Urban Resilience Roadmap

Dhankuta Muncipality
Koshi Pradesh, Nepal
March 2024

UNDP

URBAN RESILIENCE ROADMAP OF DHANKUTA MUNICIPALITY

KOSHI PROVINCE, NEPAL
MARCH 2024

FOREWORD

Cities around the world are growing rapidly, and Dhankuta Municipality is no different. With this rapid growth, we face many challenges, like environmental degradation, social issues, and economic hardships. It is crucial that we plan carefully to make our cities better prepared against such shocks and stresses.

I am thrilled to present the Urban Resilience Roadmap of Dhankuta Municipality that embodies our collective efforts. This comprehensive plan revolves around four key pillars: nurturing diverse and inclusive socio-economic opportunities, safeguarding our environment while tackling climate change and disaster risks, enhancing infrastructure and services, and fortifying governance and investments. The overarching objective of this roadmap is to empower our community in effectively combating the escalating challenges posed by natural calamities and climate change. The roadmap was prepared through involvement of various stakeholders through workshops, interviews and discussions. These included members from municipal departments, marginalized groups, and industrial sectors. Their input has helped us understand what resilience means for our community. Dhankuta Municipality is committed to implementing plans. Our past

planning efforts such as periodic plans, and Dhankuta Smart City Plan have shown the potential of Dhankuta for a better future. With the Urban Resilience Roadmap, we have a chance to build on this, making sure our development is environmentally friendly and focused on adapting to climate change. The success of our efforts depends on the ongoing cooperation and engagement of multi-stakeholders.

My sincere appreciation goes to UNDP for collaborating with Dhankuta Municipality to formulate this resilience roadmap. As the Mayor of Dhankuta Municipality, I fully support this Urban Resilience Roadmap. It is more than just a document; it is a commitment to our people that we will strive to make Dhankuta adaptable and resilient.

Thank you.

MR. CHINTAN TAMANG
Mayor
Dhankuta Municipality

PREFACE

Over 4.4 billion people, which accounts for 56 percent of the world's population, are living in cities. It is projected that by 2050, about 7 out of every 10 people would live in cities. Urbanization can present opportunities for sustainable development, while at the same time rapid urban growth can result in environmental pollution, loss of agricultural land, and rise in urban inequalities which further exacerbates environmental, social, economic and food security risks.

In midst of these multifaceted challenges, it is important to build resilient cities that can withstand the current and future risks and challenges of urban development. Resilience has emerged as a core aspect of Sustainable Development Goals (SDGs), and Nepal as a member country of UN is committed towards achieving of SDGs by 2030. This necessitates embedding and mainstreaming resilient strategies and actions by all three tiers of government – federal, provincial and local, with an aim to foster sustainable urban development.

UNDP has been supporting the national efforts to achieve the Sustainable Development Goals (SDGs) by fostering inclusive economic growth, good governance and resilience to risks. Given that local governments are at the forefront of dealing with the impacts of disasters, and are mandated by the Constitution and Local Government Operation Act with roles and responsibilities related to urban planning, socio-economic development and disaster risk management, UNDP Nepal supports local governments in building resilient communities. In 2023, we supported Waling Municipality of Gandaki Province and Duhabi Municipality of Koshi Province to formulate Urban Resilience Roadmap which provides a holistic framework to foster resilient urban development.

More recently, UNDP collaborated with Dhankuta Municipality to formulate a strategic framework that holistically addresses disaster and climate risks, socio-economic challenges, inaccessible physical infrastructure and services, and urban governance and investment issues to promote risk-informed urban development. I would like to congratulate Dhankuta Municipality on successfully formulating an 'Urban Resilience Roadmap' and thank the leadership of the municipality for accounting resilient strategy into city development activities. I believe this roadmap will serve as a guiding and strategic tool to embed resilience in its development activities, and render holistic benefits to the citizens.

Mainstreaming the Roadmap into municipal annual planning and budgetary plans will lead to its effective implementation. However, implementation of the Urban Resilience Roadmap can be challenging as it requires coordination, partnership and multi-agency collaboration. I believe the concerted efforts from the municipality will overcome this challenge through its strong commitment to build its resilience and stride towards resilient urban development. We look forward to the implementation of the roadmap and will be happy to support the municipality to every possible extent.

MS KYOKO YOKOSUKA
Resident Representative
UNDP

ACKNOWLEDGEMENT

On behalf of Dhankuta Municipality, I am delighted to express my heartfelt gratitude to everyone who contributed to the formulation of Urban Resilience Roadmap. This significant accomplishment would not have been possible without the collaborative support of United Nations Development Programme (UNDP).

First, I extend my sincere thanks to our Honorable Mayor and Deputy Mayor for their proactive decisions and unwavering support throughout the project. Their leadership has been crucial in making this roadmap a reality. I also thank our Environment Officer for his continuous support, follow-up, and enthusiasm, which has been invaluable. My appreciation goes to all the staffs of the different Sections and Sub-sections of the municipality for their warm welcome and unbiased responses to our inquiries.

The Urban Resilience Roadmap is a collaborative achievement, reflecting the active participation of numerous stakeholders from provincial ministries, district agencies, municipal officers, and local communities. It is a detailed document that lays out strategic action plans for mitigating vulnerabilities that threaten our community's well-being. The roadmap, with its emphasis on preparedness and flexibility, provides a clear path for Dhankuta Municipality to thrive in the face of adversity.

As we move toward implementation, it is critical that we remain committed to the roadmap's strategies and proposals. This roadmap demands a firm commitment to developing policies and strategies aligned with our vision and allocating resources for prioritized initiatives. The sustained participation of diverse stakeholders is vital to our success. The effectiveness of the roadmap will depend on our ability to collaborate and coordinate activities across all levels of government, the private sector, civil society, and our local community.

As we embark on this journey, we are guided by the principles of inclusion and collaboration. The municipality and its authorities are wholeheartedly committed to successfully implementing the roadmap, ensuring budget allocations for priority projects. I express my sincere appreciation to all who contributed in different capacities to produce this document. Thank you all for your commitment to making Dhankuta a resilient and sustainable city.

Thank you.

