networking as well as limited sharing among the policy makers (mainly the government authorities), good practices are hidden and isolated (Clar, Prutsch and Steurer, 2013).

**5.2.4 Provisions made in the existing legal frameworks/guidelines on climate adaptation**

The study reviewed all the relevant legislative policies, guidelines, acts and programmes from Bheemdatt Municipality to analyse if they have made any provisions in terms of consumption, sustainable consumption, climate change adaptation and EbA/NbS. With this, the objective was to establish if the local government representatives are well-versed

in the concept. As the country underwent political restructuring during 2017 with clearly defined roles and responsibilities to federal, provincial and local level governments, most of such documents were formulated only in and after 2018. Documents relevant to this study were formulated only in 2021.

### **Gender Equality and Social Inclusion (GESI) Policy, 2021**

The GESI Policy, 2021 mainly highlights the use of resources for the benefits and needs of the most vulnerable population in the municipality including women, Persons with Disabilities (PwDs), single women, etc. It does not say anything about how the resources are consumed, how to ensure the sustainability of resources, how vulnerable people might have affected/ influenced the use/conservation of natural resources, etc. It was interesting to explore that the policy ignores the provisions made by other policies such as community forestry directives that provide more spaces, mainly for women.

### **Building Code, 2021**

As explained in the document, the objective of the building code in Bheemdatt is to regulate the urbanisation process and create an environment where everyone can live in a clean, healthy, and sustainable environment. The document identifies various zones with potential urban expansion zones; according to which, Wards 4 and 10 fall under the urban expansion zone. As per the building code, the municipality is required to have enough open spaces, green zones, forest zones, buffer zones, etc. It also says that the rivers, ponds, and other natural patches such as forests within the municipality must be protected, and the citizens have the responsibility to protect and manage such areas as designated. No constructions can be made in such places by the public and the government should identify them as vulnerable areas, publish it and make people aware and informed about such areas.

### **Town Development Commission Act, 2021**

The municipality has developed the 'Town Development Commission Act', which identifies the roles and responsibilities of the commission as (i) conducting studies and research to explore the development possibilities and opportunities within the municipality; (ii) identifying potential natural resources and their wise utilisation; and (iii) developing project banks and edit on regular basis for the benefit of the city development to explore and approach external funding agencies.

### **Local Forest Act, 2021**

The Local Forest Act, 2021 of Bheemdatt has made several provisions in terms of managing and wisely using the natural resources within and near the municipality. The major provisions include the following:

- Manage forests to mitigate and adapt to climate change, conserve biodiversity, promote environmental services and contribute to sustainable development.
- Promote forest conservation of all kinds-private, community, and leasehold; and promote locally led climate change adaptation practices such as through the promotion of CFUG.
- Promote community homestays, watershed conservation, development and management of biological corridors, conservation of wetlands, and promote forestation/reforestation in open/public lands.
- Develop the plan for climate change mitigation and adaptation.
- Farm NTFPs and medicinal plants, as well as promote agroforestry.
- Discourage the practice of disposing of waste in open spaces and forest areas.

While the Act is quite strong in terms of encouraging the sustainable use of natural resources and their protection, it remains silent on people's lifestyle, household consumption and individual consumption behaviour of the citizens.

### **Public-Private Partnership Act, 2021**

The Public-Private Partnership Act, 2021 has identified the priority projects to be implemented by applying the Public-Private Partnership model. This includes the generation and distribution of electricity within and by the municipality, rural and urban water supply, solid waste management, promotion of eco-tourism, among others. The Act highlights that such activities can be implemented in close coordination with development agencies such as national and international non-government organisations, and in collaboration with the federal, provincial, and other local government agencies. The Act, however, does not mention anything about promoting conservation efforts, and sustainability activities through the public-private partnership.

### **Electric Auto-Rickshaw Registration Act, 2021**

Bheemdatt Municipality formulated the Electric Auto-Rickshaw Registration Act in 2021, encouraging its citizens to use electric auto rickshaw within the municipality for the health benefit of citizens and to reduce the cost of local transportation. The use of electric rickshaws was visible in the municipality, observed during the field study. As per the Act, the rickshaw can be electric, solar as well as operated by other kinds of renewable energy.

This act, however, does not provide any information on its benefits as an environment-friendly and less carbon-emitting means of transportation. Nor does it encourage the public to use such public transportation over petroleum.

### **Environment and Natural Resources Conservation Act, 2021**

Among all the Acts, the Environment and Natural Resources Conservation Act, 2021 was found to be the most elaborated Act in terms of natural resources management, sustainable consumption and promotion of local/indigenous practices. Following are the major considerations made by the Act.

- Protect the human rights of citizens to live in a clean and pure environment.
- Manage biodiversity, create a balance between development and environmental conservation and protect biological diversity in the Municipality.
- Develop an adaptation plan, and while doing so, specifically consider the groups that are mainly impacted such as women, PwDs, children, senior citizens, and economically poor households.
- Implement projects to mitigate green gas emitting activities.
- Provision Environment Officer in the local government office.
- Reduce waste generation, and manage waste produced within the municipality.
- Promote locally-led climate change adaptation activities which include wetland management, conservation of biodiversity that are dependent on wetlands, protect indigenous knowledge and utilise experience as well as skills of local people in conservation.
- Conserve open spaces, green spaces and forest areas within the municipality.
- Support the governance, management, and technical capacity of local natural resources management groups such as CFUGs.



- Design and implement activities to conserve various ecosystems within the municipality such as watersheds, forests, wetlands, etc.
- Promote forestation and reforestation in public lands, and promote nurseries as well as urban gardens, which can be done by the private sector or individuals upon approval of the local government.
- Allocate financial resources for environmental conservation.
- Provision of punishment against activities that go against environmental conservation.

### **Market Management Act, 2021**

While the Environment and Natural Resources Conservation Act, 2021 remains silent about the promotion of local products, the Market Management Act, 2021 highlights the production, utilisation, and marketing of local products, and focuses on the need to develop the necessary infrastructure to promote local products thereby promoting the circular economy. It is the only Act that acknowledges the terms “consumption” and “consumers”. It focuses on organising various activities to celebrate international consumers’ right day, ensure the quality of products sold in the market and requires that all the local businesses be conducted in such a way that the local aesthetic environment is not disturbed. Despite this, the Act does not talk about selling and promoting green products and green food.

### **Urban Planning Commission Act, 2021**

The study also considered the Urban Planning Commission Act, 2021 as relevant, as the urban commissioners are one of the major stakeholders in improving the overall development and environmental condition of the city. The Act identifies that the commissioners have the responsibility to identify potential natural resources and develop a plan to protect them. However, it does not investigate the details such as protecting certain kinds of ecosystems and natural resources within the municipality. Nor does it acknowledge urban ecosystem as much more complex and different compared to the rural areas.

### **City Disaster Management Act, 2021**

The City Disaster Management Act, 2021 has identified various kinds of disasters and calamities in Bheemdatt Municipality and has rated the municipality to be vulnerable. It highlights the need to develop the capacity of local government to deal with such disasters

and raise awareness among the citizens regarding the vulnerability of people towards various forms of natural disasters. At the same time, the Act does not acknowledge NbS as one of the most effective and environment-friendly approaches to reducing loss and damage as well as reducing the risk of disasters.

### **5.2.5 Potential adaptation practices and their promotion in the study area**

The key informant interviews showed that the natural adaptation practices that can be promoted in the area should start simple and be accompanied by basic knowledge and awareness of the impacts of climate change. The key informants and the experts' consultation workshop informed that the practice of conserving nature is a sustainable consumption behaviour. Therefore, they cannot be separated from each other. The efforts that can be promoted in the study area, as suggested by the key informants, have been categorised into three areas: institutional, community level and individual/household levels (Figure 50).

Among all the reviewed documents of the local government, the Environment and Natural Resources Conservation Act, 2021 has provisions that many other Act does not cover. While it makes the local government accountable for formulating the necessary procedures and plans, it also highlights that the citizens have equal responsibility to conserve the environment and promote environment-friendly development. However, it does not discuss household consumption such as individual kitchen gardens, and the use of environment-friendly transportation such as electric rickshaws, etc. The local government documents seem to exist in isolation and are less coordinated. As such, the Acts do not acknowledge the provisions made by the other Acts, guidelines to complement the efforts and make them effective when implemented.

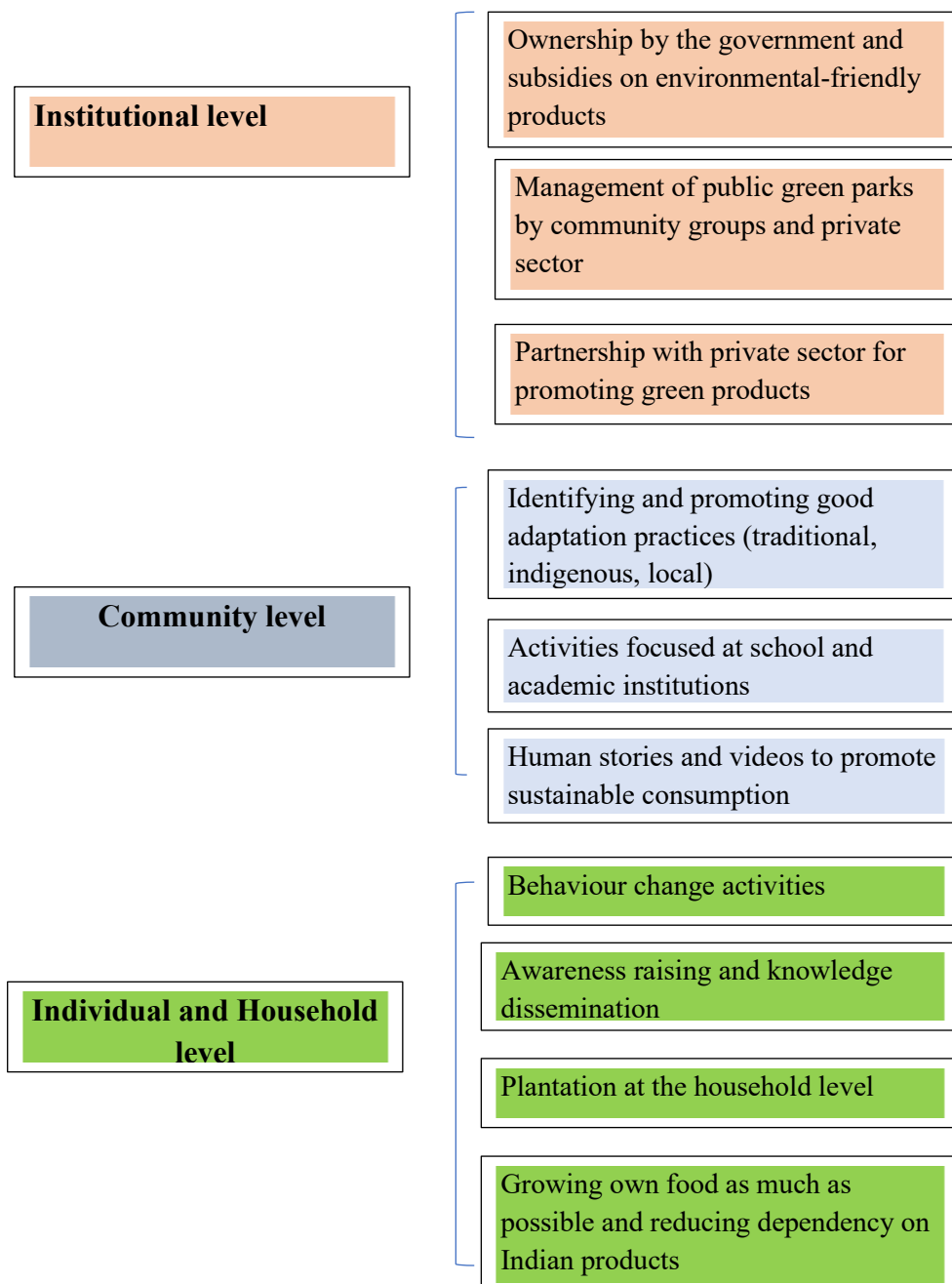
The interesting observation is that all these documents were developed during the same year, and the same local government representatives as well as administrative staff might have been engaged in developing them. Also, the community consultations were done at the ward level as mentioned in the document themselves, despite which they remain as stand-alone documents and less coordinated.

In addition to the frameworks, guidelines and policies, it is very important that the concept of EbA or NbS is frequently discussed, and their co-benefits are communicated to multiple stakeholders of the urban areas. The reason why the documents in Bheemdatt seem to be less coordinated might be because the government agencies were practically less engaged in the formulation of all these documents, and the external consultants/experts might have engaged more.

Raymond et al. (2017) have provided examples from various cities to communicate that no single approach works in enhancing the effectiveness of NbS. For example, in the case of Vienna, the concept of the *Green and Open Space Strategy* was effective for the scale-up, as the people and policymakers were frequently consulted in designing as well as implementing the strategy. Similarly, Cohen-Sachem et al. (2016) analysed the core principles for successfully implementing EbA, where they highlighted that the concept of multi-stakeholder engagement and continuous monitoring of the effectiveness is somehow missing in the principle, despite being extremely important.

The concept of participation and multistakeholder consultation is very relevant to my study, as also evidenced and presented in the previous chapters. The findings are in line with the findings of Huang and Rust (2011) who concluded that the government could play an active role in achieving sustainability by applying multiple strategies such as punishing those who pollute and promoting subsidies for green products and services. Similarly, this finding also agrees with Archer et al. (2014), who concluded that the local efforts to climate change adaptation can be complemented by the local government and vice-versa. Communicating science to the local people and integrating research findings into the planning process is more relevant. My discussion here is that multi-stakeholder engagement as well as monitoring of effectiveness is possible only when the local government and the citizens are aware of the benefits of the solutions proposed and are also aware of the policy provisions in their area.

**Figure 50: Potential ecosystem-based adaptation and sustainable consumption efforts in the study area**



Source: Adopted from Bista, Gruehn and Sunuwar (2023)

### **5.2.6 Chapter Summary and Conclusion**

This chapter explored the knowledge and awareness of people in climate change and their impacts in urban and peri-urban areas. The respondents were asked initially if they knew about the concept, followed by a probing question on how much knowledge they have regarding the impact of climate change in recent years. The education level of the respondents was identified as the main socio-demographic variable that is associated with the knowledge of respondents on climate change. The chapter also presented findings on various adaptation measures adopted by the respondents for climate change adaptation. Some of the examples include changes in cropping patterns, plantation, food storage through traditional methods, training, etc. The major sources of knowledge on climate change include training provided by government agencies, training from non-government agencies, traditional and cultural practices, learning from peers, etc. The chapter also investigated the knowledge level of respondents by asking about the pattern of natural hazards in recent years compared to the past.

Knowledge of locals on EbA as an approach to climate change adaptation was explored. The majority of the respondents were found to be unaware of the concept of EbA. The respondents also informed that they have not practised any such practices as EbA. This, however, proved to be false when observed. The community were found to have been practising many EbA initiatives such as the use of drought-resilient varieties, the construction of sheds at home, plantation around the house, use of natural pesticides, multi-use water systems, kitchen gardening, etc. The locals were also unaware of any kind of policies and practices initiated by the government on climate change and EbA. This was found to be associated with the education level of the respondents.

The KII and experts' consultation indicated that there are individuals at the local government level, who are aware of the concept of EbA and have knowledge of climate change (Box 5). While they were aware of the impact climate change can pose, very little knowledge was observed regarding the mitigation of, and adaptation to climate change. Despite this, many legislative frameworks were reviewed by the documents of the municipality, which when properly implemented can have a significant impact on the community.

***Box 5: Awareness level of the local government authorities***

“Conservation of environment and biodiversity can take place in many forms. Some of the examples may include managing the indigenous varieties of crops, that are slowly being extinct. Another way can be managing the street animals such as cows, which is the area of major concern in the municipality. Planting fruit trees along the sideways of the streets and maintaining gardens can be equally a good idea. The local government has recently been in discussion with the company on biogas, so that the street cows can be managed by managing the cow-dungs”.

*Source: Local government representative, Experts Consultation Workshop, Bheemdatt Municipality, April 2023*

The chapter ended by presenting some of the major recommendations received from the study on the potential measures to promote sustainable consumption at the institutional, community and individual/household levels. While the first chapter on findings presented that people are willing to adopt sustainable consumption practices, this chapter highlighted that the knowledge and understanding of climate change and EbA is low in the study area, which is a basis for promoting sustainable consumption. To promote NbS practices such as EbA, people’s way of consumption including their lifestyle must change. The next chapter, therefore, seeks to establish the linkages between sustainable consumption and the adoption of EbA.

## **CHAPTER 5.3 INTERLINKAGES BETWEEN SUSTAINABLE CONSUMPTION AND ECOSYSTEM-BASED ADAPTATION**

### **5.3.1 Introduction**

The consumption patterns in urban and peri-urban differ, and in most instances owing to the level of income and knowledge. With the growing urbanisation and modernisation, lifestyles and consumption patterns have been largely changing, which has a direct impact on the availability of natural resources for future use. At the same time, the globally increasing temperature and changing climate are directly impacting the state of naturally available resources. Nepal is highly vulnerable to climate change and natural disasters. Climate-related natural disasters such as floods, landslides, droughts, and extreme weather events have resulted in loss of life, properties and livelihoods, and extensive damage to all climate-sensitive sectors and the country's economy. To cope with this, various adaptation practices have been promoted in Nepal including the concept of EbA.

At the national and international level, various studies have been conducted in isolation to dig into the variables associated with sustainable consumption behaviour and adaptation practices such as EbA. UNEP's Adaptation Gap Report (2021) has unfolded the impact of the COVID-19 pandemic on adaptation planning and constraints with the available finance, and the economic cost of climate change impact being higher in developing countries compared to the previous years. Despite a recent trend of gradually increasing international public adaptation finance for developing countries, adaptation finance flows are projected to stabilise or possibly even decline because of the COVID-19 pandemic (UNEP, 2022).

After the positive outcome dealing with the COVID-19 Pandemic, COP27 held in Sharm El Sheikh, Egypt saw significant progress on adaptation, with governments agreeing on the way to move forward on the global goal of adaptation, which will conclude at COP28, improving resilience amongst the most vulnerable. New pledges, totaling more than USD 230 million, were made to the Adaptation Fund at UNFCCC, 2022 (COP27), which will help many more vulnerable communities adapt to climate change through concrete adaptation solutions (UNFCCC, 2022). The COP27 was also closed with a remarkable agreement to provide 'loss and damage' funding for vulnerable countries hit hard by

climate-induced disasters. A greater effort and innovation are required both in terms of adaptation and mitigation.

This chapter presents the findings associated with the relationship between sustainable consumption and EbA. It presents the argumentation on why and how sustainable consumption should be established as the indicator of effective EbA. It further argues that individual knowledge, awareness, and belief in the environment and climate change have a direct relationship with their consumption patterns. In addition to further explaining the results presented in the previous two chapters, this chapter has been furnished mainly through a systematic literature review of around 80 literature/studies on household consumption behaviour focusing on food consumption, mobility, energy use, water use, recreational activities, the practice of reuse/recycle, less food waste, etc. The green product purchase and use patterns have also been studied. Numbers of literature are available that show the linkage between people's sustainable behaviour/consumption patterns and the effectiveness of nature-based practices of climate change such as EbA.