DASHARATH RAI
Chief Administrative Officer
Dhankuta Municipality

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
BMIS	Building Management Information System
CC	Climate Change
CCI	Chamber of Commerce and Industries
CCTV	Closed Circuit Television
CDO	Chief District Officer
CTEVT	Council for Technical Education and Vocational Training
DEOC	District Emergency Operations Centre
DHM	Department of Hydrology and Meteorology
DRR	Disaster Risk Reduction
DUDBC	Department of Urban Development and Building Construction
EIA	Environmental Impact Assessment
EWS	Early Warning System
FM	Frequency Modulation
GESI	Gender Equality and Social Inclusion
ICU	Intensive Care Unit
IRA	Initial Risk Assessment
IUCN	International Union for Conservation of Nature
LEOC	Local Emergency Operations Centre
LNOB	Leave No One Behind
LPG	Liquified Petroleum Gas
NARC	Nepal Agricultural Research Council
NDRRMA	National Disaster Risk Reduction and Management Authority
NPR	Nepalese Rupees
OSR	Own Source Revenue
PUDBC	Provincial Urban Development and Building Construction
RAP	Resilience Action Planning
RCC	Reinforced Concrete Cement
SDG	Sustainable Development Goals
SMS	Short Message Service
SWM	Solid Waste Management
UNDP	United Nations Development Programme
URR	Urban Resilience Roadmap

EXECUTIVE SUMMARY

The Rockefeller Foundation (2015) defines resilience as, "the capacity of individuals, communities, and systems to survive, adapt, and grow in the face of stress and shocks, and even transform when conditions require it". With rapid urbanization, cities are regularly exposed to threats of natural hazards and human induced disasters. These disasters disproportionately affect the socially and economically disadvantaged sections of society. Likewise, the effects of climate change can be seen in the increased intensity of and damage caused by various disastrous events like flood, fire, landslides, earthquake, and storm. The topography of Nepal ranging from the high Himalayas to flat Terai poses a special difficulty in resilience building. Dhankuta is an example of a city in hilly region of Nepal where the steep slopes and frequent rainfall expose the municipality to threats of landslides and flash floods. With high potential to develop as a hill station, Dhankuta can become an example of resilient city in the region by identifying the key developmental challenges and addressing them via an urban resilience roadmap.

The Urban Resilience Roadmap of Dhankuta Municipality identifies, and analyses developmental risks prevailing at Dhankuta and offers actionable ideas for improved urban resilience. Based on field observations, comprehensive literature review, multiple discussions with relevant institutions, stakeholders' engagement, and workshops, four major components are identified to pave the way for a resilient Dhankuta: i) Diverse and Inclusive Socio-Economic Opportunities, ii) Environment, Climate Change, and Disaster Responsive Development, iii) Accessible and Adaptive Infrastructure and Services, and iv) Effective Governance and Investments.

To collect data and information related to these components, a communicative approach was used. Training sessions were carried out to educate the municipal staffs, relevant government and non-government institutions, local communities, and other relevant stakeholders about the concept of resilience, its objectives, and usefulness in the context of Dhankuta Municipality. To improve urban resilience, this comprehensive roadmap aims to address the municipality's major disasters and climate change risks. At the same time, special focus has been made on improving the living standard of the marginalized communities which are often overlooked in major developmental projects.

For each major component, key issues are identified, which has prompted the development of a set of strategies to successfully address them. An overarching strategy guides the urban resilience roadmap. The comprehensive resilience strategy includes integrated urban planning, resilient housing and infrastructure, smart technology integration, participatory decision-making, addressing social inequalities, promoting a diverse local economy, education and awareness initiatives, forest and biodiversity conservation, ensuring healthcare access for marginalized communities, and fostering collaboration with various stakeholders for shared knowledge and resources. The strategies are further developed into action plans that are prioritized to ensure efficient and effective implementation.

Key issues of Component 1: Diverse and Inclusive Socio-Economic Opportunities include the out-migration of youth for employment, monkey menace's impacts on agriculture, insufficient mechanisms for promoting tourism, a lack of awareness regarding the effects of climate change on agriculture, and a lack of marketing of traditional products made by marginalized communities. To address these issues, various actions have been recommended including carrying out empirical research, establishing innovation center, providing trainings for skill development, providing incentives for marginalized communities, and developing tourism infrastructure.

The key issues under Component 2: Environment, Climate Change and Disaster Responsive Development include increased use of toxic pesticides that are detrimental to biodiversity and soil productivity, insufficient efforts to collect rainwater, insufficient initiatives to upgrade solid waste management facilities, lack of environmental and disaster-prone areas mapping, lack of early warning systems and firefighting equipment, and inadequate and ineffective initiatives to relocate communities at risk of landslides. To address these issues, recommended actions include awareness campaigns, integrated pest management programs, establishment of fund for evidence-based decision-making, municipal byelaws for rainwater harvesting, conservation of springs, empowering residents with knowledge on extreme weather events, GIS mapping of hazard prone areas, strengthening the District Emergency Operations Centre (DEOC) and establishing Local Emergency Operations Centre (LEOC), and conducting suitable relocation of landslide affected populations.

The main issues of Component 3: Accessible and Adaptive Infrastructure and Services are insufficient adherence to the National Building Code (NBC) and Building Bye-laws, poorly maintained drinking water supply system which lacks lab testing for water sources, poor quality as well as inadequate coverage and maintenance of the road network, inadequate knowledge of and funding for preventive healthcare systems, and non-adaptive, inaccessible public buildings, and inadequate open spaces in public buildings and urban fabric. To mitigate the problems caused by these issues, some actions are recommended including conservation of water sources, springs, rainwater harvesting, upgrading of roadway networks, improvement in vaccination program, adherence to universal accessibility principles in designing of public buildings, capacity building and training programmes.

Key issues of Component 4: Effective Governance and Investments include a lack of e-governance adoption and a delayed shift to digital operation, lack of internalization of gender equality and social inclusion (GESI) issues, lack of initiatives addressing mental health and drug abuse, and lack of collaboration with NARC Pakhribas to take advantage of opportunities for the agricultural sector's improvement. The actions to address these issues include improvement in capacity for digital and online systems for major municipal operations, development of GESI action for each project, and leadership development for organic farming in coordination with NARC.

The Urban Resilience Roadmap of Dhankuta Municipality is a strategic initiative aimed at promoting sustainable urban development by tackling challenges related to urbanization, environment, and climate change. Resilient urban development in Dhankuta demands sustained cooperation among development partners like the province government, non-governmental organizations, as well as increased collaboration for funding sources.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Introduction

The concept of 'resilience' has several definitions. The Rockefeller Foundation (2015) defines resilience as, 'the capacity of individuals, communities, and systems to survive, adapt, and grow in the face of stress and shocks, and even transform when conditions require it.' Building resilience is about making people, communities and systems better prepared to withstand catastrophic events – both natural and manmade – and able to bounce back more quickly and emerge stronger from these shocks and stresses.