The previous two chapters have shown that individual behaviour is directly dependent upon the awareness level, education and exposure of people, and is the determinant towards nature-friendly practices such as plantation, organic farming, use of less sophisticated and nature-based recreational activities such as nature-walk. Despite the importance highlighted by various documents of international and national institutions such as the report of Brundtland commission and legislative frameworks in the case of Nepal, social components and people's behavioural aspects on consumption have been hardly considered even to establish the consumption behaviour as an indicator to effective EbA.

### **5.3.2 Methods**

This chapter derived the results as well as the discussions presented in the previous two chapters. The available theories, projects and literature and their findings were specially reviewed to check if there have been any linkages established in the past between sustainable consumption and EbA. The peer-reviewed journal articles published between 1992-2022 were reviewed. The search engine used was Google Scholar, and in total 80 relevant articles were finally reviewed. The analysis of such literature is presented in



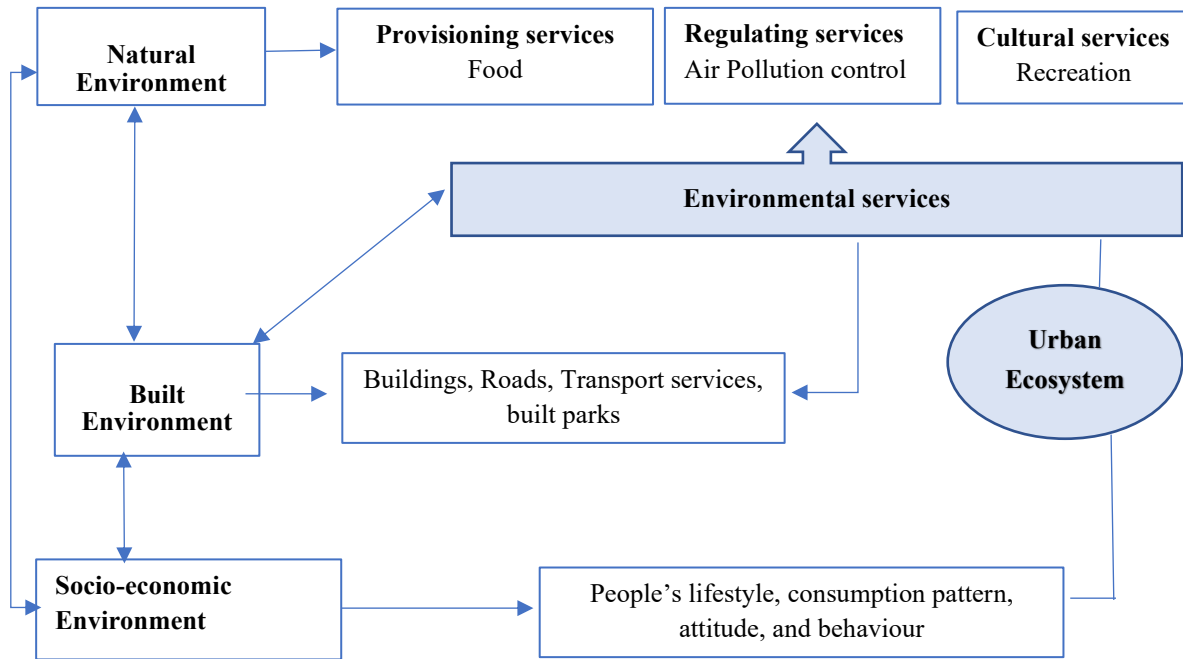
Chapter II, and discussions have been further utilised in this chapter to strengthen the argumentation.

Findings from the relevant questions through household surveys were also analysed to derive their meanings and possible indications. The information/contents gathered through the FGDs and KIIs were analysed. As the questions were comparatively technical and the respondents were required to know sustainable consumption, EbA, NbS and climate change impacts; expected responses could not be extracted from the household survey. Information received from FGD and KII were therefore used to present results in this chapter. The experts' consultation workshop conducted at the end of the data collection process, largely supported validating the information collected through FGD and KII. The key informants were also selected purposively and included the group leaders of the community forest users' group, university professors at local universities, government representatives from the municipality and two wards (urban and peri-urban), elected representatives, environment focal point of the Municipality, president of the conservation network, social activists and forest officers.

### **5.3.3 Results and Discussions**

This study focused on only a few components within the urban ecosystem: natural, built and socio-economic. The international instruments to which Nepal is a signatory were initially reviewed and Nepal's commitment to these instruments was assessed. This was then followed by the relevant policies, frameworks and projects in Nepal focusing on NbS and EbA; including their focus and indicators of success. The chapter then follows with people's understanding of sustainable consumption behaviour and if this can contribute to reducing climate change impact, thereby adopting natural methods of adaptation such as EbA. Furthermore, the chapter presents a brief analysis of the possibility of combining urban and peri-urban efforts; and acknowledges both the induced and autonomous EbA to deal with the impacts of climate change. Finally, the chapter presents the potential of sustainable consumption by individuals/households as an indicator of effective EbA (Figure 51).

*Figure 51: Urban ecosystem within the context of this study*



*Source: Authors' construct based on research findings and literature review*

### 5.3.3.1 Nepal's signatory status with the relevant international instruments

Nepal has been a signatory party to various international instruments since 1964 and until 2018. Some of the instruments that are associated with climate change, climate change adaptation, and NbS include the Ramsar Convention (1971), UNFCCC (1992), Kyoto Protocol, 1997, Paris Agreement (2016), and Convention on Biodiversity (1992) (Table 16). Commitment to international frameworks and conventions creates an obligation among the participating countries to develop national-level guidelines and action plans to achieve global targets. For example, as a signatory to the Ramsar Convention, Nepal has identified Ramsar Sites of international importance; and has been implementing interventions to protect them and enhance the livelihood of those that are dependent on the wetland resources. Until 2023, Nepal has been the signatory to 15 such international instruments, which shows the commitment of the GoN towards protecting the climate, reducing loss and damages due to climate change, conserving biodiversity, and sustainably using natural resources. All of these require the support and participation of people and affirmative changes in people's consumption behaviour.

**Table 16: List of International instruments to which Nepal is a signatory**

SN	International Instruments/Commitments	Date of Signature (A-amended, R-Rectify)
1	Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, 1963	7/10/1964 (R)
2	Statute of the International Atomic Energy Agency, 1957	8/7/2008 (A)
3	Convention on the World Meteorological Organisation, 1873	12/8/1996 (A)
4	Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar), 1971	17/12/1987 (A)
5	Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973	18/6/1975 (A)
6	Vienna Convention for the Protection of the Ozone Layer, 1985	6/7/1994 (A)
7	Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal, 1989	15/10/1996 (A)
8	Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, 1990 Copenhagen Amendment to the Montreal Protocol, 1992 Montreal Amendment to the Montreal Protocol, 1997 Beijing Amendment to the Montreal Protocol, 1999	6/7/1994 (A) 6 /7/1994 (A) 18/5/2012 (A) 18/5/2012 (A) 18/5/2012 (A)
9	United Nations Framework Convention on Climate Change, 1992	2 /5/1994 (R)
10	Convention on Biological Diversity, 1992	23/11/1993 (R)
11	United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification Especially in Africa, 1994	15/10/1996 (R)
12	Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997	16/10/2005 (A)
13	Stockholm Convention on Persistent Organic Pollutants, 2001	6 /3/ 2007 (R)
14	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998	9/2/2007 (A)
15	Instrument of Ratification (Paris Agreement)	01/10/2016

Source: GoN, 2018

### **5.3.3.2 Sustainable consumption within national legislative frameworks on climate change**

The national-level Acts and legislative documents (Table 17) have focused on sustainable measures towards climate change adaptation, in which sustainable consumption has been considered as one of the key strategies.

#### **The National Adaptation Plan (2021-2050)**

The NAP (2021-2050) has been formulated in Nepal, and approved by the Council of Ministers, GoN on 28 October 2021. The document has duly considered the specific needs, options, and priorities of Nepal; utilisation of the services of national, provincial, local, and community-based entities; and promotion of ecosystem health. In addition, NAP has also emphasized on the participatory, gender-responsive, socially inclusive, and policy-coherent principles and NbS that align with sustainable development objectives, policies, plans and programmes. One of the priority adaptation programmes according to the NAP includes developing integrated settlement and urbanisation models that apply NbS policy interventions to reduce risk.

**The Second Nationally Determined Criteria (NDC, 2020):** Nepal also submitted the second NDC, in December 2020, according to which Nepal's longer-term *Low Greenhouse Gas Emission Development Strategy* has the vision of achieving socio-economic prosperity by building a climate-resilient society. The strategy aims to achieve net-zero greenhouse gas emissions by 2050 (NAP, 2021-2050). Some of the targets mentioned in the NDC include (i) by 2030, adopt low-emission technologies in major industries that generate greenhouse gases (for example, brick and cement industries) to reduce coal consumption and air pollution, including through the development and/or enactment of emission guidelines; (ii) develop and implement adaptation measures based on circular economy and sustainable resource use; (iii) afforest/reforest viable public and private lands, including agroforestry; and (iv) raise awareness and implement capacity building activities.

**The Fifteenth Plan of Nepal (2019/20-2023/24):** The fifteen periodic plan of Nepal (GoN, 2020) calls for cities and human settlements to be inclusive, safe, sustainable, and resilient. Nepal's urban population has grown rapidly over the past two decades (MoFALD, 2017). For the period 2014- 2050, Nepal is expected to be among the top ten fastest-urbanising countries in the world (UNDESA, 2014). The fifteenth periodic plan of Nepal (2019/20-

2023/24) acknowledges the need to balance infrastructure development and ecosystems, recognising the need for climate-resilient and environment-friendly ecosystem development. Some of the very important things highlighted by the plan regarding climate adaptation and consumption include the following:

- Promotion of green jobs, green enterprises, and nature-based tourism.
- Planned, environment-friendly, disaster-resistant, safe, inclusive, infrastructure-focused.
- Promoting economically dynamic ways of city planning.
- Development of urban corridors and pollution-free urban environment.
- Preservation, promotion and sustainable utilisation of agricultural biodiversity.
- Encouraging local governments to guarantee programmes and budgets for climate adaptation and resilient technologies to enhance farmers' capacity to cope with climate change.
- Declaration of organic farming areas for the promotion of organic farming, including the use of organic fertilizers produced from biogas and other sources.
- Development of local-level climate adaptation plans.
- Promote food-green cities.
- Promote greenery in at least 10% of land under their jurisdiction by the local governments; and
- Promote green and public places in a planned manner.

The concept of sustainable consumption at the individual or household levels and sustainable lifestyles have not been mentioned. Nevertheless, many of the points mentioned above indicate sustainable consumption. The document acknowledges that achieving longer-term, effective and economically viable adaptation plans requires sustainable consumption such as the use of cleaner energy, promotion of organic farming practices, promotion of green food and increasing greenery, among others.

**National Climate Change Policy, 2019:** Climate change policy envisions “a country spared from the adverse impacts of climate change” (pp. 5) showing strong linkages between natural resources conservation and socio-economic dimensions. It also provides the overarching policy direction on climate change for the country. The climate change policy developed in 2011 was reviewed to include new and innovative components in 2019,

which has the goal of contributing to the socio-economic prosperity of the country by building a climate-resilient society. Among others, the strategy has the objective to conduct research, make effective technology development and information service delivery related to climate change; and protect the health of deteriorating ecosystems from the impact of climate change. The policy acknowledges the role of households and communities in reducing greenhouse gas emissions and recommends sustainable ways of consumption such as diversified kitchen gardens, multi-use water systems, maintenance of greenery along the roadside, reducing emissions from the transportation sector, etc.

**National Urban Development Strategy (NUDS), 2017:** The NUDS has the “*Vision 2031: Balanced and Prosperous National Urban System*”. It seeks to promote environmental, social and economic sustainability of urban development. This means that urban development initiatives should be environmentally sustainable, i.e., should not have a negative externality and should not over-stretch the capacity of the environment to sustain itself. It acknowledges that a sustainable, inclusive, resilient, and green city can only be one that is efficient, well-governed, and effectively managed. NUDS focuses on three basic concerns of governance: enhanced capability and technical competence of local bodies, institutionalisation of a system of transparency and accountability in the urban planning and development process, and a citizen-oriented delivery of services and development outcomes.

The strategy also highlights the strengthened production-distribution-consumption linkages between urban and rural areas. It acknowledges the gaps in the hierarchy of provincial and regional urban systems and strengthens the provincial and regional flow of goods and services for a balanced national urban system, as acknowledged by the strategy. For this, the strategy seeks to promote and facilitate rural-urban value chains, promote innovative, economic and environment-friendly buildings, and promote the use of solar energy.

**The Nepal National REDD Strategy** was introduced to reduce greenhouse gas emissions from deforestation and forest degradation. The GoN prepared the Readiness Preparation Proposal (R-PP) and submitted it to the Forest Carbon Participation Facility (FCPF) in April 2010 and was endorsed by the FCPF Participants Committee in June 2010. At the national and international levels, Nepal has committed to reducing emissions by addressing

the drivers of deforestation and forest degradation and is actively engaged in the REDD readiness and implementation process. This process is an important step towards the decentralisation of forest management, strengthening of community-based forestry and resource use, enhancement of non-carbon benefits and recognition of customary practices. This strategy provides guidance to address the drivers of deforestation and forest degradation, such as the consumption pattern of natural resources, which ultimately improves the carbon sink capacity of Nepal's forests (MoFE, 2018).

### **5.3.3.3 National efforts on sustainable consumption as part of climate actions**

Nepal has been implementing several interventions related to climate change management ever since it became a Party to the UNFCCC in 1994. Likewise, the Alternative Energy Promotion Centre (AEPCC) has initiated activities relating to clean development mechanism (CDM) by establishing a climate and carbon unit. The LAPA and its implementation frameworks have been developed that seek to support the local governments in designing plans and programmes that are climate-affirmative, such as sustainability in consumption. Community-based adaptation plans are also being implemented at the community level with the support of various community organisations, civil society, private sector and other institutions. Being a party to the Kyoto Protocol, Paris Agreement, Sendai Framework and Sustainable Development Goals, Nepal has been utilising the opportunities created in the international arena as per the national needs and has been fulfilling its obligations accordingly (Table 17).

At the institutional level, the GoN introduced the Climate Change Council in 2009, the Multi-stakeholder Climate Change Initiatives Coordination Committee (MCCIC)-established in 2010, and the Climate Change Coordination Committee in 2011. The GoN also introduced a climate change budget code during the 2012–13 fiscal year. The National Planning Commission (NPC) has been using a climate change budget code. By 2016, government estimates showed that almost 20% of the budget allocation was directly or indirectly addressing climate change, including both adaptation and mitigation (MoFE, 2018). Nepal has also been successful in accessing climate finance from mechanisms under the UNFCCC, including the Least Developed Countries Fund (LDCF) and the Adaptation Fund.

Available data reveals that more than 80% of property loss due to disasters is attributable to climate hazards, particularly water-related events such as floods, landslides, and GLOFs. Water-related disasters claim more than 300 lives a year, displace people, and destroy homes, farmland, and other essential infrastructure (Bishowkarma, 2017). In August 2017, 18 districts in Nepal’s Terai region were severely affected by floods (GoN/NPC, 2017), which affected almost 1.7 million people. At present, **Nepal’s longer-term development vision** is guided by the SDGs. A roadmap has been developed for achieving these global goals, laying out concrete and specific targets for Nepal’s development progress by 2030. The priority adaptation programmes under the roadmap include developing *Integrated Settlement and Urbanisation Models for Climate Risk Reduction and Supplying Climate Adaptation Services* through NbS and policy reform.

**Table 17: List of national level legal frameworks and documents related to climate change and NbS**

Sectors	Name of Document	Published year	Category	Publisher
Development	15th Five-Year Periodic Plan	2020	Policy and strategy	NPC
	SDGs Status and Roadmap: 2016-2030	2018	Report	NPC
	Needs Assessment, costing, and financing strategy for SDGs	2018	Strategy	NPC
	International Development Cooperation Policy	2019	Policy	MoF
Conservation and Development	The Nature Conservation-National Strategic Framework for Sustainable Development (2015-2030)	2015	Framework	NPC
Finance	Intergovernmental Fiscal Management Act	2017	Act	GoN
Finance and Climate Change	The Future for Climate Finance in Nepal	2011	Report	NPC, UNDP, UNEP
	Climate Change Budget Coding Guideline: Criteria and Method	2012	Guideline	NPC
	Green Climate Fund Handbook for Nepal	2017	Framework	MoF
Natural Resource and Finance	National Natural Resources and Fiscal Commission Act	2017	Act	Law Commission /GoN
Environment	Environment Protection Act, 1997	2019 (Revised)	Act	Law commission/GoN
	Environment Protection Regulation, 1997	2020 (Revised)	Rules	MoFE
	Nationally Determined Contributions	2020 (2 <sup>nd</sup> )	Report	GoN



	Nepal's Long-Term Strategy for Net Zero Emission	2021	Strategy	GoN
Climate Change	National Adaptation Programme of Action	2010	Framework	
	Climate Resilient Planning: A tool for long term climate adaptation	2011	Plan	NPC
	National Climate Change Policy, 2011	2019 (Revised)	Policy	MoLJPA/GoN
	National Framework for Local Adaptation Plans for Action, 2011	2011	Framework	MoE
	Climate Public Expenditure and Institutional Review	2012	Report	UNDP, ODI
	Economic Impact Assessment of Climate Change in Key Sectors in Nepal	2013	Report	MoSTE
	National Adaptation Plan, 2021-2050	2021	Plan	GoN
Climate and Disaster	Vulnerability and Risk Assessment and identifying adaptation options: Summary for policymaker	2021	Report	MoFE
	National Framework on Climate-Induced Loss and Damage	2021	Framework	MOFE
Agriculture	Agriculture Policy, 2061	2005	Policy	Law Commission /GoN
	Agriculture Development Strategy (2015-2035)	2015	Strategy	MoALD
Urban	National Urban Development Strategy (NUDS)	2017	Strategy	MoUD
Forest	Forest Act, 1993	2019 (Revised)	Act	MoFE/Law commission
	Forest Policy, 2000	2019 (Revised)	Policy	MoFE
	Forest Sector Strategy (2016-2030)	2015	Strategy	MoFE
Wetland	National Ramsar Strategy and Action Plan, Nepal	2018	Strategy and Action Plan	MoFE
Disaster	National Policy for Disaster Risk Reduction	2018	Policy	MoHA
	Disaster Risk Reduction National Strategic Action Plan (2018-2030)	2018	Action plan	MoHA/GoN
GESI	GESI Strategy and Action Plan	2021	Action Plan	MoALD/IFAD

*Source: Author's construct based on the resources available in various ministries, December 2022*

Almost all the Acts, policies and legal frameworks related to natural resources management and biodiversity conservation put emphasis on the sustainable use of natural resources. Strict protection of natural resources in any form without sharing the resources with people and without engaging them in management would lead to human-nature conflict (Bhatta,

Koh and Chun, 2010). In addition, only having policies and Acts does not automatically lead to sustainability outcomes, the GoN should put efforts to raise awareness within the government itself and among the public.

A study conducted by Yadoo and Cruickshank (2012) recommended for promoting climate change strategies through renewable energy technologies, multi-stakeholder engagement and capacity-building efforts, which appears to be lacking in the context of Nepal. The Agriculture Development Strategy (ADS) (2015-2035), for example, presents a deep analysis and proposes actions on sustainable consumption and production; and acknowledges that the strategies should be designed based on the geographical nature of the supply chain from production areas to the export destinations (GoN/MoAD, 2016). This, however, does not seem to have been realised in practice at the local level. My argument here is that conservation outcomes have always been linked with their uses at the people's level. Moreover, the state of mind largely depends upon awareness, knowledge, education, and access to information (Wang et al., 2020).

### **5.2.3.3 Initiatives by development organisations on climate change adaptation**

**The EbA in Mountain Ecosystems:** This project was implemented by UNEP, UNDP and IUCN and funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). It was one of the UNEP EbA flagship projects and the first of its kind in Nepal. Its objective was to strengthen the capacities of Nepal, Peru and Uganda to promote EbA options in their adaptation strategies. Being implemented by the Ministry of Science, Technology and Environment (MoSTE) and the Ministry of Forest and Environment (MoFE), this project focused on developing as well as applying the methodologies and tools for mountain ecosystems; piloting EbA interventions at various levels and supporting the development policies and programmes on EbA at a national level (UNEP, 2015). It focused on enhancing the learning curve of local and national institutions as well as transferring the knowledge and experience of increasing ecosystem resilience through EbA. Previous studies focused on EbA, mainly from this project show a limited basis to ensure the sustainability of this project and projects of such kind. They are shorter-term, people's longer-term behaviour and livelihood are less prioritised and the learnings are less replicated in other areas with similar environmental settings (Bhattarai et al., 2021).

**Enhancing capacity, knowledge and technology support to build climate resilience of vulnerable developing countries project is funded by GEF/SCCF; popularly known as *EbA South Project*.** The National Development and Reform Commission (NDRC) of China, through the Institute of Geographic Sciences and Natural Resources Research (IGSNRR), is the executing agency for this project. The main aim of the project is to build climate resilience using EbA in the Least Developed Countries (LDCs) and Small Island Developing States (SIDS) in the Asia-Pacific region and Africa. The project was implemented in the Africa and Asia-Pacific regions and three pilot countries: Seychelles, Nepal, and Mauritania. In Nepal, the project mainly focused on community-based watershed restoration in Lamjung (UNEP, 2022).

While this project has strongly acknowledged the need for engagement of multi-stakeholders and consultation at various levels, the focus was only on designing nature conservation activities. It did not have any activities on citizen's consumption patterns and targeted interventions on sustainable behaviour; and as such no indicators were designed to measure the effectiveness in terms of people's consumption.

**Catalysing Ecosystem Restoration for climate resilient natural capital and rural livelihoods in degraded forests and rangelands:** Also called as EbA II, this project is being implemented between 2019-2022, by MoFE, climate change division in three districts of Nepal (Achham, Salyan, Dolakha). The expected result areas include: (i) enhance institutional capacity on EbA; (ii) improve policies and strategies to enhance EbA programmes; (iii) restore forest and rangeland through EbA; and targets to reach 56,170 people from 11,453 households (MoFE, 2020). The project expects to monitor the success of the project through changes in the behaviour of various stakeholders (MoFE, 2023) because of the project, this however, has not been elaborated.

**Nepal Climate Change Support Programme (NCCSP):** Funded by FCDO, (then DFID), between 2013 and 2017, NCCSP was implemented in 26 local government bodies of 14 districts of Western Nepal with a major focus on climate and disaster risk management, environment, and energy. This was the first largest intervention of its kind on climate change adaptation in Nepal, which was extended until 2020 with an additional 12 local

governments. The project benefitted 84,443 people (NCCSP, 2020). While the project largely focused on infrastructural development as the climate mitigative measures, it also claims to have enhanced the livelihood of poor and socially disadvantaged people from the project area, it did not have any indicators regarding the consumption pattern or the pro-environmental behaviour of people (UNDP, 2023).

**Building Climate Finance Capacity in Nepal:** This project was implemented between December 2019 and December 2022 as the second phase of NCCSP, which was focused on investing in green infrastructure and improving the local government's capability to distribute climate funds. By equipping government stakeholders with the financial systems and knowledge to make climate-smart investments, the project intends to improve citizens' access to public services and resources that avert the worst effects of recurrent weather shocks. This project built on and bought-in the thrust of EbA projects introduced in 2011 in Nepal and was considered Phase II of NCCSP. The project, however, did not consider the budget for a wider level of awareness generation and knowledge on sustainable consumption and lifestyles, which will have an ultimate impact on greenhouse gas emissions.

**Urban Ecosystem-based Adaptation for climate-resilient development in the Kathmandu Valley, Nepal:** The first of its kind, Urban EbA is being implemented in Kathmandu, Lalitpur and Bhaktapur Districts of Kathmandu Valley, by UNEP through the Kathmandu Valley Development Authority since 2022, with a target of reaching 82,000 people directly. This project seeks to develop technical guides and policy briefs to mainstream urban EbA, improving the knowledge base of EbA through awareness-raising programmes and implementing urban EbA interventions on the ground, such as rehabilitating and restoring ecosystems and establishing urban green spaces. This project has three objectives: (i) increase the capacity of the local and federal government to integrate EbA into development planning; (ii) enhance local communities' knowledge and awareness of EbA; and (iii) support local communities to adopt EbA approaches to reduce impacts from climate change (Adapted from UNEP, 2022).

**The Hariyo Ban Nepal ko Dhan (Hariyo Ban) Programme:** This project was funded by USAID and was implemented by the development organisations -CARE, WWF, National

Trust for Nature Conservation (NTNC) and Federation of Community Forest Users Nepal (FECOFUN). This five-year project was designed to help communities build resilience to the adverse effects of climate change and improve the livelihoods of Nepal's most impoverished communities. At the end of the project, the project was able to enable nearly 163,000 of the poorest and most vulnerable people to build the resiliency they need to thrive by preserving biodiversity, mitigating greenhouse gas emissions, adapting to a changing environment, and sustainably managing their natural resources. As the project was hugely focused on people's participation and longer-term livelihood development of vulnerable populations, the project attempted to bring behavioural change among the beneficiaries on the use of natural resources.

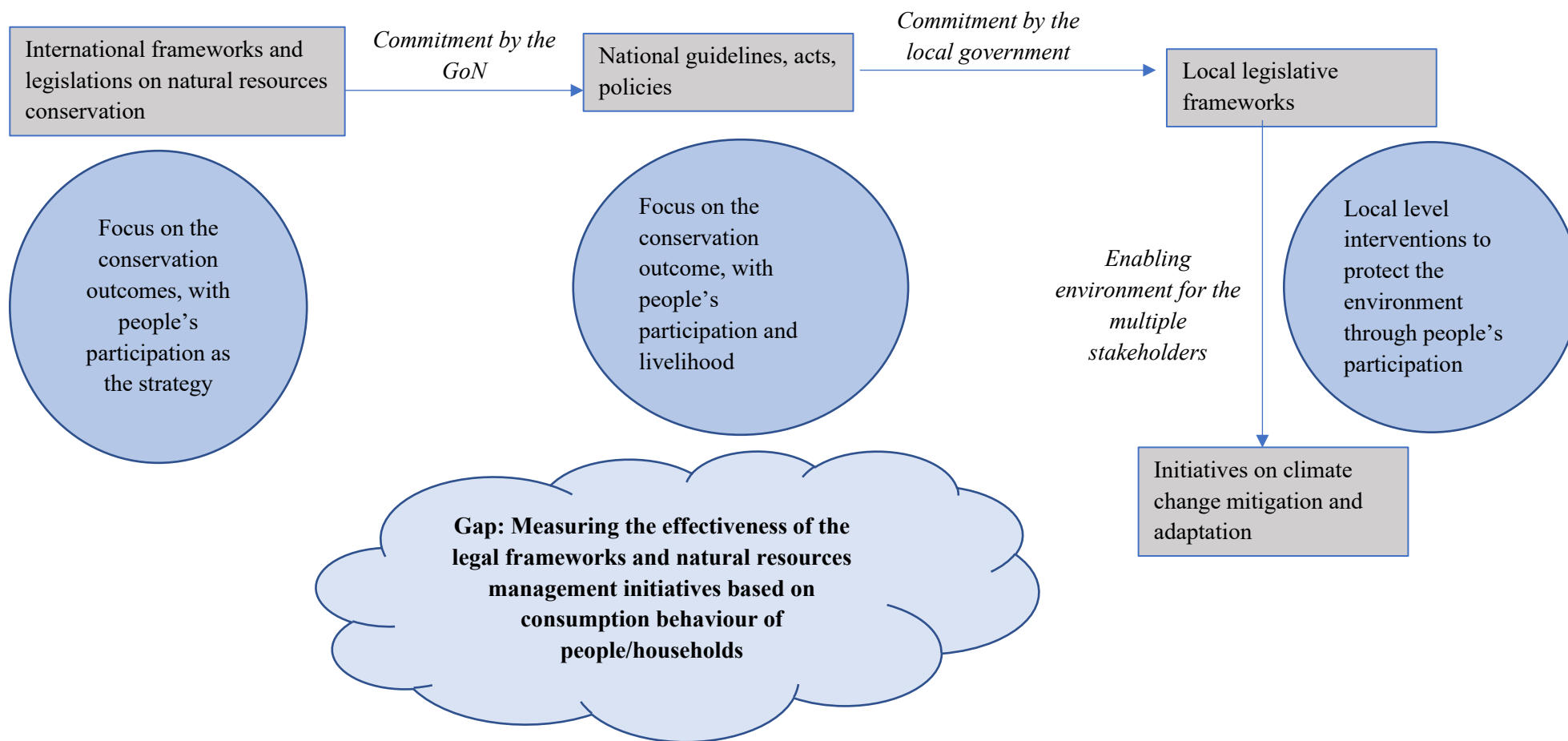
The **Cities and Climate Change Initiative (CCCI)**, coordinated and implemented by UN-Habitat, is the flagship programme of the Sustainable Urban Development Network (SUD-Net). It brings together multiple stakeholders including local and federal governments, academia, NGOs and international organisations with the objective of strengthening their capacities to respond to climate change. As part of this project, CCCI promoted urban and peri-urban agriculture in three cities in Burkina Faso, Nepal, and Sri Lanka to ensure food security among the urban poor; while at the same time combatting impacts from climate change in the urban areas. In the longer run, this initiative focuses on participatory planning, sustainable urban planning, responsive leadership, and practical initiatives at multiple levels. Some direct and indirect initiatives to promote sustainable consumption have been introduced by this programme.

The **Urban Agriculture and Climate Change (UACC)** initiative was supported by UN-Habitat and the Resource Centres on Urban Agriculture and Food Security (RUAF) Foundation. UACC has the mandate to integrate Urban and Peri-Urban Agriculture and Forestry (UPAF) in policies for development in three major cities including Kathmandu. UACC is supporting a local NGO – the Environment and Public Health Organisation (ENPHO) – to promote productive rooftop gardens, rainwater harvesting and recycling of organic household waste using climate-smart technologies. This project coordinated with this initiative to avoid duplication and promote the complementarity of project activities (UNEP, 2014).

**EU SWITCH Asia Programme in Nepal:** Funded by the European Union, there are some smaller-scale and shorter-term projects implemented by the development organisations (national and international INGOs) that are focused on sustainable consumption and production. These projects have been implemented since 2007 in Asia. However, they are very specific and perform in isolation with learnings less disseminated to a wider public for replication. Some of the major areas of intervention including the circular economy (mainly waste recycling), conservation of natural resources, sustainable lifestyles, and sustainable fashion, among others. The **Grant Scheme Component** targets micro, small and medium-sized enterprises (MSMEs), business organisations, industries, retailers, chambers of commerce, national clean production centres, universities, NGOs and consumer organisations willing to test and adopt cleaner and more sustainable production processes, improve the sustainability of their products and change their consumption behaviour (EU, 2023).

In practice, the concept of sustainable consumption by individuals, households and communities is not new in conservation-related initiatives. This is seen in the international frameworks, national legal frameworks, local level guidelines and strategies and the initiatives designed as well as implemented. However, the emphasis is on the conservation and protection outcomes, and therefore the effectiveness is measured on that basis. Sustainable consumption behaviour has not been indicated as an effective outcome, which should be the longer-term target in principle (Figure 52).

**Figure 52: Place of sustainable consumption in legal frameworks and initiatives**



Source: Author's construct based on the review of past projects focused on legislative frameworks

### 5.3.4 People's understanding of pro-environmental consumption behaviour and nature conservation

The legislative frameworks and the flagship climate adaptation projects implemented until and within the period of this research show very little consideration of the concept of sustainable consumption at individual and household levels, while a bit higher acknowledgement is made of the application of NbS/EbA. Building on the same and to substantiate the argument further, this section presents people's perspectives, regarding the knowledge and understanding of people on sustainable consumption, and how are they possibly translated into nature conservation efforts.

The respondents were asked if they knew the benefits of using the bicycle and growing their food, as their major lifestyle-changing initiatives. All the respondents in urban and 99% in peri-urban believed that the use of bicycles had multiple co-benefits on health and the environment. Similarly, 93% of respondents in urban knew the environmental benefits of growing their food. In peri-urban, a comparatively lower percentage knew the environmental benefits of growing their food (77%) and they grew their food as they had no choice. On the contrary, the FGDs from peri-urban were livelier during the discussion on the co-benefits of growing their food, thereby giving the sense that the people in peri-urban are more aware of this matter (Box 6).

***Box 6: Growing our own food reduces cost, keeps us healthy, protects the traditional crops and protects nature***

Majority of the people (both in urban and peri-urban) are highly dependent upon the Indian Market for food and income. One of the very good lessons taught by COVID-19 related lock-down is about growing own food and maintaining the kitchen garden. Many people have started growing vegetables at least for their own purpose and people are happy to have their own organic food. Urban people are always dependent upon the market if they don't grow their own food. However, if they grow, their dependency is lower, and they always get fresher and cleaner food. At the same time, in peri-urban, support received from the family members and neighbours is higher, so that the household is more encouraged to practice farming. These days, people are encouraged to protect the traditional varieties and try them in their farm.

*Source: FGD, Gaddachaur and Tiken, Bheemdatt-10, September 2022*



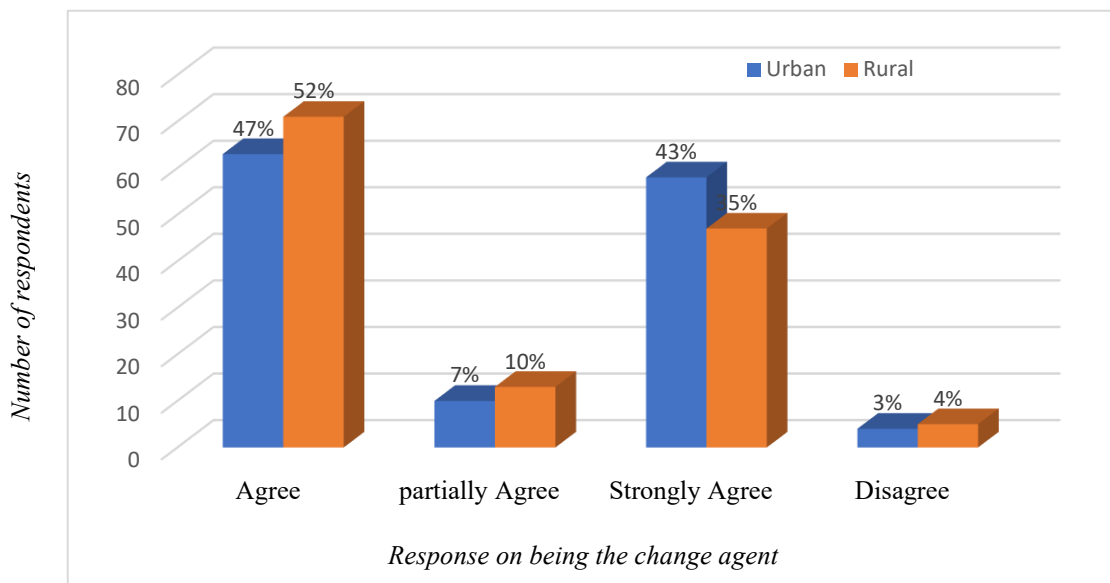
Pro-environmental behaviour as indicated in the previous two chapters, is mainly related to the level of education, peer-pressure, and some other demographic factors such as age, gender and occupation. Upon explaining well, the respondents were able to give some examples of pro-environmental behaviours and nature conservation separately. However, understanding them in conjunction and together was a challenge in the study area. Previous studies too, have hardly considered the two areas as overlapping and integrated. For example, several studies have been conducted on pro-environmental behaviours (Hoque, 2014; Shittu, 2020; Carrero, Valor and Redondo, 2020), but no mention of nature conservation has been made despite the concept being obvious.

#### **5.3.4.1 Being the change agent for sustainable transport**

The concept of a change agent or role model is not straight forward to understand. Therefore, the respondents were explained about the concept and asked if they believe, they can be the change agents in shifting the mode of transport, to reduce air pollution. More than 90% of the respondents in urban agreed (47% agreed and 43% strongly agreed), 7% partially agreed and 3% did not agree that they could be the change agents. Those who disagreed believed that being a change agent requires time, energy, and financial resources (Figure 53). In addition, they also believed that this is the agenda of developed countries and wealthy people in developed countries, which may not be practical for poorer households. This information was also raised during the KII (Box 7).

Being a change agent can simply refer to being able to influence one's family member, neighbour or friend on the sustainable mode of transportation. As presented in chapter 4.1, peer pressure plays a significant role in an individual's consumption pattern. Previous studies have given several examples of individual influence (both positive and negative) on the use of sustainable modes of transport (Luo, Guo and Zhan, 2022; Khoo and Ong, 2015; Feygin and Pozdnoukhov, 2018), which contradicts the findings of this study.

**Figure 53: Level of agreement on being a change agent by shifting the mode of transport**



Source: Household survey, September 2022

**Box 7: Changes in the mode of transport with time**

Previously, the means of transport used was bull carts, human held carts, and bicycles. In addition, the access roads were not well developed, and people did not have access to distant market/services for selling produces, health facilities, education and even job. However, due to the better road connections among the bigger and smaller market centres/service centres and also the availability of more modern and faster means of transport, vehicles such as motor bikes, cars, bus, trucks, tippers, tractors are in use now. Even the farmers have become more advanced and use tractors to plough the land. Recently, the transportation reached to the different parts of villages and up to India (Delhi). Therefore, using bicycles slows down the development pace, reduces economic activities and kills time of students and jobholders.