1.1. Background

Over 4.4 billion people[1], or 56% of the world's population, now live in cities. It is projected that by 2050, about 7 out of every 10 people would be living in cities, with the urban population more than doubling from its current level. As a result of unmanaged urbanization, cities are becoming more vulnerable to disasters and are facing the consequences of climate change more acutely. Disasters such as fire, landslides, earthquakes, floods, and storms that affect densely populated regions inflict significant losses in terms of lives, livelihoods, and the built environment as compared to rural areas. Socially, the urban poor are always the most vulnerable and frequently suffer the most severe consequences of changing climate and disaster scenario. In this global context, it becomes imperative to prioritize resilience in city planning to allow the cities to be better equipped to deal with the challenges of urbanization. Resilience[2] should be established as a multi-faceted concept[3] in cities development covering broader attributes related to physical, social, economic environmental, climate, disaster, institutional and financial components of city's urbanization.

Nepal is one of the highly urbanizing countries in South Asia. Major cities like Kathmandu, Lalitpur, Bhaktapur, Biratnagar, Pokhara and Nepalgunj are rapidly urbanizing in the recent decades influenced by various factors like politics, globalization, and aspirations of the people. Only 17% of the urban population lived in 58 urban municipalities in 2011. However, by 2015, the number of urban municipalities had grown to 217. The number of urban municipalities has now risen to 293 following the federal reform. The administrative conversion of rural regions to municipalities has resulted in an increase in Nepal's urban population and the number of urban municipalities[4].

In the context of Nepal, National Disaster Relief Act[5] was enacted in 1982 to guide the provision of aid for people affected by natural disasters. Likewise, to tackle the pertinent threat of earthquakes, the National Disaster Risk Management Strategy 2009 was introduced. This was relevant because Nepal is in 11th position in terms of earthquake risk (Global Report on Disaster Risk). In the aftermath of the 2015 Gorkha Earthquake, National
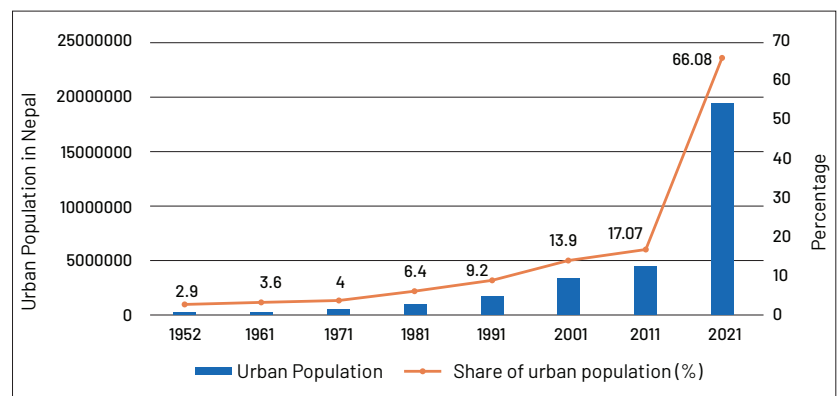
Figure 1–1 Urbanization trend in Nepal (Poudel et al., 2021)

---

1 Figures from the World Bank

2 Various national and international resilience literatures and frameworks were studied including making cities resilient 2030 (UNDRR), Sendai Framework (UNDRR), Resilient Cities (OECD), Framework for resilient cities (NUDS), Building resilient cities (ADB), resilient roadmap of Waling Municipality, City RAP (UN-Habitat), and Resilient Cities Index (Arup). The details are present in the annex.

3 Resilience is a multifaceted concept evolving continuously and gaining prominence across sectors and agencies to describe the ability of a system or institution to overcome the stress and shocks caused due to some hazards or events. The most recent definitions incorporate the ability to 'bounce forward' or transform or adapt to a new stable state as 'resilience'. The concept has influenced various disciplines and different fields, such as ecology, engineering, geography, and psychology, and it has been used in academic, political, and policy discourses.

4 Exercising the rights guaranteed by the Local Government Operation Act and the Constitution, the local government (rural municipalities and municipalities) can enact municipal laws, levy taxes, and create and carry out development plans and budgets. They have a mission to build key infrastructure services for agriculture, jobs, water and sanitation, roads, irrigation, environment, health, and education, among others.

5 This Act enabled a committee to recommend declaration of affected areas, formulate national policy regarding the relief work, associate with and coordinate social organizations in National Calamity Relief Work. Importantly, this Act enabled the committee to keep money, food, clothes, medicine, construction materials received from within and outside the country as aid or donation under Central Natural Calamity Aid to send them as required for relief work in disaster area.

Disaster Risk Reduction and Management Act 2017 was introduced which paved the establishment of a dedicated National Disaster Risk Reduction and Management Authority (NDRRMA). Additionally, the Act mandates the establishment of disaster management committees at the local, provincial, and national levels. In order to promote successful disaster management, the Act highlights the significance of coordination and cooperation between diverse range of stakeholders, including the government, civil society organizations, and the private sector. Building community resilience and guaranteeing the participation of underrepresented groups and people with disabilities in measures to reduce disaster risks are also prioritized.

1.2. Rationale

The topography of Nepal[6], which ranges from high mountains to hills and plains (terai), present unique opportunities to make climate friendly cities while posing technical difficulties for ensuring resilience. The occurrences of different types of disasters such as landslides, flash floods, riverine floods, and earthquakes are different from region to region. For instance, the steep slopes and frequent rainfall in the hilly region make it more vulnerable to landslides and flash floods, whereas the Terai region is more susceptible to riverine flooding and inundation. Each geographic location presents a varied set of challenges when it comes to urban development.

Given these opportunities and challenges, it is not prudent to come up with a single model for resilient cities in Nepal. Instead, different strategies must be used that maximize the unique characteristics of each location. A resilience roadmap should pave ways for identifying and evaluating risks, enhancing infrastructure, and increasing community preparedness for disasters. By encouraging risk-informed development and by boosting the ability of local authorities and communities to effectively avoid and respond to disasters, the roadmap aims to internalize the challenges and establish a culture of resilience in Nepalese cities.

Dhankuta is a strategically located historic city in the hills of Koshi Province with a rich history of over 400 years. It is an example of a prosperous trade and commerce-driven hill city with rich cultural and social background. Its unique geographical location, as well as the evolving urbanization exposes Dhankuta Municipality to various natural and human induced shocks and stresses.

In this context, UNDP is supporting Dhankuta Municipality to develop its roadmap for building resilience and identifying recommendations for sustainable and resilient urban development. Taking precedents from similar works in Nepal and other countries, the roadmap provides an action plan to guide multi-sectoral resilient development of Dhankuta Municipality. The roadmap is not, however, an implementation plan.

1.3. Conceptual Framwork

The urban resilience of Dhankuta has been framed as per the local context and the exhibiting geo physical, socio economic and governance systems at the local level. The city has been experiencing different shocks in the form extreme geo physical events along with shifts in agricultural practices and livelihood. The conceptual framework focuses on four main aspects/components.

Diverse and Inclusive Socio-Economic Opportunities is one of the major operational components of the roadmap. With around 60% of population currently engaged in agriculture, and geographic location with view of the mountains (at Hile) and landform of Dhankuta makes it a potential tourist hotspot, Dhankuta has a diverse array of economic opportunities.

The prevalence of environmental and disaster risks of fire, landslides, road accidents, as well as the implication of climate change in agriculture and magnitude and intensities of disaster suggest Climate Change and Disaster Responsive Development as the second component.

Likewise, Accessible and Adaptive Infrastructure and Services has been identified as another major component considering the building construction practices, waste management, drinking water supply, and infrastructural development.

Considering the cross-cutting issues of developmental dynamics, provision of budget for disaster risk reduction and climate change, coordination and effectiveness of urban governance and investments, Effective Governance and Investments has been identified as the fourth component of the roadmap.

---

6 According to Asian Disaster Reduction Center 2019, among 200 countries, Nepal ranks 4th, and 11th most vulnerable to climate change and earthquake risks respectively. The country is in top 20 of all multi-hazard risks prone countries in the world.

Figure 1-2 Conceptual Framework of Urban Resilience Roadmap of Dhankuta Municipality

1.4. Methodology

The study for preparation of urban resilience roadmap of Dhankuta has been carried out primarily as social science research. Exploratory research of the situation of the municipality through the lens of resilience is being carried out using consultative and participatory data collection methods. Stakeholders' engagement has been prioritized throughout the study and has been carried out with stakeholders from diverse backgrounds matching the major themes of the study.

The initial phase involved review of literature and conceptualization of the framework. While the review of relevant literature and documents continued, a series of field studies were carried out to collect data as well as to conduct orientation training and workshops with the concerned stakeholders. Data collection methods include key informant interviews, focused group discussions and transect walks. Various maps, graphs, and tables along with descriptive analysis have been used.

Phase I | Decoding Urban Resilience
Review of secondary sources, framing the project concept, exploratory site visit, introductory meetings, presentation and onboarding

Phase II | Fieldwork and Data/Information Collection
Finalizing components, sub-components and identifying potential indicators, field visits, baseline data mapping, data and information compilation and ready for analysis, workshop

Phase III | Data and Information Analysis and Interpretation
Use of different data analysis and presentation tools

Phase IV | Submission of Urban Resilience Roadmap for Action
Incorporation of feedback on draft reports, operationalization, finalization and submission of the roadmap
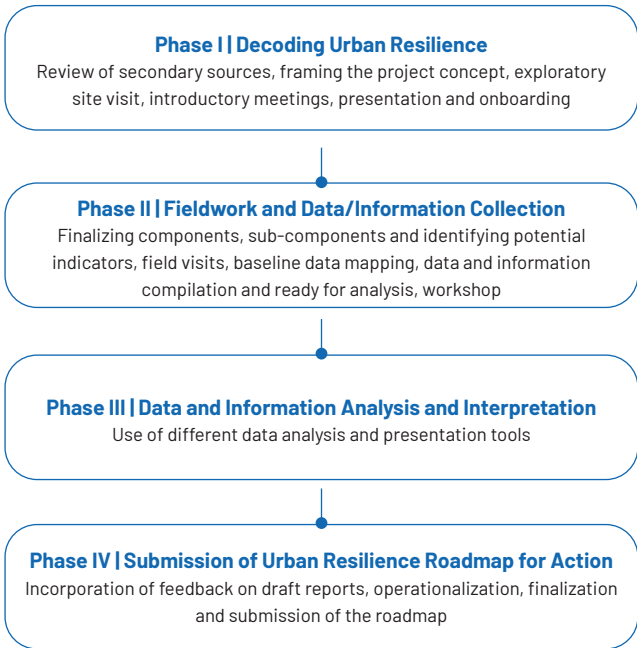
Figure 1-3 Overall process of urban resilience roadmap preparation

Using the 4 major components, a questionnaire was developed based on the indicators derived from previous studies[7] as well as questions from the City Resilience Action Planning Tool (CityRAP). Relevant data was collected accordingly using stakeholders' engagements, key informant interviews, focused group discussions, and workshops[8]. Transect walks across the municipality provided insights about the overall setting and conditions of various urban infrastructure and socio-cultural dynamics prevalent in Dhankuta.

Primary Data Collection	Various Key Informant Interviews, Focused Group Discussions, Stakeholders Consultations, Transect Walk	Mayor, Deputy Mayor, Different Sections of the Municipality, Local Groups, Marginalized Communities, Provincial Government Institutions, District Institutions
Secondary Data Collection	Standard Publications, Reports, Guidelines, Manuals, Policies, etc.	Global and Regional, National, Provincial, Local Level institutions
Workshops and Group Exercise	Vulnerability Assessment of the municipality and capacity development	Various stakeholders including municipality, development partners, security officials, industries, press, etc.
Vulnerability Assessment and Risk Mapping	Combination of exposure and vulnerability assessment	Base maps, Historical Data, Geographical Data, Multi Hazard Risk Mapping

Table 1-1 Data Collection Tools and Techniques for Urban Resilience Roadmap of Dhankuta

---

7 Previous studies include Urban Resilience Roadmap prepared by UNDP for Waling Municipality and Duhabi Municipality.

8 Details of the key notes and discussions in Key Informant Interviews, Focused Group Discussions, Stakeholders' engagement, and Workshops have been shared in the annex document.

DHANKUTA: AN OVERVIEW

2.1. Location and Demography

Dhankuta Municipality lies in Dhankuta district of Koshi Province, eastern part of Nepal. With a total of 10 wards, the municipality is surrounded by Chhathar Jorpati on North and East, Sanguigadhi on the South, Shahidbhumi on the Southwest, and Pakhribas on the Northwest. The total land area of the municipality is 111 sq. km, and the municipality lies between an elevation of 250 m to 2144 m above mean sea level. The municipality is around 48 km north of Dharan, and 89 km far from Biratnagar.