Source: KII, Bheemdatt-4, October-November 2022

Lind et al. (2015) in their study in six urban areas in Norway gave an interesting finding that people with high income and females used more public transportation and bicycles compared to male members of the society and those with comparatively lower income. This was mainly associated with the level of knowledge and awareness of health as well as the environment. Another similar study in Argentina also confirmed that individual knowledge

and consciousness of biospheric benefits and altruistic value have an important role to play in supporting the policies on reducing car usage (Jakovcevic and Steg, 2013). They also argue that strengthening personal norms, such as through awareness-raising activities can lead to higher acceptability and intention to reduce car use and promote the use of more environmentally friendly mode of transport such as cycling. Schneider (2013) also found similar findings that in addition to awareness and knowledge enhancement, an individual should be assured of their safety and security through a separate cycling lane, reduced cost and subsidy to the bicycles, create an environment where people enjoy the bicycle, and encouraging people to make sustainable transport choice a habit. These examples are, however, mainly from the developed and middle-income countries, the context might not be relatable to the context of Nepal. Overdoing the promotion of bicycles can sometimes be also taken as an anti-development effort.

While sustainable transport planning can already include nature conservation as one of its objectives, adopting a sustainable mode of transport can reduce further environmental degradation. Local people from the study area are less informed of this situation and is less explored. The experts' consultation workshop confirms that achieving changes of this sort requires continuous and persistent effort from the government side. This includes punishments, subsidies, the introduction of school-level curriculum, intervention of various scales and regular dialogues.

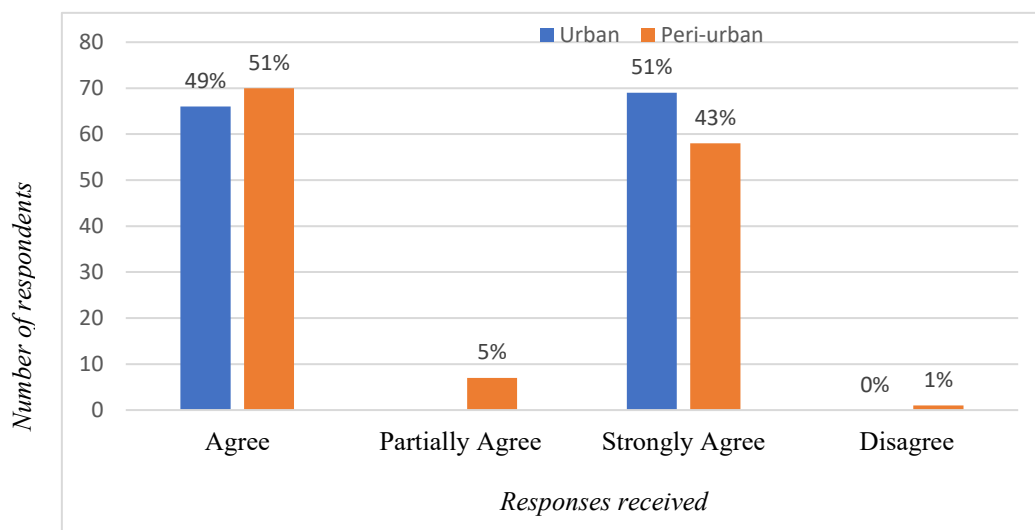
#### **5.3.4.2 Consuming less and reducing food waste**

With a population of 30.3 million in 2022, Nepal stands 143<sup>rd</sup> in the HDI out the 191 countries, with 25% of the children within the age bracket of 0-59 months malnourished (WFP, 2023). Nepal is going through fundamental structural shifts mainly after the restructuring, which will change the nature of food security and nutrition in the country, their effects and how they are addressed in the years to come.

With the scenario of rapid urbanisation, the food insecurity dynamics are likely continuously changing mainly in urban areas. Moreover, Province 7 (study area) has some of the growing cities in Western Nepal and is the second most food-insecure Province of Nepal. In this context, talking about sustainable consumption of food and food waste was quite challenging and sensitive at times, mainly during the household survey. Despite this,

almost all the respondents in urban areas agreed that consuming only when required and reducing food waste can contribute to sustainability. More than 90% of respondents in the peri-urban strongly/agreed to the same, while 5% partially agreed and 1% disagreed from the peri-urban area (Figure 54). The respondents who disagreed believed that the food wasted by people in such a small area may not contribute to the bigger problem of sustainability. In addition, they also believed that the food, if wasted by human beings is provided to their livestock and therefore, it is not wasted in a true sense.

**Figure 54: People's response on consuming less and reducing food waste**



*Source: Household survey, September 2022*

The KII confirmed that food waste is not an issue in the study area, especially in peri-urban settlements. In urban areas, however, food waste is increasing mainly during celebrations and major social functions such as weddings. Nepalese people are cultured to prepare more food and offer a variety of items during such events, and people tend to serve themselves more than required ending up with food waste. Therefore, sensitisation on food waste is more relevant and important in the urban context. This will automatically reduce unnecessary use of water, energy used in cooking and storing the extra food, and other resources involved in the preparation as well as storage of food.

Food waste has been increasingly reported mainly in developing countries, where food insecurity among the larger population still exists. Recent studies show that Central and Southern Asia represent the highest food loss (UNCRD, 2022) despite the situation of food

insecurity. Awareness and knowledge on the harmful impact of over-consumption, under-consumption, maintenance of healthy body weight and eating healthy is very urgent in the study area. It is also important to note that loss of cooked food is not only an issue, rather ready-to-harvest crops are lost on an annual basis because of disaster events such as floods and droughts. Traditional methods of crop handling, food waste management and resource management are potential areas of awareness raising and promotion (Box 8).

***Box 8: Traditional ways to reduce food waste***

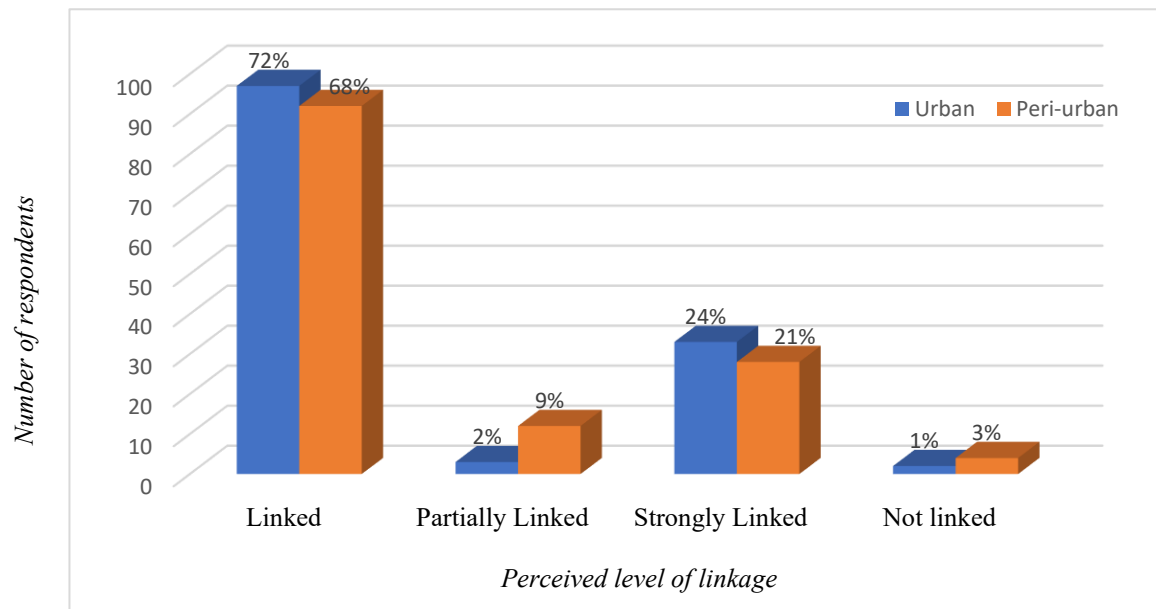
In peri-urban areas, cooked food is never wasted. First of all, we do not cook extra unless that is required, and we cook on a daily basis. Extra food from breakfast is used to lunch and lunch to dinner. We also have a practice to give extra food to our livestock as most households have at least few livestock. The water used for washing dishes are automatically used in kitchen garden to grow green vegetables. Similarly, almost all of us produce manure at home, therefore, kitchen residues are also used to produce the manure.

*Source: FGD, Gaddachaur, Bheemdatt-10, September 2022*

#### **5.3.4.3 Promoting the use of urban green parks**

The respondents in the study area believed that there was a direct link between urban green parks and adaptation to climate change. More than 70% of respondents in the urban and 68% in the peri-urban areas expressed that they see the link, while 24% in the urban and 21% in the peri-urban saw strong link between the parks and adaptation. A nominal respondent in urban (1%) and peri-urban (3%) however, had the opinion that there was no linkage (Figure 55).

**Figure 55: People's response on the link between urban green parks and climate change adaptation**



*Source: Household survey, September 2022*

The concept of developing urban green parks is increasing in Nepal when linked to climate change adaptation. The open spaces in the middle of the town and cities were traditionally in practice; and were used mainly for social gatherings, mitigation of impacts of natural hazards (such as during earthquakes), partying, etc. During the FGD (22 September 2023, Tiken, Bheemdatt-10), people also mentioned that conservation efforts are stronger when they are tied well with the religion, culture, and values of people. For example, there are certain plants, forest patches, animals and ponds, that are protected and kept clean for religious purposes. Such plants can be planted in urban parks to enhance their value and encourage usage. It is better when such practices are promoted by combining them with awareness-raising activities for climate change adaptation.

Also considering the examples and findings presented in the previous two chapters: 5.1 and 5.2, understanding anything in silo and as one entity is common in the study area. Moreover, the previous chapters indicated that people are aware of the concept of urban green parks for recreational purposes. However, connecting the use of urban green parks to climate change adaptation is still weak, and some reluctance among the communities still exists regarding the use of urban parks (Box 9). This indicates that knowledge and

education that have been disseminated in various formal and informal forms have been shorter-term and less focused on the impact urban green parks can have.

***Box 9: Reluctance on the use of urban green parks***

“My experience shows that people who do not use the parks are afraid of getting in contact with the drug addicts and drug sellers who used the parks as their destination points in the past. This made the parks unsafe for many people, mainly youths (especially girls). In order to promote the use of parks more and more, free entry in the morning and evening hours should be made. This helps connect people with the park and they become habituated going to the parks”.

*Source: Ward level government representative, Experts Consultation Workshop, Bheemdatt Municipality, April 2023)*

### **5.3.5 Peri-Urban and Urban interaction for sustainable consumption and effective**

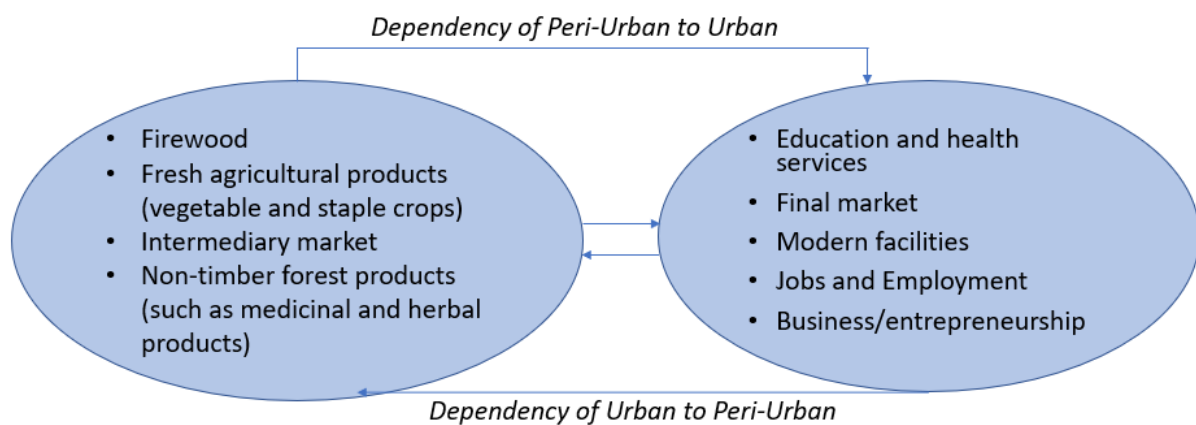
#### **EbA**

Understanding the peri-urban requires a better understanding of the urban and rural linkages, as it connects the two geographies and better explains the dependency. The dependency or the interaction between urban and peri-urban occurs for several purposes such as timber, fodder, NTFPs, water, vegetables, food, parks/forests, milk, and other commodities: construction materials, disposal of waste from urban to peri-urban, off-farm employment, education, etc. Peri-urban areas also serve as an intermediary market or a service centre, which requires attention both from the peri-urban and urban areas for development. To attain the three Sustainable Development Goals SDG11 (sustainable cities and communities), SDG12 (responsible consumption and production), and SDG13 (climate action), the integration of peri-urban studies and their interaction with the rural and urban should be considered.

Citizens living in urban and peri-urban settlements interact with each other on a regular basis and have inter-dependency for the resources available. For example, people living in urban areas prefer visiting parks/open spaces to have the feeling of freshness, openness, and peace. Similarly, people from peri-urban visit urban areas for the resources, services and commodities that are available in urban. In some cases, individuals or family also prefer to live both in urban and rural areas enjoying the benefits of both locations (Schmidt-Kallert, 2009). My study showed that people from urban areas depend upon the peri-urban

for fresh products that are either produced in the peri-urban itself or brought to the peri-urban from rural areas (Figure 56). In such a situation, peri-urban acted as the intermediary market. The market actors of commodities such as vegetables and staple crops from peri-urban were acting as the intermediary actors and provided collection centres with both the products and agricultural inputs required. In addition, firewood, NTFPs, etc. were supplied to urban residents by the peri-urban. Peri-urban residents were found to be dependent on the urban centres for modern food (junks), health and education services, employment, clothes and other modern facilities.

**Figure 56: Urban-Peri-urban interdependency**



*Source: Authors construct based on KII, FGD and Household Survey, September- November 2022*

The key informants believed that ecosystem restoration and protection should not be done in isolation, but rather requires an integrated approach. For example, conserving a wetland requires effort from the government, people who are directly dependent upon the wetland resources and those who visit the wetland just for recreational purposes. Similarly, they also agreed that the urban ecosystem is a complex setting, where multiple stakeholders have a role to play to keep it balanced. As long as the settlements do not act in isolation, they interact and depend upon each other, a balance can be created among the several smaller and larger ecosystems. This supports the findings of the study conducted by Reid et al. (2019) to assess the effectiveness of EbA from 13 projects around the globe including Nepal, who have highlighted that the local/indigenous knowledge when combined with the scientific knowledge has yielded better results to create effectiveness. Moreover, the



induced projects have improved all the ecosystem services (provisioning, regulating, cultural and supporting) in almost all countries.

My findings also support the findings of Baffoe et al. (2021), who in their study from Ghana emphasized that achieving sustainable development of any region requires integrated planning documents and policies that consider multiple aspects- social, cultural, economic, and environmental benefits. Their example in the agriculture sector is relevant to mention, where they indicated that having a strong agriculture policy with value-chain strengthening components without considering the potential pollution issues is of no use.

While the awareness might be increased in urban about buying green products, if the skills and capacity of those producing are not enhanced; then sustainable development cannot be achieved. Forster et al. (2015) have emphasized the food systems where the rural-urban interaction mainly takes place, the reason behind the interaction is food. The United Nations Conference on Human Settlements (UNCHS) in 1976, in Vancouver, Canada emphasized such linkages to establish and acknowledge that no development can be sustainable without effective rural-urban linkages. Although the land conversion from farmland to urban settlements, initially as the peri-urban and then as urban is reducing the food-producing land; the peri-urban still hosts a huge portion of agri-productive land, providing food supply to the urban communities (Forster et al., 2015). This was very much observed in my study area and therefore, the concept of linking urban with the peri-urban makes perfect sense to attain longer-term sustainability in terms of resource use and environmental protection.

Carrus et al. (2015) in their study argued that the availability of open spaces and parks in urban and peri-urban areas motivates citizens to frequently visit and interact with nature; and this results in positive psychological outcomes. Assessment of the existing open spaces and green spaces also helps planning at the various spatial levels and potentially reduces loss and damages due to hazards in urban areas such as flood (Rayan, Gruehn and Khayaam, 2021) and fire. People have generally supported such practices in recent years. Tu, Abildtrup and Garcia (2016) found that people are willing to pay for peri-urban forests as the value of their land and the quality of their life becomes higher when they live near the parks. At the same time, they concluded that the willingness to pay for such forests decreases with the increase in their income as they tend to own their private gardens.

Having said that, people who live in the rented accommodation were more interested in visiting the parks compared to those who owned the house.; which, however, is not the situation yet in my study area. Considering that household income is seen to have a direct association with landholdings at present, future researchers can follow up on this aspect.

### **5.3.6 Integrating induced and autonomous EbA practices for improved effectiveness**

In the context that only three major projects focused on EbA have been implemented in Nepal so far, there is no separate project implemented in Bheemdatt that is branded as an EbA project. Nevertheless, many initiatives that integrate the components of nature conservation, management of smaller ecosystems including community forests and promotion of open spaces and green parks, contribute to reducing green-house gas emissions and promoting climate change adaptation. The respondents gave several examples of practising natural adaptation practices both in the urban and peri-urban areas, more so in the peri-urban areas. They, however, did not know if it was an EbA practice. Many examples the respondents presented were connected to their religion, cultural/traditional practices, and indigenous knowledge. This shows that identifying and continuing such autonomous practices that conserve the natural environment is important together with the planned initiatives by the government and non-government agencies.

These findings are in line with the studies in other countries. Even in developed countries such as Germany, the term “Ecosystem-based Adaptation” is rarely used by the local authorities, even though many municipalities practice and have introduced some of the components of EbA in their planning documents in the form of green infrastructure, urban parks, etc. (Zölch, Wamsler and Pauleit, 2018). The automatic activities that the people have been practising in the study area could be autonomous adaptation practices. Autonomous adaptation is defined as the adaptation that does not constitute a conscious response to climate stimuli, but it is triggered by ecological changes in natural systems and by market or welfare changes in human systems (IPCC, 2007).

This study also noted several practices in the study area, especially the urban such as green parks, kitchen gardens with fruit trees, sheds in the house, raised floors of the houses/infrastructures, etc. From the government side, urban parks/open spaces are allocated. Similarly, the community forests, formation of disaster management committees,

city disaster management guidelines (as presented in the previous chapter) etc. exist that can be considered as good practices from the government side in terms of induced urban EbA practices. These two types of practices- autonomous and induced when combined, can prove to be effective in enhancing climate change adaptation practices.

### **5.3.7 Potential to establish sustainable consumption as the indicator of effective EbA**

In the study area, those people adopting pro-environmental behaviour and practices at the household level were found to be either community leaders and/or environmental activists/activists of nature-based practices such as EbA. For example, people living in the peri-urban area of Bheemdatt engaged in managing the community forestry, were found more aware of the impacts of climate change and possible adaptation options. They were also found to grow their food, use the wastewater in the kitchen gardens, manage the household waste produced and sell the extra products in the local market as one of the socio-economic co-benefits from managing the community forests (Box 10).