According to the census report of 2021[9], the total population of Dhankuta municipality is 35,983. This is an increase of 7,619 people compared to 2011 when the population was 28,364. The population density of the municipality is 324 people per sq. km. The sex ratio is 91.49 male per 100 females with 47.8% population as male and 52.2% as female. The census of 2021 also reports that there are 9,637 households in the municipality with an average household size of 3.73 persons. The population pyramid of the municipality shows that the proportion of young people is higher than the elderly population suggesting the demographic dividend.

People from surrounding locations are migrating to Dhankuta for better access to urban infrastructure and services. A look at the percentage of population by former place of residence shows that about 40% of the population of the municipality are immigrants.
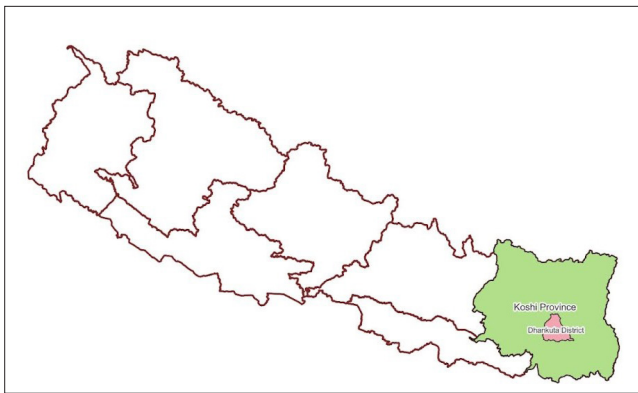

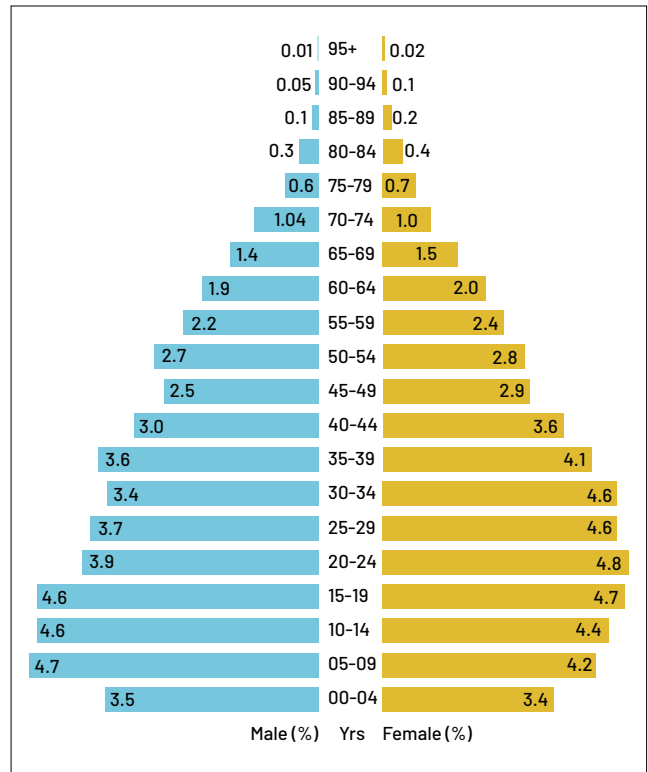Figure 2-1 Location of Dhankuta district in the map of Nepal

Figure 2-2 Population Pyramid of Dhankuta Municipality (National Population and Housing Census, 2021)

2.2. Social Fabric

According to the National Population and Housing Census 2021, the majority of people living in the municipality are Kshetri and Aathpahariya[10]. Hinduism is the major religion (60%), followed by Kirat (25.6%).
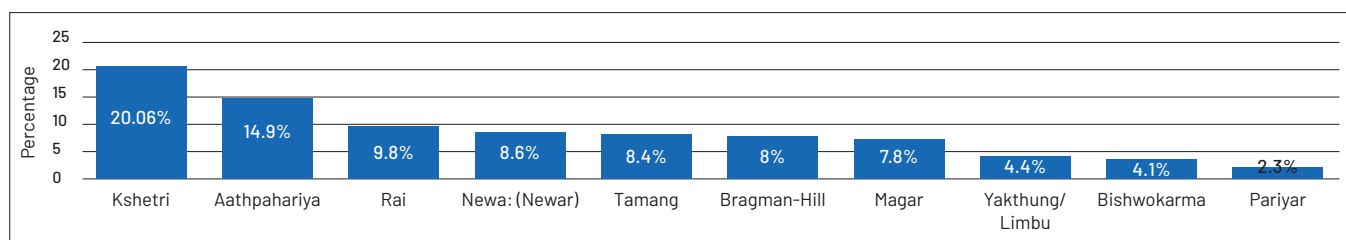

Figure 2-3 Major Ethnic Groups (National Population and Housing Census, 2021)

Study of Bishwokarma Community in Ward 4

The Bishwokarma community, which consists of 20 houses, is facing numerous challenges. Most male members work abroad. The community is largely reliant on remittances for financial support. Even though nine people from the community have received national recognition for their handicraft abilities, they remain marginalized, unable to become entrepreneurs or compete in the market production sector. The District Coordination Office and the Municipality Office provide occasional assistance by providing capital for purchase of machinery, construction of community building, but there is no systematic approach to support diversification of economic opportunities in the community.

Study of Athpahariya Community

Wards 2, 3, 4, 5, 7, and 8 are home to the majority of Dhankuta's indigenous Athpahariya population. While the census indicates there are 6-7 thousand Athpahariya, there may be 10-12 thousand in fact as per the local community. However, many Athpahariya identify as Rai in the census, causing identity issues. Notably, the Athpahariya community is represented by the ward chairs of Wards 4, 5, and 8. Agriculture and animal husbandry are the main occupations of the Athpahariya community, however, returns from the latter are inadequate. The major agricultural products include corn, pulses, and millet are farmed, as well as fruits such as mango, salifa, avocado, and dragon fruit. Foreign employment is common, with at least one member of each household working abroad, especially in Gulf countries.

The diverse cultural practices, festivals, and use of "Baunna Chulo" are all important components of the Athpahariya community's life. They also believe in the power of "Mundum" for resource management. However, the community is facing financial difficulties, which has resulted in cooperative loans, culminating in mental health issues and family troubles. Financial literacy is poor, and drinking continues to be a social problem. Men typically control market access and decision-making, whereas women work primarily within agriculture.