The FGDs in all the areas indicated that people in the study area have some level of knowledge about the relationship between consumption patterns and adaptation practices. People knew that the (i) overuse of natural resources can degrade and deplete the environmental condition at the local level; (ii) it disrupts the natural and ecological balance; (iii) wise use of natural resources preserves the resources for future generations; and (iv) sustainable consumption of resources helps use the resources for longer. The participants of the FGD also mentioned that their culture and traditional practices insist them to make wise use of resources and reduce waste as well as pollution. As the discourse and dialogues on sustainable consumption rarely happen at the community level, the community believed the information and research on this topic might have been rarely conducted. Major recommendations made by the community to improve knowledge and practice on sustainable consumption and EbA include (i) government-led awareness raising activities; (ii) collaboration between government and non-government sector; (iii) mainly the tole level (community level) activities; and (iv) mobilisation of experts and educated people in the community for knowledge dissemination and awareness raising.

***Box 10: Relationship between sustainable consumption and effectiveness of EbA***

- There is an inter-relationship between the consumption pattern and conservation/management of natural resources. If we do not balance these things, then the whole human civilisation will be in danger.
- The sustainable consumption/lifestyle reduces the impacts of climate risk. By limiting the use of natural resources, conserving forests, controlling pollution, using renewable energy, using organic fertilisers, and managing the unsettled settlements, we can reduce the impacts of climate risks and promote biodiversity conservation in a longer run.
- Sustainable consumption is also about increasing responsibility towards environment, maintaining sustainability, reducing the impacts of climate impacts (floods and landslide), limiting carbon emission, proper waste management, improving the quality of lifestyle and achieving the sustainable development goals.
- In the area, a proper pre-assessment of the potential projects focused EbA is required, which will help the environmental conservation and human livelihood in a long run. By coordinating and collaborating with local government and other organisations, such interventions should be implemented. Based on the type of interventions, intended changes in people's behaviour should be assessed and encouraged for greater effectiveness.

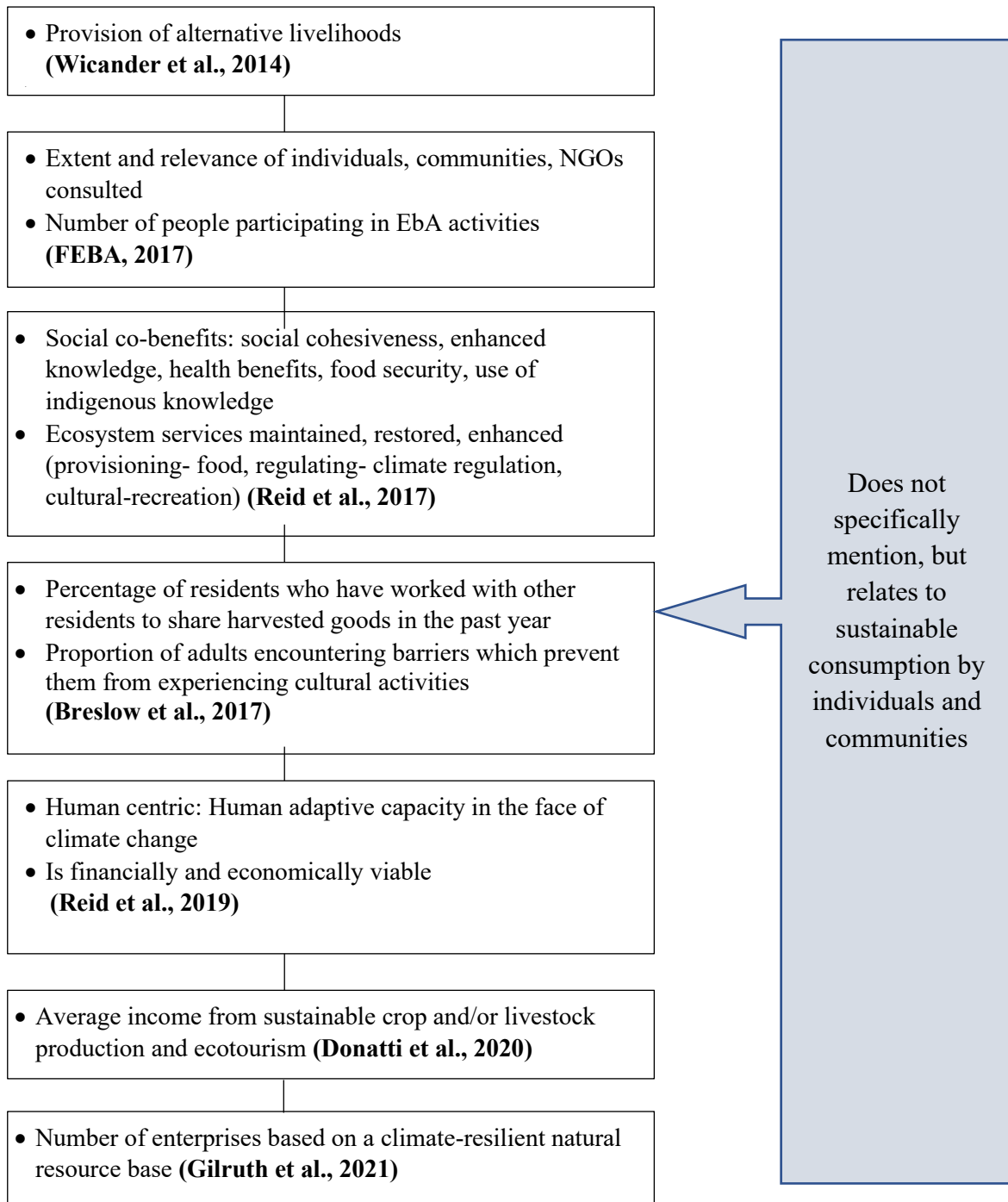
*Source: KII, Bheemdatt-4 and Bheemdatt-10, October-November 2022*

Similarly, the KII also confirmed that people see the relationship between sustainable consumption and the effectiveness of EbA (Box 10). The EbA projects result in enhanced knowledge and awareness among the local people and can be promoted in several ways such as pond conservation, modified farming practices, soil and water conservation techniques, forest protection, local climate water and rangeland management, ways of differentiating degraded from productive land, local practices addressing land degradation etc. (Reid et al., 2019). Ideally, this indicates that the local people have started practicing sustainable consumption practices, while less at the individual and household level.

The available literature presents EbA mainly from the geo-physical and natural perspective, and the use as well as conservation of provisioning, regulating, and supporting ecosystem services have been explored. The use of cultural services and the importance of the same are, however very few. One of the major indicators to measure the effectiveness of EbA is

increased awareness and knowledge of people (Reid et al., 2017; Reid et al., 2019; GIZ, 2018). As a result of improved awareness and knowledge of climate change impacts and wise use of ecosystem services, people should start consuming resources sustainably, and it should be reflected in their lifestyle in the form of sustainable consumption. My argument, therefore, is that sustainable household consumption and lifestyle are indicative of the effective EbA practices, where they exist. Secondly, areas where people have practised sustainable lifestyles or pro-environmental behaviour are likely to promote EbA measures. The findings and arguments are also based on the literature available on EbA projects that have mainly focused on ecological, economic, and less on social indicators. Findings from this study build on the study conducted by Breslow et al. (2017), who proposed social indicators to measure the effectiveness of EbA in addition to the geophysical, economic, and other outcomes that are focused on natural resources management (Figure 57).

**Figure 57: Indicators on the effectiveness of Ecosystem-based Adaptation focusing on sustainable consumption**



Source: Authors' construct based on literature review

### **5.3.8 Chapter Summary and Conclusion**

Despite the linkages between the consumption pattern and climate change adaptation/nature conservation, they are often considered isolated, and the nexus among the two or more relevant areas has not been explored. This chapter attempted to explore the perception of people regarding the linkages within these areas. More specifically, the linkages between sustainable ways of consuming resources and EbA practices were assessed. In this chapter, Nepal's participation in various international treaties/legislative frameworks was studied followed by national-level frameworks that consider sustainability, climate change adaptation and/or nature conservation as the major focus. The major provisions made by the national-level legislative frameworks and policy instruments were assessed to check if they have made any mention of sustainable consumption. Similarly, the chapter also presented some examples of larger projects being implemented in Nepal following the institutional mechanisms. Such projects also included examples of flagship EbA projects, climate change-focused projects and sustainable consumption initiatives implemented by various bilateral organisations, contracting agencies, international non-government organisations (INGOs) and NGOs in Nepal.

The review of legislative frameworks and flagship projects reveals that conservation outcomes have been the focus when measuring the effectiveness of these frameworks and projects. However, the strategies to reach such outcomes are always the people and consideration of the social aspects. The chapter further presented findings on people's understanding of pro-environmental behaviour and its association with nature conservation, people's response to using sustainable mode of transport for the benefit of nature, and people's response to reducing food waste for sustainability. The chapter also presented the association between the use of urban green parks and adaptation to climate change. While there is a very thin line between the urban and peri-urban, their interlinkages and linkage with the rural areas play a significant role in reducing carbon footprints and promoting a circular economy.

The chapter also presented findings on the interlinkages observed in the urban and peri-urban settlements selected by this research. Chapter 5.2 presented several instances where the locals had adopted autonomous EbA practices or locally led adaptation practices. This chapter presented an opportunity to combine such autonomous practices with the induced

initiatives that can be planned well and executed in conjunction. It (focused on theoretical background) provided several indicators adopted to measure the effectiveness of EbA projects. This chapter built on those findings and identified studies on the indicators that might have considered sustainable consumption directly or indirectly. Based on those previous research findings, the focus of the legal frameworks as well as some relevant projects reviewed, I argue that sustainable consumption can be and should be considered as one of the major indicators to measure the effectiveness of EbA.

The next chapter presents the summary analysis of all three chapters focused on results (5.1, 5.2, 5.3) and compares the findings from urban and peri-urban settlements. The comparison has been made in terms of consumption patterns, the knowledge of climate change and EbA, and the potential explored by the research to consider sustainable consumption as an indicator of effective EbA. Moreover, the following chapter will also present an analysis of, how the concept of sustainable consumption as an indicator of effective EbA applies to all kinds of settlements including peri-urban settlements.



## **CHAPTER 5.4 COMPARISON OF CONSUMPTION PATTERN AND ECOSYSTEM-BASED ADAPTATION PRACTICES BETWEEN URBAN AND PERI-URBAN AREAS**

### **5.4.1 Introduction**

This chapter presents a comparison of the major attributes and variables of research between urban and peri-urban areas. Initially, the chapter will present the demographic and sociocultural differences of respondents in both the urban and peri-urban areas, followed by the results of major areas of consumption and influencing factors in consumption patterns in the two locations. The association of consumption sectors (food, transport, recreation) with the socio-demographic factors in both areas has also been presented, along with the difference in results obtained. Furthermore, differences in the two areas regarding the practices of EbA have been discussed. Finally, a summary of adopting sustainable consumption as an indicator of EbA in two settings is explained.

### **5.4.2 Methods**

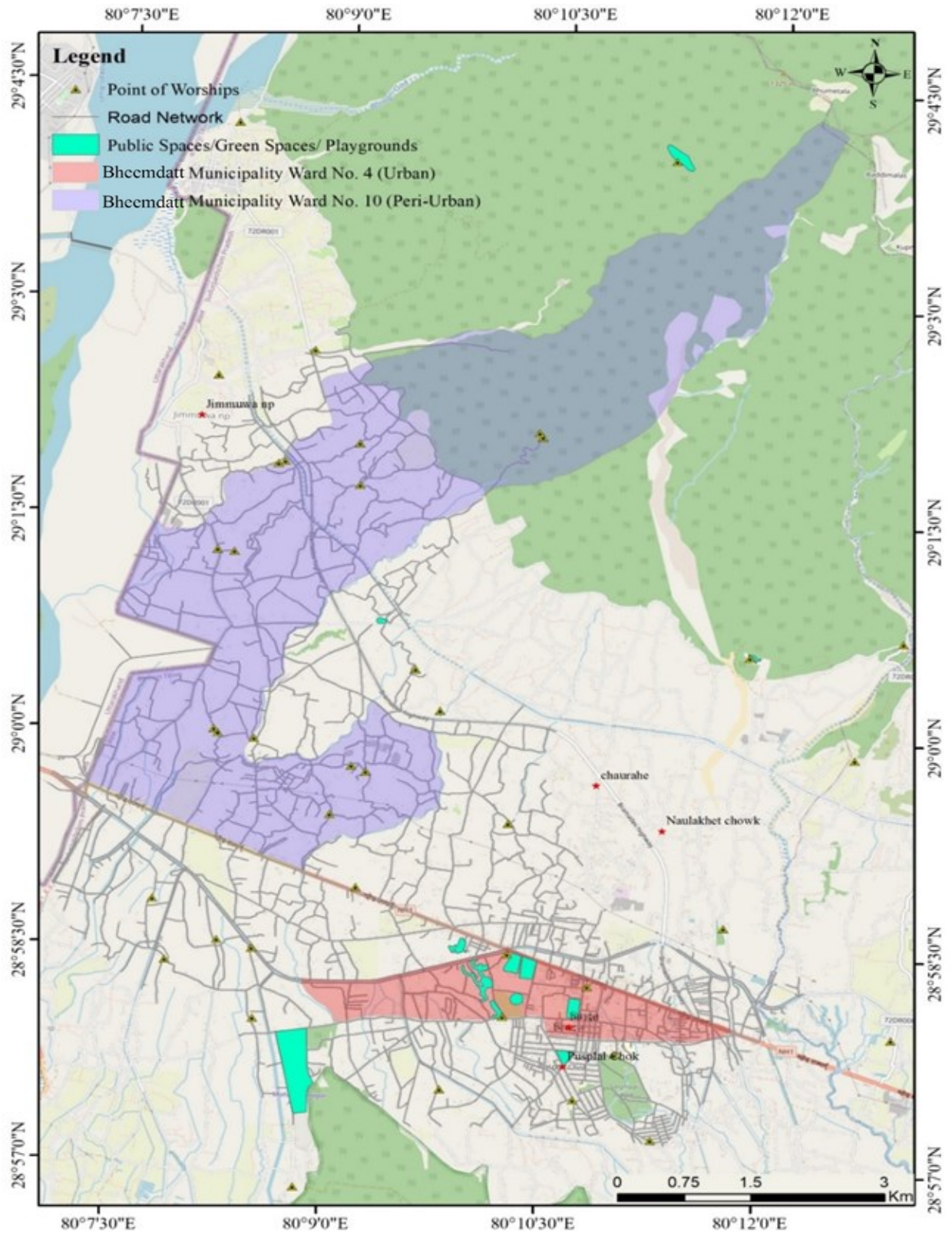
This chapter follows an analysis of the chapters presented in the previous three chapters focused on results and summarizes the findings indicating the differences between urban and peri-urban areas. The comparative results are interpreted and described in this chapter. The hypothesis “*There is no significant difference between the urban and peri-urban areas regarding the household consumption pattern*” has been tested using a Z-test (Z test to compare means and proportions) and the findings are presented. The statistical results were also triangulated using information collected qualitatively through KII, FGD and the expert's consultation.

### **5.4.3 Results and Discussions**

#### **5.4.3.1 Urban and peri-urban settlements**

The urban and peri-urban settlements were selected based on a preliminary field visit, observation of the settlements, linkage with the rural and urban cores, availability of smaller market points and interaction with the residents regarding their movement to and dependency on the urban centres. From the potential wards pre-selected, where the household survey questionnaires were pre-tested; one ward each from the urban and peri-urban areas was finalised (Figure 58).

Figure 58: Map of Bheemdatt with urban and peri-urban settlements with road networks



Source: Modified by author based on various open sources

### **Socio-demographic structure**

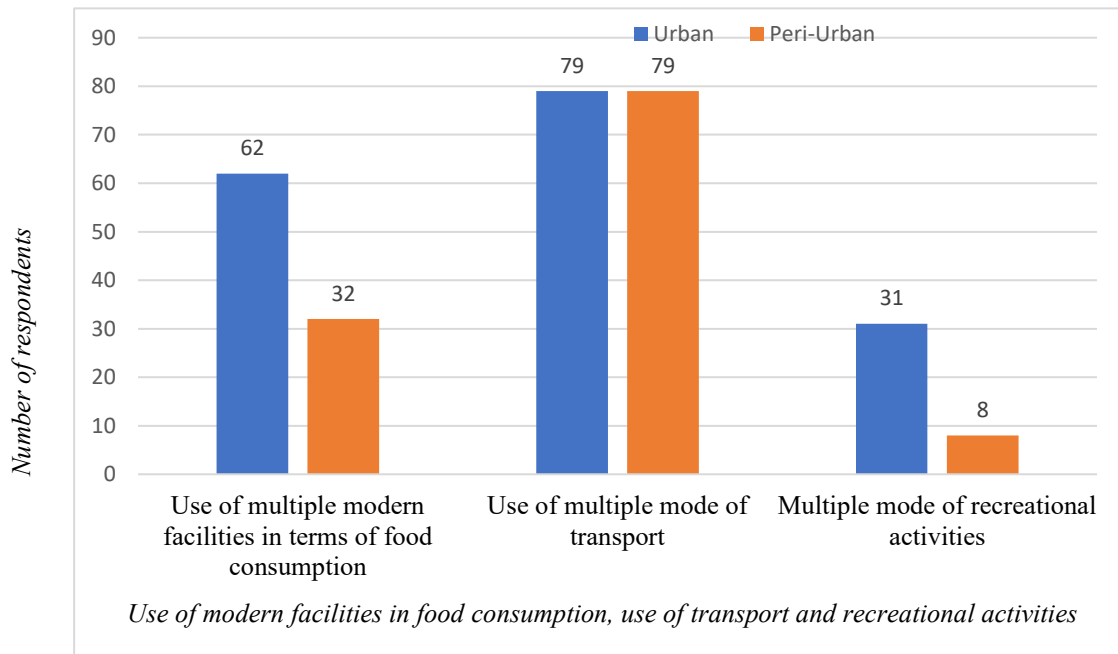
The respondents selected for this study, who were household heads were 64% male in the urban and 59% male in the peri-urban areas. The higher percentage of women in the peri-urban area was a result of a higher number of male members moving to the urban areas for jobs, business and studies. Ethnicity-wise, both study areas were dominated by Brahmin and Chhetri castes with a small percentage (3%) of Tharu communities (indigenous communities) in the urban areas, while there were none in the peri-urban areas.

In both areas, the majority of the respondents were within the age bracket of 30-59, and the majority in both areas had completed higher secondary education. Only 32% of respondents in urban and 38% of the respondents in peri-urban areas were found to be associated with networks/associations, which comes as a surprise as the FGD revealed that almost all the households are associated with one or more such groups. The average family size in both areas was observed to be 4-5 members. Comparatively, the average income of households in urban areas was higher compared to the peri-urban areas; with the major sources of income being jobs and business in urban areas, and a combination of agriculture and jobs in the peri-urban areas.

### **Consumption patterns**

When comparing the consumption behaviour of respondents in urban and peri-urban areas, some differences were observed. There was no difference in the use of transport facilities, mainly the use of modern facilities. However, in terms of food consumption, the urban population (45% of the total respondents) used more modern facilities compared to the peri-urban population (23% of the total respondents). Similarly, regarding recreational services, 22% of urban respondents used modern facilities while this number was only 5% among peri-urban respondents (Figure 59).