Key concerns in Ward 8 Athpahariya community include non-commercialized agriculture due to limited market access, as well as the need to develop water-efficient farming practices. Furthermore, due to a debt problem, over 200 people have lost their land to high-interest loan lenders. Education is facing issues due to a high dropout rate, particularly among disinterested youth. Furthermore, there is an urgent need for improved healthcare facilities, such as regular health camps, with a focus on maternal and women's health issues.

10Athpahariya is the indigenous community of Dhankuta. One of the major cultural heritages of the community is located in Dhankuta, called the 'Baunna Chulo'. 'Baunna Chulo', which literally translates to '52 cooking stoves' is a community cultural house where various rituals of the Athpahriya community take place. This building used to be 9 bamboo long and 400-500 baskets of thatch was required to cover the roofing. This building is an important part of the Athpahariya existence. It is in fact a sacred space for the community. Only priests have access to a certain portion of the building. There is a need to document the building (architecture and structure) and allocate budget to revive the building's glory in its traditional form. The term 'mundum/mundhum' refers to the strong power of the Kirati's 'holy scripture'. But the 'mundum' is not a scripture because it is neither the holy writings of a religion nor a holy book. It is only an oral tradition.

The National Population and Housing Census 2021 result shows that most of the people have their own houses (76.9%), while few are living in a rented space (19.3%). According to the municipality Household Survey 2016/17[11], around 72.92% of house owners have land certification while 15.23% lack it. The same survey indicated that only 16.35% of the houses are constructed with building permits.

Most houses are constructed with bricks/stone masonry in mud mortar (56.7%). RCC frame structure is relatively new and accounts for 16.8% of total building construction in the municipality.

Half of the population has access to tapped water within their compound, while the remaining have access to public tap water with fetching time ranging from 15 to 45 minutes. The water quality though not checked frequently, is satisfactory except during monsoon. Around 43.2% of the population still relies on firewood for cooking, indicating that a large portion of the population is still rural. Around 56.3% of the population uses LPG for cooking.

Agriculture is still the mainstay of the economy. More than 60 percent of the labor force is engaged in agriculture/horticulture. About 21.2% of the total households have someone living abroad which indicates that a major source of municipal income comes from remittance as well.

The literacy rate of the municipality is around 84.5%. Literacy rate among women is lower at only 78.9% compared to men at 90.6%. According to the Education Sector Plan of the municipality (2021–2030), there are 48 primary child development centers, 56 schools (39 government and 17 private), 3 CTEVT training schools, 1 open school[12], 4 government colleges, and 6 private colleges. The document mentions that access to education of the marginalized community is weak and there is a lack of quality management of educational services in the municipality.

There are various health institutions present in the municipality. Dhankuta District Hospital is the major health facility equipped with birthing units and ICU facilities. Health camps are conducted from time to time with the support of municipal and provincial government in remote areas to provide health services to deprived communities at their doorstep. For referral, Dharan and Biratnagar hospitals are widely used.

2.3. Economy

The National Population and Housing Census 2021 data shows that the major economic activity of the municipality is agriculture with 60.4% of the population engaged in it. 34.6% of the total land of the municipality is under cultivation as per the land use map present in master plan for developing Dhankuta[13] as smart city 2019.

The National Census 2021 results[14] indicates that other major economic activities include wholesale and retail, repair of vehicles, and construction. Of the 30,318-population aged 10 and above, 73.7% (22,349) are economically active. With 21.2% of households having at least one member of the family abroad, the economic status of the municipality is increasingly driven by remittance.

Dhankuta also holds potential for tourism development with rich cultural and natural tangible and intangible heritage. Likewise, various herbs are available in the forests of the municipality, which can be used for operation of small to medium scale commercial herbal medicine industry. The development of roads in recent years and good connectivity with the mid-hill highway has provided opportunity for development of Dhankuta municipality.

2.4. Urbanism, Urban Growth, and Urban Development

Dhankuta Municipality is densely populated in the market areas of Dhankuta bazaar and Hile. Urban development is guided by roadway development. The Koshi highway passes through these two main urban centers of the municipality. The municipality has undergone mostly ad-hoc development along the major roadways. Dhankuta bazaar is located at the ridge of the hill and is therefore less prone to landslides and flooding. The existing land use map[15] (Figure 2-4) of Dhankuta shows that only 3.57% of the total land area is built-up while 59.57% is forested.

Several development plans have been prepared for Dhankuta Municipality in the past years. Periodic Plan and Integrated Urban Development Plan are some important plans prepared for the municipality. It is also expected that the development of Eastern Urbanizing Corridor[16] would assist development of Dhankuta municipality as a peripheral area.
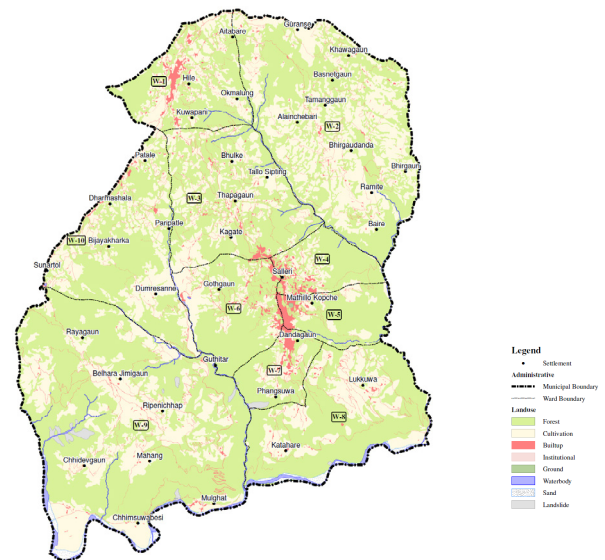
Figure 2-4 Existing Land use Map of Dhankuta Municipality (Source: Preparation of Master Plan for Developing Dhankuta as a Smart City, DUDBC, 2019)

---

11 Information extracted from Dhankuta Municipality Profile 2018.

12 "Open school" refers to an institution that has been accredited by the Distance Education Committee to conduct educational programs at the school level through the means of distance education/open learning. Education conducted through this method is considered an alternative form of schooling and a second chance for school education.

13 Dhankuta Municipality was declared the capital of Avocado by the third meeting of municipal council on June 22, 2018.

14 https://censusnepal.cbs.gov.np/results/economic?province=1&district=7&municipality=4

15 In 2019, a land use map was prepared as an output for Preparation of Master Plan for Developing Dhankuta as a Smart City by DUDBC, MoUD.