**Figure 59: Use of modern facilities by urban and peri-urban respondents**



Source: Household survey, September 2022

In many situations, peri-urban people tend to emulate the lifestyle of urban people, including the adoption of modern facilities. As presented in the previous chapters, peers have a huge influence on the lifestyle an individual adopts. This dynamic can lead to more complexities rather than simplifying lifestyles in peri-urban areas. As depicted in Figure 58, the urban population seems to be living a more luxurious life compared to peri-urban areas. This finding is in line with the conclusion by Cai et al. (2020) who found that the lifestyle of students in urban and peri-urban areas differs, with the peri-urban students being more likely to engage in physical activities and spend less time on screens compared to inner urban. This also suggests that the inner urban population have greater access to gadgets and modern facilities compared to the peri-urban population.

#### **5.4.3.2 Factors affecting the consumption pattern**

This section presents the results and analysis of the factors affecting consumption patterns in urban and peri-urban areas.

##### **Food consumption**

Since individuals in urban areas typically have a higher purchasing power for expensive products compared to those in peri-urban areas, this dynamic affects the food consumption

pattern, which tends to be less sustainable in urban areas compared to peri-urban areas (Table 18). Among the various factors identified, the affordability of luxury products ( $p=0.002$ ) significantly differs between peri-urban and urban areas. The KII and FGD however, confirm that the affordability of luxury products and the availability of modern facilities combined equally influence the consumption patterns in peri-urban areas. For example, as fancy restaurants are available in urban areas, mainly youths and children are tempted to try those more frequently; compared to the peri-urban where such facilities are not available. The urban population know more about the benefits of growing their food (93%) compared to the peri-urban (77%); which, however, is less feasible for them compared to the peri-urban due to the less availability of land and time to grow food.

**Table 18: Food consumption pattern in urban and peri-urban**

<b>Factors affecting the food consumption pattern</b>	<b>Peri-urban</b>	<b>Urban</b>
Affordability to luxury products	3.7%	14.2% ( $p= 0.002$ )
Availability of more modern Technologies/facilities	79.4%	86.6%
Depleting natural resources	48.5%	38.1%
Increase in income source	27.9%	23.9%
All of the above	0.7%	2.2%

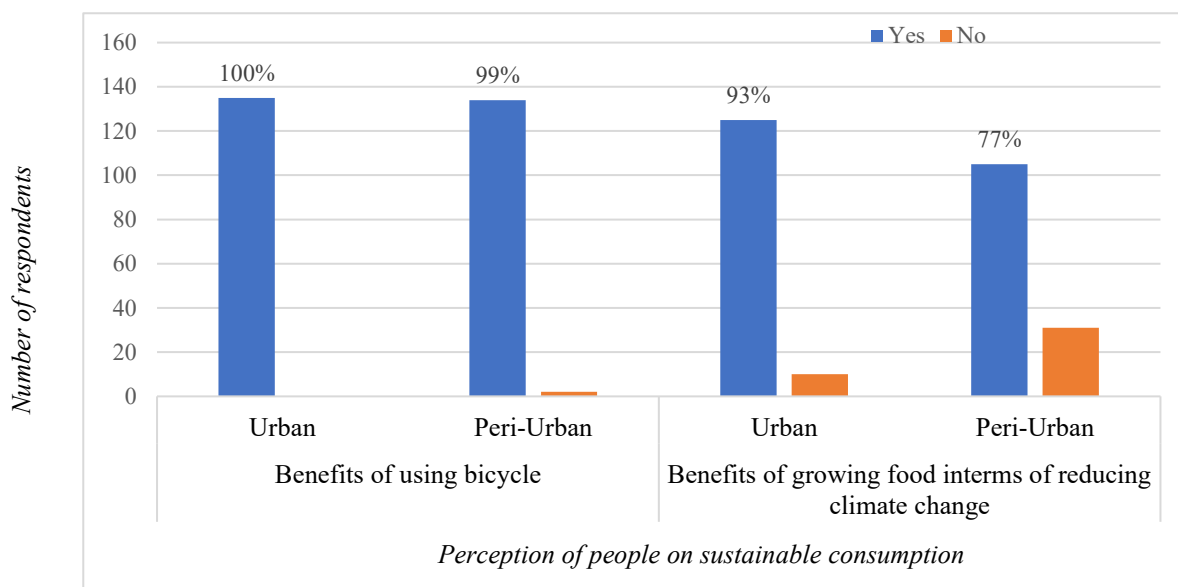
*Source: Household survey, September 2022*

This finding differs slightly from studies conducted in Nepal’s core urban areas, such as Kathmandu. UNEP in 2014 highlighted that growing food in peri-urban is frequently discouraged by low return on investment, rapid conversion of agricultural land to physical infrastructure, labour shortages, environmental degradation due to urbanisation and alluring job opportunities elsewhere. Conversely, this study aligns with the findings from Sub-Saharan Africa, where the researchers concluded that the urban population were more food-insecure compared to the rural and peri-urban population. This disparity arises from urban areas relying entirely on peri-urban areas for food, without producing their own (Chagomoka et al., 2018). Another study conducted in one of the districts in Punjab Province in Pakistan also had similar findings, where they concluded that the food insecurity in peri-urban is higher compared to the rural as the rural population produce their food (Bashir et al., 2010).

### Choice of mobility/transportation

Both the urban and peri-urban populations demonstrated an awareness of the benefits of using bicycles over motor vehicles (Figure 60). However, the practical circumstances leave them with limited options, particularly in peri-urban areas. People in peri-urban areas are compelled to travel frequently to distant urban areas for various reasons such as jobs, education, business, etc.

**Figure 60: Benefits of sustainable consumption as perceived by the respondents**



Source: Household survey, September 2022

Moreover, a statistical analysis (Z-test) conducted to check the difference in consumption patterns in peri-urban and urban areas did not show any significant difference between the two groups regarding the factors influencing the use of transportation facilities (Table 19).

**Table 19: Transportation use pattern in urban and peri-urban**

Factors affecting mobility (use of transportation services)	Peri-urban	Urban
Increase in income source	27.9%	31.3%
Availability of modern facilities	83.1%	90.3%
Peer pressure	6.6%	6.7%
Distantly located job centres	27.9%	28.4%
Others	4.4%	1.5%

Household survey, September 2022

While multiple factors can influence the use of transportation services, mobility within urban areas is typically shorter compared to peri-urban. The FGD revealed that peer pressure heavily influences the choice of transport in both areas, often considering it a status symbol. Additionally, the local government's promotion of electric rickshaws is viewed as old-fashioned by youths and targeted mainly for the elderly people. In peri-urban areas, the necessity of motorised vehicles for commuting to jobs and education leaves few options for cycling, except for those who actively choose it. This could still be the option in the study area if the road lanes are better developed to encourage bicycling. Another discouraging factor for bicycling is the higher temperature during the day. Strategies to adapt to the extreme heat, such as greenery and subsidies from the government could encourage bicyclers in the study area.

Studies conducted in other developing countries such as Pakistan and India also show that sustainability in transport systems is largely challenged due to unreliable, costly, and privatised public transportation systems. This leads to a demand mainly by the peri-urban population to own a private motorised vehicle (Jain, 2013). Marshall et al. (2009) also agreed that the peri-urban population has higher transportation costs due to less proximity to the market, and other facilities. They further emphasized that the development of markets and improved access to communication technologies help peri-urban residents stay connected with urban areas, reducing transportation costs and enhancing the reliability of public transportation.

### **Use of recreational facilities and willingness to pay for urban green parks**

The frequency of visits to urban and peri-urban green parks did not vary significantly between urban and peri-urban respondents, as also presented. However, factors such as social networks, maintenance, access to services, etc. are some factors that showed significant differences in peri-urban and urban areas about the use of recreational services (Table 20). People going to urban green parks for social networking is significantly higher in urban areas than in peri-urban areas ( $p=0.015$ ). Likewise, the willingness of people to visit such places if they are well-maintained by the local government/clubs is higher in urban areas compared to the peri-urban ( $p=0.018$ ) (Table 20).

**Table 20: Use of recreational facilities in urban and peri-urban**

<b>Factors affecting recreation</b>	<b>Peri-urban</b>	<b>Urban</b>
Recreation/exercise	46.3%	38.1%
Social networking	44.9%	59.7% ( $p=0.015$ )
Maintenance by local government/ local clubs	22.1%	35.1% ( $p=0.018$ )
Limited access to gym/fitness	2.9%	6.7%
Others	2.2%	2.2%

*Source: Household survey, September 2022*

People in peri-urban areas also share a rural setting to some extent. For example, the population is less dense and there are better social relations and networking through their day-to-day chores in peri-urban areas. Therefore, they do not feel the need to visit parks or other public areas to enhance their networks as in the urban areas. Similarly, sufficient meeting points and open green spaces are available in the peri-urban areas, which might have influenced the expression of WTP for access to urban green parks.

The information collected from FGDs confirms the reasons for the differences in consumption patterns, particularly concerning food consumption, transportation services (mobility) and use of natural recreational services (urban and green parks). These findings, to some extent, align with previous research that highlighted how green spaces in peri-urban areas tend to hold higher value for urban populations due to limited open spaces within urban centres (Kalfas et al., 2022). The results also support the findings of Conedera et al. (2015) in their study of the Swiss mountainous regions of the South Alps, where they found that urban populations are likely to visit both urban and peri-urban parks, while the peri-urban respondents visit the park, only when they are in proximity (Table 21).



**Table 21: Perceived difference between the consumption pattern in urban and peri-urban**

Area of consumption	Urban settlements	Peri-urban settlements
Food	<ul style="list-style-type: none"> <li>• Mainly dependent on the market for food, because they lack enough land for production in the market area.</li> <li>• Do not have the opportunity to eat as fresh food and vegetables as in the peri-urban settlements.</li> <li>• Depends on the peri-urban areas for the production and supply of food.</li> </ul>	<ul style="list-style-type: none"> <li>• Produce their food, mainly staples almost for a year and green vegetables up to 80% of their need.</li> <li>• Highly dependent upon the Indian market for food and earning. The dependency of people are increasing, and people are leaving their traditional farming. One good lesson taught by the lockdown is growing their food (especially vegetables and spices) in their home garden.</li> </ul>
<b>Mobility</b>	<ul style="list-style-type: none"> <li>• People live in luxury, walk less, use more modern facilities and technologies.</li> <li>• Even for short distances, people prefer to take a vehicle as it is crowded and polluted.</li> </ul>	<ul style="list-style-type: none"> <li>• Comparatively, people in rural walk more, and use more bicycles.</li> <li>• For short distances, people prefer to walk</li> </ul>
<b>Recreation</b>	<ul style="list-style-type: none"> <li>• Use music and the recreation is mainly in-house.</li> <li>• Visit gym centres at times.</li> </ul>	<ul style="list-style-type: none"> <li>• Engage in agricultural and farm activities, which form the part of recreation and exercise.</li> <li>• Walk in the forest and neighbourhood to enjoy</li> </ul>

*Source: Author's construct based on household survey, FGD, KII, September-November, 2022*

#### **5.4.4 Knowledge of climate change**

The respondents in urban areas were generally found to be more knowledgeable (81%) about climate change compared to the peri-urban population (71%). In both urban and peri-urban areas, the education level of the respondents showed a significant association with the knowledge of climate change. In both cases, the higher the level of education, the higher the level of knowledge. Regarding the sources of knowledge and skills on climate change

adaptation, a major difference observed was that the peri-urban population learned about climate change mainly through their traditional and cultural practices (39%) and from others/their peers (31%), while only 29% in urban had learned it from their traditional practices. This finding supports the findings of Rauf et al. (2017), who through their study in the Faisalabad District of Pakistan concluded that knowledge about the impact of heat waves is significantly lower among peri-urban respondents compared to urban respondents. The knowledge level also varied based on factors such as knowledge of heat waves, age and marital status.

#### **5.4.5 Knowledge of EbA to climate change**

Of the total respondents (135 in urban and 136 in rural areas), the majority (79%) in peri-urban areas did not know what the NbS to climate change and/or EbA is. The situation was, however, better in urban areas i.e., 54% knew about the concept. Upon explaining what EbA is, many of the respondents in both areas, 92% in urban and 85% in peri-urban, expressed that they have not practised any sort of EbA practices.

Studies from Sub-Saharan Africa focusing on peri-urban ecosystem services highlighted that there was a distinct gap in the knowledge of ecosystem services mainly in the peri-urban areas, which is of great importance to ensure well-managed ecosystem services. This helps in reducing the physical exposure of peri-urban areas to floods and droughts and minimising climate change risks through increased socio-economic resilience to hazard impacts and the provision of the carbon sequestration function (Mngumi, 2020). Rauf et al. (2017) also highlighted that adaptation is impacted by income level, family size, urban/peri-urban background, perceived barriers, and perceived benefits. Most often, the governance of green infrastructures requires that planning departments have the necessary technical skills and knowledge in the overall planning process, which can then be trickled down to people for better acceptance (Borelli et al., 2017).

Contrary to this information, the FGD and direct observation in the field revealed that the peri-urban population has practised more EbA interventions as a group such as through the CFUGs (Box 11). In addition, selected individuals within the groups were also found to be highly knowledgeable about the impacts of climate change in peri-urban areas.

***Box 11: An example of EbA practice in peri-urban area***

Mr. Dharma Nanda Panta, 51 years, a member of Shree Shanti Community Forest in Bheemdatt-10, Tiken, shared that people would understand the concept of EbA if that is linked to the economic activity. He also added that the provincial as well as the local government are more aware on the religious activities compared to the conservation ones. Therefore, budget allocation and priority should be made on the conservation activities from the government side too. He further added, “Individual households can also contribute significantly to conservation efforts if they understand the benefits and if they are provided the subsidies. He also shared the experience of the CFUG, their struggle and the progress made so far such as the plantation of medicinal plants, plantation of bamboo and broom grasses, trees, etc.

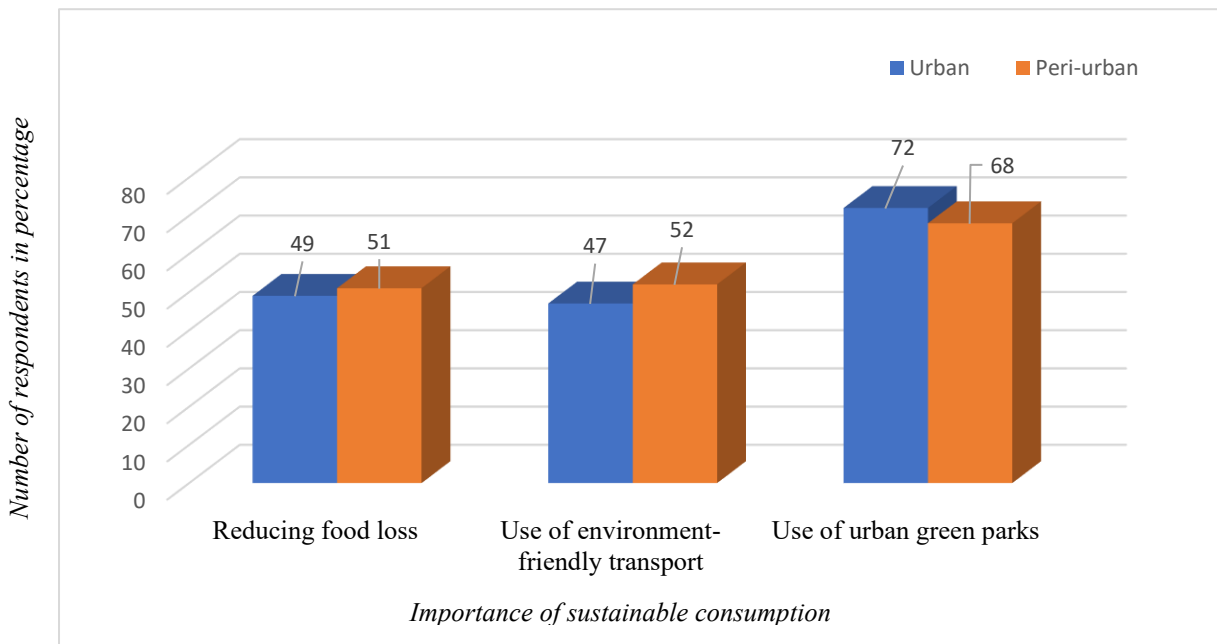
*Source: FGD, Bheemdatt-10, September 2022*

#### **5.4.6 Knowledge of sustainable consumption**

There was no major difference observed between the population of urban and peri-urban areas in terms of their responses to sustainable consumption practices and their linkage with nature. As presented in Figure 61, a similar percentage of the population in both settlements agreed that measures such as reducing food waste, adopting environmentally friendly transportation options like bicycles, and promoting the use of urban green parks contribute to the protection of nature and lead to effective EbA practices.

Beyond merely understanding terminologies such as ‘climate change,’ ‘NbS,’ ‘EbA,’ and ‘sustainable consumption,’ individuals in both urban and peri-urban areas were found to possess a greater awareness of sustainable consumption practices when properly explained. Approximately 50% of respondents in both urban and peri-urban settings are acquainted with the importance of reducing food waste and adopting environmentally friendly transportation services (with the peri-urban population showing higher awareness than the urban). Similarly, about 70% of respondents in both urban and peri-urban areas are conscious of the advantages of utilising urban green parks (with the urban population demonstrating greater awareness than the peri-urban). However, translating this awareness into practice faces challenges due to various practical reasons, including the distant location of job and education services, limited availability of well-functioning transportation services, and poorly maintained parks.

**Figure 61: Understanding of urban and peri-urban on sustainable consumption**



Source: Household survey, September 2023

#### **5.4.7 Application of sustainable consumption for effective EbA**

The findings indicate variations in consumption patterns between urban and peri-urban areas. While some consumption areas exhibit significant differences, others do not. For instance, individuals in peri-urban regions tend to engage in food cultivation, experience lower levels of food waste and dine out less frequently compared to their urban counterparts. Additionally, the peri-urban population lacks the option for motorised vehicles, often relying on travel to urban areas for purposes such as selling goods, education, employment, and business activities. The utilisation of urban and peri-urban green parks holds relevance in both contexts, albeit more pronounced in urban areas due to the prevalence of extensive brown infrastructural development.

The findings also highlight the presence of various forms of NbS and EbA practices in both urban and peri-urban areas, which hold significant relevance in terms of adapting to the changing climate. Although larger-scale EbA projects are not implemented in the study area, smaller initiatives from both government and non-government sectors are in place, showing potential for growth. When integrated effectively with the selected autonomous practices and indigenous knowledge, such initiatives have the potential to yield substantial impacts. Considering this, people's behaviour and household consumption pattern is crucial

for the implementation of effective EbA practices in both settlement types. These efforts should, however, be complemented by awareness-raising activities, knowledge dissemination, regular monitoring, follow-up measures, and increased interaction between the local government and the community.

#### **5.4.8 Chapter Summary and Conclusion**

This chapter has presented the key variables and attributes of research comparing urban and peri-urban settlements across three consumption areas: food, transport services and the use of urban green parks. The consumption pattern related to food seems to be less sustainable in urban areas when compared to peri-urban areas, with higher food waste being observed in urban settings. The usage of transportation, on the other hand, exhibits no significant difference; however, respondents in peri-urban areas are constrained by fewer alternatives, leading them to rely more on motorised vehicles, compared to their urban counterparts. This trend persists despite the knowledge possessed by the peri-urban population.