16 Stretching from Dharan to Biratnagar and from Itahari to Damar, "Eastern Urbanizing Corridor" is the main theme of Integrated Development Strategy for Nepal's Eastern Urbanizing Corridor that was prepared under the ADB's technical assignment on "Nepal- Economic Corridors Initiative: Preparation of Sub-National Development Strategies". The corridor was identified by the Ministry of Urban Development in the National Urban Development Strategy. The policy themes of the corridor plan are accelerating electrification, improving connectivity, developing commerce and trade, developing human capital, improving management of land, converging public services, optimizing spatial development, managing natural and cultural heritage, improving governance and management, and strengthening civil society.

2.5. Environment, Climate Change, and Disaster

Dhankuta municipality is considered one of the cleanest cities. Nepal Government's Solid Waste Management Technical Support Center declared it the "Cleanest City" in the country in 2017. This municipality has put lots of effort into solid waste management, drainage, and sewerage system, greening and beautification. As a result, Dhankuta residents consider cleanliness as part of their regular civic duties. The municipal workers sweep up public places and streets every day while the streets in front of the houses and shops are swept clean by the owners themselves. Some of the locals now recycle and reuse materials which earlier they would have thrown into the garbage. The municipality has provided training to households to segregate biodegradable and non-biodegradable waste.

Around 60% of the total municipality land area has slopes between 15-30 degrees (Figure 2-4). The traditional settlements are built along the ridges with relatively flat slopes and stable geology. More than 50% of buildings in the municipality lie on slopes between 11 to 20 degrees. The old bazar or settlement areas have never experienced landslides in the recent past except for some low scale soil erosion nearby new road construction.

Geologically, the municipality consists of quartzite, slate, phyllite and fluvial deposits. The municipality is generally stable in terms of geohazard but consists of a small number of landslides. These landslides are controlled by lithology and distance to drainage. The chemical and physical weathering process turned rock into the soil. The soil consists of Eutri Cambisols, Gleyic Cambisols and Chromic Cambisols. Lithology consists of Quartzite, slate, phyalite and fluvial deposits.

Most of the water is being naturally drained through the rivers flowing in this municipality. These rivers include Lungdang, Aaitabaare, Muga, Mulawari, Futchuwa, Ghatte, Hajari Sim, Nibuwa, Tankhuwa, Patle, Baghe, Dhankuta, Dhobi, Gokunde (Khamche), Raduwa, Tamor and Phongsuwa river.

The municipality has warm and temperate climatic conditions which receives a high amount of rainfall in the summer. However, the rainfall pattern is changing with intense rainfall in the rainy season and long dry winter. The maximum rainfall occurs in the months of June, July, and August. The temperature ranges from 10 to 24 degrees Celsius.

Figure 2-5 Slope Map of Dhankuta Municipality
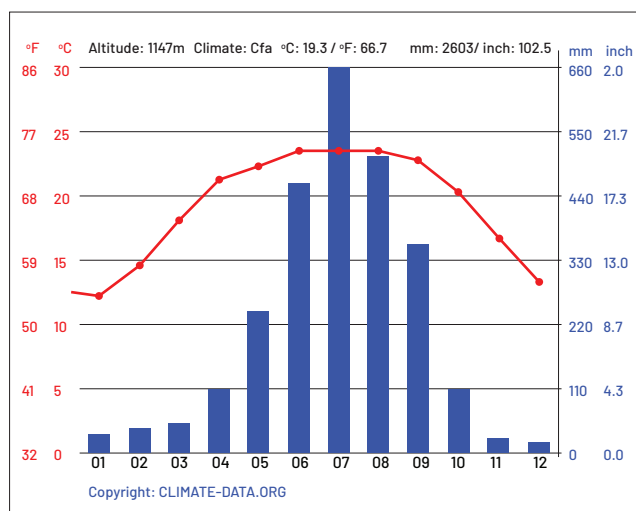
Figure 2-6 Temperature and Rainfall Data for Dhankuta (Source: Climate-data.org)

According to bipadportal[18], between 2013 and 2023, incidence of fire is the major cause of disaster followed by landslide, thunderbolt, heavy rain and others resulting in highest death toll respectively (table 2-1)

SN	Incidents	Number	Death	Economic loss (NPR)
1	Fire	69	2	97,403,000
2	Landslide	16	3	3,570,000
3	Thunderbolt	14	4	640,000
4	Heavy rainfall	13	0	9,500,000
5	Forest Fire	12	0	0
6	Flood	5	2	0
7	Windstorm	4	0	2,102,500
8	Earthquake	2	0	4,000,000

Table 2-1 Details about disaster incidents that occurred in Dhankuta Municipality between 2013 and 2023 according to BipadPortal

ROAD TO RESILIENCE:
SITUATION OF DHANKUTA

3.1. Diverse and Inclusive Socio-Economic Opportunities

3.1.1. Agriculture and Tourism

Agriculture is the primary source of income for more than 60% of the population of Dhankuta Municipality. The municipality has conducted a study about agriculture and land ownership. This study has revealed a wide range of land sizes, from large estates exceeding 100 ropanis (5.09 hectare) to smaller parcels as little as 2 ropanis (0.1 hectare). Dhankuta was once known for its citrus exports, particularly oranges; however, the threat of citrus disease and climate change has limited this production to the wards 1, 3, and 10 that are located at higher elevation. There is a need for comprehensive study of the effects of climate change on the agricultural sector of Dhankuta. On the other hand, avocado[19] has emerged as the municipality's trademark fruit. Nonetheless, difficulties exist due to a lack of suitable storage facilities, which limits year-round availability.

In the recent years, there has been a shift in the cultivation pattern from commercial vegetable farming with a rise in maize[20] cultivation which has been aided by subsidies from the municipality ranging from 50% to 100%. The establishment of effective auction marketplaces, where bidders and sellers meet to exchange goods or services, enabled by cooperatives guarantees that farmers' agricultural products are adequately compensated. The wards 2 and 8 face problem of unreliable agricultural productivity with shortage of irrigation facilities, which are aggravated by inefficient transportation[21] systems as well as haphazard use of chemical fertilizers and pesticides. Farmers are also harmed by the monkeys which frequently destroy their crops[22] significantly affecting their net agricultural yield. Addressing these issues is critical in developing measures to improve Dhankuta Municipality's agricultural foundation. Importantly, these insights are essential to devise realistic and pragmatic ways to prevent the massive outflow of youth for foreign employment.