The statistical analysis indicates that the peri-urban population is comparatively less aware of climate change and EbA practices, although observations reveal the opposite to be true in practice. In terms of effective EbA practices, both induced and autonomous, individuals in peri-urban areas demonstrate a range of impactful behaviour, surpassing their urban counterparts. Given that sustainability necessitates an integrated planning perspective, knowledge transfer between urban and peri-urban areas is essential. Moreover, the involvement of local governments is pivotal in ensuring effective implementation and oversight. That said, the promotion of sustainable consumption practices makes sense and can be considered an indicator of effective EbA in both areas.

## CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Conclusions

Consumption of resources is growing with the increasing global human population. The exploitation of resources for consumption is an issue that can trigger climate change. EbA, as a tool of NbS, is being practised to reduce the impacts of climate change. Various factors contribute to changing consumption pattern, which vary from place to place. Limited research has been conducted in this field internationally and in Nepal. Nepal's rapid urbanisation highlights the need for the wise use of available resources as well as sustainable consumption at the individual and household levels in the current context. This study attempted to explore the concept of sustainable consumption through three concrete examples of environmental services for household consumption (food-provisioning, mobility/transportation-regulating; and urban green parks for recreation-cultural).

This research adopted mixed research methods, incorporating both the quantitative and qualitative approaches and tools. The research findings are presented through descriptive and statistical analysis to elucidate the prevailing yet unexplored nexus between multiple sectors. Some of these include (i) household-level consumption, climate change and nature conservation; (ii) urban area, climate change and EbA practices; (iii) urban and peri-urban linkages, sustainable consumption, and climate change; and (v) sustainable consumption and effectiveness of EbA. Through this study, accompanied by several examples and cases, I argue that sustainable consumption can be considered one of the major indicators to measure the effectiveness of EbA.

Household surveys, KIIs, FGDs, expert consultation workshops as well as secondary information reveal that knowledge and awareness on sustainable consumption are limited among the local people and local government authorities. The existing knowledge and research outcomes have not been communicated well to the relevant stakeholders such as private sector entities, students, youths, women, and other consumers. This study shows that people are inclined towards modern facilities and services available in the market regardless of their climate consequences, cost and affordability. Often the times, they also become peer pressured to consume in a certain way. The findings indicate that the respondents have no intention to practice unsustainable behaviour. People are willing to

pay the premium price for green food products, become the change agents for sustainable transportation and willing to pay for improved services at the urban green parks, provided they receive assurance from the local government. This also affirms the possibility of encouraging people towards sustainable consumption. The local government authorities have not been able to consolidate the efforts being introduced in the municipality by the local government itself, development agencies, academia, and the private sector. Studies of this kind will empower and put pressure on these entities to design need-based plans and programmes.

This study has revealed that local people and the local government have limited knowledge and awareness of climate change, the impacts of climate change, appropriate adaptation measures to climate change, NbS for climate change, and the concept of sustainable consumption. To promote NbS practices such as EbA for effective adaptation outcomes, people's way of consumption including their lifestyle must change. Furthermore, the institutional mechanisms such as committees/sub-committees (such as EDNRM) formed to advocate for natural resources management, reducing loss and damages from climate change, and managing climate-induced disasters have not been functioning well. Moreover, the inadequate existence of legal frameworks and institutional mechanisms at the provincial and local levels are the major structural barriers to sustainable consumption. Where existing, the legal frameworks and documents are well-elaborated on paper, but poorly executed in practice.

Despite the linkages between the consumption pattern and climate change adaptation/nature conservation, they are often treated in isolation, and the nexus among the two or more relevant areas has not been explored. This study assessed the integration of sustainable consumption into the existing legal frameworks at the international, national and local levels. The frameworks that are focused on nature conservation have clear conservation outcomes and indicators. Sustainable consumption of natural resources achieved through people's participation and capacity building has been considered a strategy for such outcomes. However, the linkage between their own lifestyle and daily household consumption behaviour to effective climate change adaptation has not been explicitly focused on. Based on these findings derived from the policy documents, and

evidence at the practice level, sustainable consumption can be considered as an indicator of effective climate change adaptation practices such as EbA.

Finally, this research compared the key variables and attributes of urban and peri-urban settlements across three consumption areas: food, transport services and the use of urban green parks. The peri-urban population is comparatively less aware of climate change and EbA practices. Given that sustainability necessitates an integrated planning perspective, knowledge transfer between urban and peri-urban areas is essential. This study has indicated the need to establish a close linkage between urban and peri-urban areas, which should then be extended to rural pockets. Some differences exist between urban and peri-urban areas; nonetheless, these disparities could be leveraged to achieve effective sustainable consumption. Moreover, the involvement of local governments is pivotal in ensuring effective implementation both in urban and rural areas.

## **6.2 Recommendations**

### **6.2.1 Future Research Prospects**

As indicated in the previous chapters, this research has touched on a relatively novel yet highly pertinent area of research, particularly in the context of developing countries. Expanding upon the existing findings, communicating the findings to relevant stakeholders, and conducting further research is of paramount importance. Some of the areas that researchers and academia could promptly address include the following:

- Identifying simpler and individual-level solutions to bigger problems such as climate change.
- Contributing to the sustainable consumption theory through examples from developing countries.
- Sustainable consumption studies applying a case study approach from various cities of Nepal, and in comparable cities in other developing countries.
- Identifying various dimensions focused on sustainable transportation, sustainable food systems and sustainable cities such as urban green parks.
- Assessing the potential to promote domestic tourism, and factors influencing the same.
- Investigating the sustainable transportation systems in the growing cities of Nepal.



- Studies focusing on sustainable lifestyles that can apply to both urban poor and urban middle-income populations; and
- Effectiveness of the integrated projects on EbA – Induced and Autonomous.

### **6.2.2 Planners and Policymakers**

I have identified a few areas where planners and policymakers could intervene. Some of them include the following:

#### **Federal Government**

- “Sustainable consumption” should be considered as a long-term agenda for sustainable economic development, reduced carbon emissions, and reducing the impacts of climate change. The spirit should be trickled down at the provincial and local government levels.
- Knowledge is dynamic and not a one-time event. Knowledge of climate change and its impact on multiple sectors (health, education, agriculture, infrastructure, livelihood, migration, and social cohesion) should be continuously explored and communicated, and necessary actions should be taken to cope with emerging situations at the federal and local levels.
- The government should encourage the private sector to produce green products, subsidise them and advocate for their use by people.
- Mass-level dialogues, discussions, talks and awareness campaigns are urgent to create mass awareness of pro-environmental behaviour and sustainable consumption.

#### **Provincial and Local Governments**

- Practices such as ‘Establishment of Green Fund’, ‘promotion of electric scooters’, etc. and many such new initiatives should be continued, and a dedicated budget should be dedicated annually to promote sustainable consumption practices.
- Other favourable policies and mechanisms to create an enabling environment for people to sustainable consumption should be promoted. Where possible, mechanisms to appreciate and punish should also be introduced.

- As identified in the local legislative frameworks, action plans should be developed and implemented to promote NbS practices such as EbA, Ecosystem-based Disaster Risk Reduction (Eco-DRR), etc.
- The engagement of multiple stakeholders should be promoted such as academia and the private sector, and the concept of sustainable consumption should be promoted as momentum.
- Private sector entities should be onboarded as they play a significant role in terms of influencing consumers to buy certain types of goods/facilities.

### **Private Sector**

- Sustainable consumption is possible only when the production system and supply are sustainable. Skills and awareness of sustainable production at the household level (mainly food) and the supply of sustainable products (possibly promoted by the private sector and supported by the government) should be encouraged.
- Small, medium and large-scale private sector owners should have responsible environmental conduct, where they introduce new technologies, processes and products that are environmentally friendly.
- Investors and owners should be aware of environmental protection and should work towards creating demand for green products within the community.

### **Academia**

- The academic sector can focus on more results that generate innovative ideas and approaches for sustainable consumption.
- Communicating science is as important as generating evidence. Therefore, the information generated should be communicated widely applying multiple means.
- The academic sector can also organise advocacy campaigns, mobilising the students, for responsible environmental conduct, environmental-friendly consumption and pro-environmental behaviour.

### **Non-government Sector**

- National and international non-governmental organisations play a significant role in making a difference in countries like Nepal. The evidence generated should be

utilised and investments should be made in applied research on sustainable consumption, ultimately supporting the design of new projects.

- Advocacy with the government at all levels should focus on innovative ways of promoting sustainable consumption.
- Loss and damages due to climate change is visible in Nepal, and the non-government sector can unite to bring this discussion/agenda among all group (mainly the most at-risk people); which calls for sustainable consumption.
- The concept of sustainable consumption is almost non-existent and less discussed by the non-government sector. Considering the increasing climatic change, more projects should be designed that considers the green concept in all cycle of project development.

### **6.3 Limitations and Delimitation of the Study**

This study has the following limitations and delimitations:

- i. The study is cross-sectional, and I selected only two wards of Bheemdatt Municipality due to limited resources.
- ii. Studying consumption pattern is a complex subject with multiple factors and variances. This study has been able to focus only on three areas: food consumption, choice of the means of transportation (mobility) and use of recreational services (green parks and open spaces). The choice was made to select one each from the provisioning, regulatory and cultural environmental services.
- iii. This study was conducted in areas where no formal or inducted and larger EbA project was implemented. Therefore, the findings derived are mainly through autonomous practices and small-scale EbA and NbS interventions.
- iv. Bheemdatt is not a major city in Nepal, but rather a growing city. Therefore, the findings may not exactly apply to a major/megacity or a rural setting. The findings can rather partly apply to these settings and the peri-urban settlements that link the two.

## **CHAPTER 7. CONTRIBUTION TO THEORY BUILDING**

### **7.1 Introduction**

In this chapter, I have presented a phenomenological approach to my empirical data and its analysis to contribute to existing theories. The consumption behaviour and patterns presented in Chapter 5.1, the local knowledge and understanding of climate change impacts and green adaptation practices presented in 5.2, and the interlinkages between sustainable consumption and EbA presented in 5.3 constitute the main insights and foundations. This research delves into resource consumption in urban and peri-urban areas, with its argumentation being rooted in the perceptions, knowledge and practices of local people and the government in one of the burgeoning cities, within Nepal, a developing country.

#### **7.1.1 Contribution to the existing theories and concepts**

Sustainable consumption is a voluntary approach, and it revolves around the concept of using less, using wisely, and using only what is necessary. The theory of sustainable consumption is therefore dynamic and should continuously be explored and built on, by taking the reference of several theories which when combined, contribute to enhancing the outcome of sustainable consumption. Equally imperative is to understand the purpose of sustainable consumption, which involves striking a balance between human needs and environmental protection, as strongly highlighted by Max-Neef (1987). I also assessed the relevance of Programme Theory – Theory of Change (ToC) and Adaptation (Colloff et al., 2021), which seeks to present the step-by-step process of change scenario to reach an alternative and desired scenario. Achieving sustainable consumption too, is a journey one needs to accomplish with several milestones in between; as in the case of the ToC process.

Part of the sustainable consumption journey has been assessed by previous researchers, which includes areas such as - (i) individual knowledge, awareness, and willingness to review consumption practices; (ii) availability of the goods and services creating peer pressure; and (iii) the institutional and policy environment. In agreement with Anantharaman (2018), whose study from India highlighted the significance of relational and structural power, I argue that enabling a policy environment is one of the most important elements in sustainable consumption. In the context of developing countries like Nepal, where the priorities are on major economic development, it is challenging to take

the global agendas such as sustainable consumption without a favourable policy environment, enabling legal frameworks, an intention from the government bodies to implement the frameworks, and a consideration that the marginalised does not become further marginalised. This study also re-emphasizes the argument of Holden (2004) and Shove (2014), who highlighted the need for institutional strengthening for sustainable consumption nearly two decades ago.

The discussion on individual behaviour, lifestyle, knowledge, and awareness in the context of sustainable consumption has spanned over two decades. Through this research, I concur with the recommendations put forth by Jackson (2005), Atkinson et al. (2014); Jaeger-Erben, Ruckert-John and Schafer (2015); and Liu, Oosterveer and Spaargaren (2016) who argue that sustainable consumption entails individual consumption practices driven by knowledge and awareness, reflecting a demand for resources and services. My contribution to this lies in emphasizing the crucial role of people being knowledgeable in driving changes at the individual level within developing countries. For this to endure, consistent, persistent, and aggressive interventions are required by the government.

This study re-emphasizes that there exists a distinct limit set by the ecology for human interventions, in accordance with the *Socio-Ecological Theory*. When this limit is crossed, it becomes counter-productive to humankind. To remedy this situation, people need to start using natural/blue options over the built/grey options. This means consuming natural as well as all other resources in a sustainable manner. The study also derived that people's sustainable consumption behaviour leads to the adoption of more natural practices and solutions.

Even in developing countries such as Nepal, private sector entities play a significant role. Creating demand among individuals and households (Tukker et al., 2008; Liu et al., 2017) and implementing effective supply chain management (Zhao and Schroeder, 2010) can ensure sustainable consumption. In the study area of this research, several small and medium-scale enterprises (SMEs) were identified as having the potential to play a role. I argue that such SMEs in developing countries should be empowered and provided with a conducive environment to promote sustainable consumption. I disagree with some of the previous propositions that consumption and sustainability are inversely related, meaning higher consumption leads to lower sustainability (Holden, 2005).

It is crucial to recognise that volume and quantity are not always indicative of sufficiency. What matters is the wise and equitable use of resources among different segments of society, rather than simply encouraging lower consumption. People are often enticed by modern facilities, resources, and services when they become available, especially if their peers can access them (Shove, 2014; Holden, 2004). This study supports the conclusion drawn by Mol, Spaargaren and Sonnenfeld (2013) that the supply of sophisticated and modern technologies often creates the demand, even though many of these technologies are environment unfriendly. Additionally, this argument that understanding sustainable consumption requires familiarity with the *Ecological Modernisation Theory*, which acknowledges that urbanisation is a dynamic and never-ending process. Particularly in developing economies like Nepal, several structural transformations take place on a regular basis in urban areas and therefore, understanding the urban ecosystem requires systemic thinking, innovation, and up-to-date knowledge of technological advancement.

Additionally, this study has also contributed to the discussions on sustainable consumption and the associated sectors of interventions. The more it explores the nexus between smaller and larger, and multiple sectors and intervenes in that, the more successful the region or country becomes in achieving sustainability. For example, exploring the nexus between urbanisation and climate change, urbanisation and consumption pattern, consumption pattern and climate outcomes.

### **7.1.2 Understanding the nexus between sustainable consumption and ecosystem-based adaptation for improved climate outcomes**

#### **Nexus among urban environment, governmental institutions, and people**

The present research was people centric. The attributes of research such as behaviour, knowledge, consumption pattern, consumption of resources, EbA interventions for climate change, legal frameworks, etc. are for the people and by the people. Government initiatives such as international treaties and commitments, national policies, plans and strategies, rules, regulations and local-level acts, guidelines and programmes are formulated and implemented for urban environment conservation and management. The urban environment, including socio-economic systems, ecological areas and built-up regions, is intricately tied to human activities. However, the observation from the field is that the

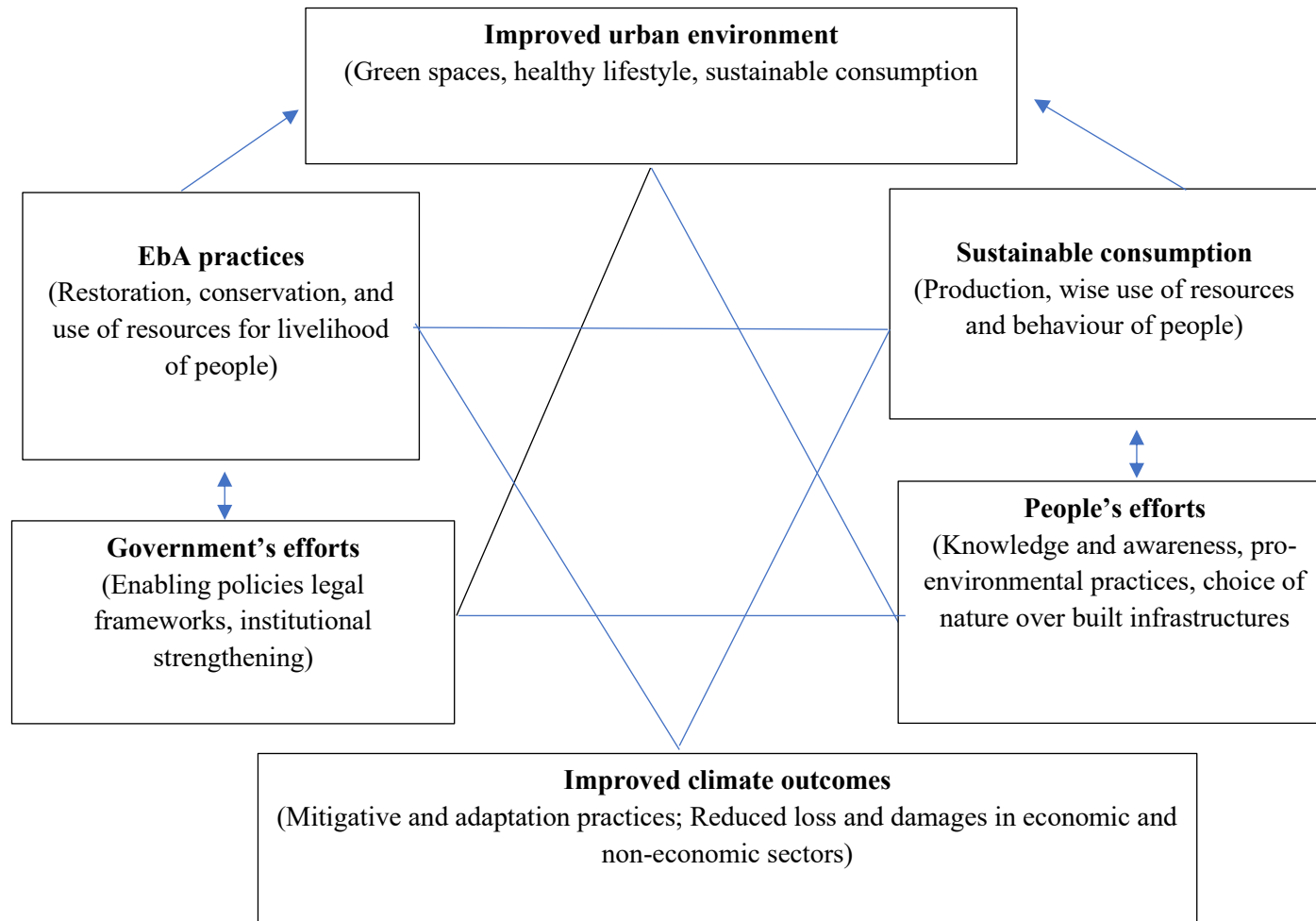
interface between people and governmental institutions is relatively weak and more intervention in that line is required, where people are engaged in designing their own interventions such as the use of open space (Tribble, 2016). Similarly, the interaction between the environment and people has been mainly one-way, which means people are taking way more from nature than giving back.

### **Nexus among climate change, sustainable consumption and EbA**

This research assessed sustainable consumption as an effective approach for climate change mitigation and adaptation, analysed the effectiveness of natural methods of adaptation being more effective and attempted to uncover the interrelationship between the two sectors. Building upon the findings of Dorst et al. (2019) and Zakaria et al. (2019), this research argues that individual ownership towards environmental protection promotes sustainable consumption. Similarly, pro-environmental behaviour leads to love for nature and thus, nature-based interventions are promoted. This study affirms that behaviour is rooted in practices, strongly supporting the role of practice theory in promoting sustainable consumption. Furthermore, the study highlights that practices can be influenced by external factors, such as favourable policies, institutional mechanisms, and peer pressure. For example, the adoption of electric scooters by numerous individuals in the study area, as a means of mobility, was something new but influenced through the subsidy and awareness by the local government.

The effectiveness of projects focused on NbS, such as EbA requires an understanding of various social theories related to human behaviour, learning and the introduction/implementation of new ideas (McKinnon and Hole, 2015). While indicators are established at the outcomes level, the effectiveness of the programmes/projects is often measured in isolation and not all the potential indicators are considered. Given that a majority of EbA interventions are induced and planned, the application of the ToC model and pathways becomes crucial to pre-identify desired changes at different stages and to regularly review progress (Colloff et al., 2021). The ToC model also offers an analysis of the problems and existing challenges across various sectors, people's way of living and their practices, allowing for the development of additional social indicators, such as sustainable consumption. This study, therefore, claims that sustainable consumption is one of the most important indicators towards measuring the effectiveness of EbA interventions.

*Figure 62: Improved understanding and nexus among government institutions, people (consumption) and environment for improved climate outcome*



*Source: Author's construct based on the research findings*



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## **ANNEXES**

**Annex 1: Questionnaire for household survey**  
**(This version was translated into to Nepali version for the survey)**

**To the Interviewer:** This questionnaire must be administered to the household head, selected randomly in Wards 4 and 8 of Bheemdatt Municipality.

**Declaration from the Interviewer:** This interview is being taken for the purpose of an individual study. No identity of the interviewer will be exposed outside without the consent of the individual interviewee, and the data collected will be used for the group analysis, deriving an average result.

---

Name of the Interviewer:

Date of the Interview:

**1. Respondents Detail**

**1.1 Personal description**

- Name of the Respondent:
- Occupation:  
Private job,  
Government Service  
Farmer  
Student  
Jobless
- Any Affiliation with social group, network?  
Yes..... (please mention) .....  
No.....

**1.2 Education Level (Please tick)**

- Illiterate,
- Primary,
- Secondary/Higher Secondary,
- Bachelors,
- Master+

**1.3 Age group (Please tick)**

- 18-29,
- 30-59,
- 60+,

**1.4 Sex (Please tick):**

- Male
- Female

**1.5 Caste/Ethnicity (Please tick)**

- Brahmin/Chhetri
- Janajati (Tamang, Gurung, Newar)
- Indigenous Group (Tharu, Chaudhary, others)
- Dalits
- Others

**2. Socio-economic information of the household**

2.1 Who is the head of your household? (Please tick)

Male ( )

Female ( )

Others ( ) – Please specify

2.2 How many members do you have in your family?

4-5 ( )

6-8 ( )

More than 8 ( )

2.3 What is the average monthly/yearly income of your household?

Below NPR 10,000 per month

Between NPR 10,000- 20,000 per month

Between NPR 20,000-NPR 50,000 per month

Above 50,000 per month

2.4 What are the income sources of your family

- Agriculture
- Job in the informal sector
- Government Job
- Own business
- Remittance
- Others.... please mention.

2.5 What is the average monthly/annual expenditure of your family?

- Below NPR 10,000
- Between NPR 10,000- 20,000
- Between NPR 20,000-NPR 50,000
- Above 50,000

2.6 Areas of Expenditure:

- Food
- Transport
- Education
- Real state

- Investment
- Health
- Others

2.10 Do you have the following modern facilities in your home?

- Food consumption: Oven, Refrigerator, LPGs
- Mobility: Car, Bike/scooter, bicycle

2.11 Do you use the open spaces/parks near your home?

**Yes**

If yes, how frequently do you use?

- Daily
- Twice a week
- Once a week
- Once in 15 days
- Once in a month

**No**

If no, why?

- There are no such spaces nearby.
- The open space/park is not well-maintained.
- Nobody uses it.
- Others.. (specify).....

2.11 Do You have easy access on a bank? For credit, or debit?

- Yes
- No

### **3. Consumption behaviour and patterns adopted by the locals in Urban and Peri-Urban Areas**

#### **Use of Natural Resources**

3.1 Which of the following natural resources does your family consume to fulfill your household needs?

- Water
- Fodder
- Firewood
- NTFPs

- All of the above
- None of the above
- Others- please specify .....

3.2 Does the use pattern of these resources change over time?

- Yes (Go to 3.1.1)
- No

### **Consumption Behaviour**

3.1.1 In your opinion, what are the factors affecting the changes in food consumption behaviour?

- Increase in income source
- Availability of more modern technology/facilities
- Affordability to luxury products
- Depleting natural resources
- Others (Specify).....

In your opinion, what are the factors affecting the changes in the use of means of transportation?

- Increase in income source
- Availability of modern facilities such as bikes/cars
- Peer pressure
- Distantly located job centres
- Others (Specify).....

In your opinion, what are the effects of the use of public spaces/open parks?

- Recreation/Exercise
- Social networking
- Maintenance by the local government/local clubs
- Limited access to GYM/Fitness Centres
- Others

3.3 Do you prefer restaurant food (Please tick)?

- Yes (Go to 3.3.1)
- No (Go to 3.3.2)
- 3.3.1 Why do you prefer restaurant food? Saves time in cooking food
- Provides happiness to the family members.
- I can afford.
- It is tastier.
- Others (Mention).....

3.3.2 Why don't you prefer restaurant food?



- Time-consuming
- Expensive
- Unhealthy
- Not tasty
- Others (please mention).....

3.4 How much time do you eat outside (restaurant) in a week?

- Never
- Occasionally
- Everyday
- Most of the time

3.4 Do you grow your own food?

- Yes
- No

If yes, go to (3.4.1)

If not, go to (3.4.2)

3.4.1 What kind of food do you grow?

- Green vegetables
- Green vegetables and Fruit
- Fruit, green vegetables and staples
- Staples

3.4.2 What stops you from growing your own food

- I don't have enough land.
- I don't have time to grow my own food.
- It is easier to buy from the market.
- Others (please specify).....

3.5 What is the mode of transport in your family?

- Bicycle
- Scooter/Motorcycle
- Car/Jeep/Truck
- Others

What is the reason for using one or more of the above?

.....

3.6 Would you prefer to walk if the destination is nearby? (maximum of 30 minutes?)

Yes/No

Why?.....

3.7 How often do you visit/walk around the public spaces/parks/open spaces near you?

- Once a week
- Twice a week
- Daily
- Less often

If you visit such areas, why do you do so?

- Exercise
- Networking with the cohorts/neighbours/friends
- Meditation/Yoga/Refreshment
- Others.. (specify).....

3.8 Would you be willing to pay an additional amount to visit/spend time in such areas, if they are improved? (Please tick)

Yes/No

If, yes, how much can you pay per month?

a. NPR 50, b. NPR 100, c. NPR 150 d. More than 200

3.9 Do you know the concept of green products? (Please tick)

- Yes (Go to 3.9.1)
- No

3.9.1 What is your preference to pay for such green products?

- I would pay 15% more if they are organic.
- I would buy the product if that is subsidised.
- I would buy if the price is less than the other available products.
- I would buy the product if I know the health and environmental benefits of the product.
- Others... (specify).....

3.10 Have you heard about the term “Sustainable Consumption”?

- Yes (Go to 3.10.1; 3.10.2; 3.10.3)
- No

3.10.1 From where did you hear about this?

- Government agencies
- Training provided by I/NGOs/clubs/associations
- FM/radio/TV/newspaper
- From children/elders/peers

- Others (specify).....

3.10.2 Do you feel the consumption pattern of your local areas is sustainable?

- Yes.. (Please mention, how?)

.....

No.. (Please mention, why)

.....

3.10.3 Do you feel the consumption pattern of your household is sustainable?

- Yes.. (Please mention, how?)

.....

.....

- No.. (Please mention, why)

.....

3.11 Could you please suggest some ways of consumption pattern that ensures less emission of pollutants and less use of resources, and is cost-effective? (sustainable ways of using resources).

<b>Food</b>	<b>Mobility/Transportation</b>	<b>Recreational services/use of open spaces or parks</b>

3.12 Would you encourage your friends/relatives for the following consumption behaviour?

- Use cycle or walk to go nearby instead of petrol/diesel vehicles.
- Use organic products.
- Minimise waste, recycle and reuse consumable goods.
- Maintain and use open spaces/parks.

- Yes (Please go to 3.12.1)
- No (mention, why?).....

3.12.1 What makes you do so?

- I feel responsible to do so.
- I believe in spreading knowledge and skill.
- Because they are not aware of the benefits.
- All of the above.
- Others (Specify).....

**4. Knowledge and understanding of locals on climate change impacts and adaptation practices**

4.1 Do you know what is climate change?

- Yes
- No

If yes, please tell me, how does that happen/occur?

-----

4.2 Do you know that the climate and weather are changing at local, national and global levels (Please tick)?

- ( ) Know it well
- ( ) Know a little
- ( ) Have heard of it
- ( ) Don't know

4.2.1 If, you know, what type of changes have you noticed in climatic conditions in recent years?

Rainfall – ( ) Off-season rainfall, ( ) Heavy rainfall  
( ) Thin rainfall ( ) Drought

Flooding ( ) Off-season flooding, ( ) Heavy flooding  
( ) Thin flooding ( ) No flooding

Landslide - ( ) Off-season landslide, ( ) Heavy landslide,  
( ) Thin landslide, ( ) No landslide,

Drought - ( ) Off-season drought ( ) Heavy drought

4.3 Have you or anyone you know tried anything to cope with the impact of such climate change?

- Yes
- No

If yes, what do you actually do for climate change adaptation?

SN	Coping Strategy	Needs of households to cope with
1	Change in cropping pattern	
2	Plantation	
3	River training	
4	Retention wall	
5	Build a safe haven (community hall)	
6	Rescue materials i.e. life jacket, rope, tube, boat, stairs etc.	
7	Food security measures i.e. storage for scarcity etc.	

How did you learn about this adaptation practice?

- Training provided by government agencies.
- Training provided by the non-government organisations.
- Practised traditionally, as part of the culture/ethnicity.
- Adopted by seeing the others effectively practising the same.
- (i) Others (specify).....

4.3 In your opinion, how is climate change related to natural disasters such as drought, landslide, floods, and fires? Is it increasing, decreasing or has there been no changes?

Climate-Induced Disasters	Trend (Increasing, Decreasing, no changes)	Reasons (If any)
Landslide		
Flood		
Fire		
Others		

4.6 Do you know what nature-based solutions/ecosystem-based adaptation is?

Yes (Please go to 4.6.1)

No

4.6.1 Can you please give some examples of such practices?

.....  
.....

4.6.2 Are they practised in this area/your locality? Why/Why not?

.....  
.....

4.7 Do you believe in nature-based solutions/ecosystem-based adaptation being an effective practice to reduce impact of climate change?

- Yes
- No

Why and Why Not?

.....  
.....

4.8 Do you know if the government in your area (ward office/municipal office/provincial office) is doing anything to reduce impact of climate change or adapt to the changing climate?

- Yes

- No

If yes, can you please name some of such initiative

.....

4.9 Do you know if the government/non-government or private sector have initiated any activities to promote sustainable consumption? (such as promoting green products, subsidies on renewable energy, subsidy for green enterprises, etc.)

- Yes
- No

If yes, can you please name them?

.....

4.10 Would you prefer to have such policies/mechanisms/activities in place from the government side?

- Yes
- No

Why and why not?.....

.....

### **5. Areas of interlinkages between sustainable consumption and EbA**

5.1 Do you know if there are any benefits of using cycle as a means of transport where possible?

- Yes
- No

Why/Why not?

.....

5.2 Do you believe that growing your own food can reduce impact of climate change?

Yes

No

If yes, how?.....

If No, how?.....

5.3 Do you agree that consuming less food and wasting less food can contribute to sustainability?

- Agree
- Partially agree
- Strongly agree
- Disagree

5.4 Do you believe that you can be a change agent to reduce climate change by shifting your mode of transport?

- Believe
- Partially believe

iii. Strongly believe

iv. Don't believe

5.5 How do you see the linkage between the existence of open spaces/green parks and adaptation to climate change?

i. Linked

ii. Partially linked

iii. Strongly linked

iv. Not linked

5.5 In your opinion, how is sustainable consumption help adaptation to climate change?

.....

## **Annex 2: Checklist for Focused Group Discussion**

Tentative time: 1 Hour, Group members: 6-10 persons

### **General Information**

Name of date and location of group discussion:

Name of the facilitator:

Attendance of participants with name, designation, affiliation, and sex.

### **1. Consumption behaviour and patterns adopted by the locals in Urban and Peri-Urban Areas**

- What are the natural resources consumed by your community?
- Does the use pattern of these resources change over time? How?
- How different is the consumption behaviour of urban and peri-urban populations (Ward 4 and Ward 8), and how have these changed in the past two decades (mainly the natural resources)?
- What kind of linkages are there between urban and peri-urban areas?
- What are the factors affecting the changes in consumption behaviour regarding natural resources?
- What are the factors affecting the changes in consumption behaviour regarding food consumption, means of transport and use of open spaces/natural parks?
- What is the consumers' preference to pay for green products (such as organic agri-products)?
- What is the consumers' willingness to pay for environmental services (recreational, mainly the urban parks)?
- Have you attended any training/orientations related to sustainable consumption, climate change and climate change adaptation?
- Who provided such training?

### **2. Knowledge and understanding of locals on climate change impact and adaptation practices**

- What is the understanding and knowledge of people on climate change?
- What kind of adaptation practices are in place induced and autonomous?
- To what extent are the EbA approaches practised?
- What are the existing institutional mechanisms to promote/prohibit sustainable consumption?
- What is the state of access to banking services?



**3. Areas of interlinkages between sustainable consumption and Ecosystem-based Adaptation**

- Is there any relationship between the consumption pattern and conservation/management of natural resources?
- Can sustainable consumption be established as the indicator of EbA?
- What could be a potential recommendation for promoting EbA approaches in urban and peri-urban areas for reduced risk of climate change impacts?

## **Annex 3: Checklist for Key Informant Interview**

### **General Information**

Name of Interviewee:

Designation:

Affiliation:

Date and location:

Name of Interviewer:

### **4. Consumption behaviour and patterns adopted by the locals in Urban and Peri-Urban Areas**

a. How do you see the linkages between urban and peri-urban areas in terms of consumption?

.....  
.....

b. In your opinion, how different is the consumption behaviour of urban and peri-urban populations, how have these changed in the past two decades?

.....  
.....

c. What are the factors affecting the changes in consumption behaviour regarding natural resources?

.....  
.....

d. Have you observed any changes in the way people consume in the following in the past 10 years?

- Food
- Means of Transport
- Use of public spaces/parks

How have they changed?.....

What are the factors affecting such changes?.....

1.5 What are the factors that are affecting the consumption patterns of local people in these areas?

1.6 What do you think, what is the consumer preference to pay for green products (such as organic agri-products, bicycles, use of less junk food)?

1.7 Will consumers be ready to pay for environmental services (recreational, mainly the urban parks)?

**2 Knowledge and understanding of locals on climate change impact and adaptation practices**

2.1 Do you think that people know about climate change? What level of knowledge do they have?  
.....

What kind of adaptation practices are in place to cope with the impacts of climate change?  
.....

2.2 Are the current adaptation practices enough to cope with the impact?  
.....

2.4 To what extent are the EbA approaches practised in this area: restoring, protecting and managing ecosystems to ensure their health and the long-term effectiveness of the services?  
.....

2.5 What are the existing institutional mechanisms (coordination with local, provincial national levels) to promote/prohibit sustainable consumption in Bheemdatt municipality?  
.....

**3 Areas of interlinkages between sustainable consumption and Ecosystem-based Adaptation**

3.1 Do you see any existing relationship between the consumption pattern and conservation/management of natural resources?  
.....

3.2 Can sustainable ways of consumption contribute to reducing vulnerabilities to climate risks, enhance livelihood and promote biodiversity conservation?  
.....

3.3 How do you observe the linkages between sustainable consumption and EbA?  
.....

3.4 Would you recommend promoting EbA approaches and other kinds of natural-based solutions in urban and peri-urban areas for reduced risk of climate change impacts? Why and how?  
.....  
.....

## **Annex 4: ToR for experts' consultation workshop**

### **Background**

Bheemdatt is the ninth biggest city in Nepal and is adjoining India. People in Bheemdatt rely heavily on the Indian market and services. As the municipality also suffers from recurrent floods and other kinds of natural hazards such as drought annually, local people are frequently displaced. The local/indigenous practices to adopt and cost-effective as well as natural solutions to such situations are important. In many ways, individual and community-level lifestyle and consumption practices affect the environment.

To explore people's understanding of the environmental impacts of consumption patterns; a household survey has been conducted in Ward 4 and Ward 10 of the Municipality. Similarly, the legislative frameworks including guidelines and acts of Bheemdatt Municipality have also been reviewed. In order to validate the information collected through various other means, a consultation workshop has been envisioned. This event is part of the PhD research conducted by Ms. Samjhana Bista with the title "Sustainable Consumption for Effective Ecosystem-based Adaptation in Urban and Peri-Urban Settlements in the Lowlands of Nepal" from the TU Dortmund University, Germany.

### **Objective**

The objective of this one-day event is to bring together experts from various fields in Bheemdatt Municipality (local government representatives from the municipality and wards, academicians, journalists, and community activists) for a discussion on the findings obtained from the household survey, FGD and KII. Findings of the study conducted in Ward 4 and Ward 10 of the municipality will be shared for validation/input from the participants. In addition, prospects for the promotion of sustainable consumption and EbA will be assessed through a discussion among the experts throughout the Municipality.

### **Method**

The following method will be applied during this half-day event:

- A brief presentation on the research background, and findings of the study so far by the PhD Student-Ms. Samjhana Bista
- Discussion on the overall findings in plenary
- Group discussion (World Cafe) on the challenges of sustainable consumption and potential opportunities to promote sustainable consumption and EbA practices in the municipality.

For this, the PhD student will facilitate the session and a note-taker in each group will be identified. This will be followed by the presentations from each group.

### **Expected Outputs**

- The envisioned event will help to validate/contradict the findings obtained from other tools, and specifically help in identifying the prospect of sustainable consumption.
- A report on the potential of promoting sustainable consumption in the municipality will be prepared, which will also facilitate the design of proposals on urban resilience in future by the municipality and other development agencies.

*Note: This consultation workshop was combined with the Multi-stakeholders' Dialogue jointly organised with, and financially supported by DCA and NNSWA at Siddhartha Hotel, Bheemdatt Municipality, Kanchanpur on 27 April 2023.*