The municipality of Dhankuta supports farmers in a variety of ways. These activities include promoting chhurpi (hard cheese), providing livestock insurance, and improving milk and dairy production and marketing. Efforts are also being made to ensure an adequate supply of buffalo meat and to improve cow farms. The municipality supports production of biogas from cattle dung and cultivation of high-quality grass for animals. Vaccinations for livestock, such as those for rabies, are being offered to ensure animal health. Livestock insurance is also provided to help in the event of an unforeseen event involving the animals. Artificial insemination procedures are being implemented to increase the number of female cattle and minimize reliance on Indian cattle imports. Farmers are increasingly purchasing livestock insurance, indicating increased understanding of risk management[23] methods among them, which is critical for the sustainability of agriculture in Dhankuta.

Tourism in Dhankuta municipality can be attracted through promotion of orange street, Ghumaune Chautari, Chuliban View Tower, Athpahariya baunna chulo ghar, and many more natural and manmade amenities. To enhance the entire visitor experience, Dhankuta is making strategic investments in tourism-related infrastructure and products, such as the creation of view towers and beautiful parks. Hile, a popular tourist site within the province, attracts visitors not only from Nepal but also from neighboring states of India such as Bihar and West Bengal. Likewise, Dhankuta's popularity extends to avocado lovers because of its unique flavor and nutrition. Furthermore, the municipality is promoting homestay sites to provide guests with unique local experiences. Tourism packages designed to entertain and interest tourists for more than a day need to be developed to encourage longer visits. Walking and hiking trails are also being developed to cater to promote adventure tourism. The municipality also has plans to promote religious tourism[24]. It is essential to establish a process in place to record[25] the number of tourists visiting the area. This shall help in planning tourism-related activities and planning in the municipality.

An interesting shift is taking place in Hile. The town's growing

---

19 Dhankuta has been declared the avocado capital of Nepal.

20 Maize is used as food, feed, and fodder. The demand for maize is rapidly increasing due to expansion of poultry and feed industries in Nepal.

21 Not all the municipality settlements are connected by good roadway networks. Some roads are not functional during rainy seasons.

22 Wards 2,3,6 and 10 are mostly affected by this issue. The monkeys have been terrorizing the people by destroying crops like maize. The locals complain about the terror in public hearing forums. Around NPR 1 million budget has been allocated to address the issue. Excerpts from Rajasthan, India have been brought - monkeys captured and exported in trucks to other forest areas but again another truck from someplace brought another set of monkeys. A long-term solution needs to be devised.

23 Farmers have become more aware about the importance and usefulness of livestock insurance because of financial risks associated with the recent outbreak of lumpy skin disease in cattle.

24 Dhankuta Chamber of Commerce and Industry (CCI) is holding discussion with potential investors to carry out these projects. There is a need for the CCI and the municipality to collaborate effectively to implement these projects as soon as possible.

25 At present, there is no record keeping of number of tourists visiting the municipality.

urbanization is now reflected in multi-story RCC buildings. Hile has grown as a vibrant commercial and trade town, distinguished by well-maintained, large roadways (Koshi Highway). The town's architectural environment has shifted toward modernity, with few historic residences remaining that are in need of renovation. Hile's continuing transformation is guiding it toward becoming a bustling concrete urban hub, much different than its outlook in the past as a traditional hill town.

3.1.2. Employment and Trainings

With over 25% population[26] aged 10 and above economically inactive, Dhankuta faces a critical challenge of youth unemployment. Some efforts have been made by the municipality to address this issue. It provides various kinds of training for entrepreneurial development. The municipality provides a 1600-hours training programme on welding and cooking with support from local development partners. In the fiscal year 2022/23 it conducted a training program to produce electricians. These training programmes mostly target the youth with almost 50% of women participation.

These trainings are conducted at the ward level. In ward 1, one hardware training and one welding training session[27] were conducted for 20 persons in each session. In ward 7, welding training was conducted for 20 people with the help of World Link group. In the province office, training on machinery for 20 people for 40 hours (6 days) was proposed but could not be conducted due to lack of participation (minimum 15 people were required – only 8 signed up, which shows that either the population is not interested in training or the information about training is not adequately disseminated).

The municipality is also focusing on the needs of the youth of different groups. The "ENSURE"[28] program takes various steps, including data collection to acquire a better knowledge of the issues experienced by individuals who have returned from abroad employment. In addition, specific training programs are available to help them successfully reintegrate into the society. Furthermore, the municipality runs a variety of training projects, such as full 10-month courses in professions such as electrical, welding and culinary works, in which both men and women are encouraged to participate. However, it is crucial to emphasize that there is a clear lack of interest among the youth in employment in agriculture. This could become a big issue in the near future, especially when the majority of the municipality's economy is based on agriculture.

The Prime Minister's Employment Program[29] has helped create jobs in a variety of sectors, including ordinary labor, school construction, and agricultural/factory production. The Program puts strong emphasis on Gender Equality and Social Inclusion (GESI), recognizing the need to foster equitable opportunities for all. However, in other activities of the municipality, GESI receives less attention, underscoring the need for broader initiatives to prioritize and solve gender equality and social inclusion problems in all facets of employment and societal development.

3.1.3. Microcredit Cooperatives

Dhankuta Municipality has a strong presence of microcredit cooperatives, with over 70 in operation, around 50 of which are actively supporting the community. These microcredit cooperatives are mostly concerned with agricultural efforts and play an important role in providing financial assistance to local farmers and entrepreneurs. Farmers in the municipality regularly participate in multipurpose and agricultural cooperatives, which serve as vital avenues for obtaining loans for a variety of agricultural and commercial activities.

There are some challenges associated with microcredit cooperatives. One of the challenges is the use of loan money for purposes other than they borrow for (including entertainment, family ceremonies, and alcoholism), resulting in loan repayment issues. Furthermore, the relatively high interest rates connected with these microcredit loans have placed a significant financial strain on the farmers resulting in insurmountable loan repayment pressures with some cases reporting extreme measures such as self-harm and suicide.

3.1.4. Gender Equality and Social Inclusion

Dhankuta Municipality has launched several poverty-relief initiatives. Currently, efforts are being made to identify and collect statistics on poor households within the municipality. Over 800 people under the poverty level[30] have been identified. Ongoing initiatives are focused on the planning and implementation of programs aimed at improving their living standards. Skills development and entrepreneurial training programs[31], such as "Garibsanga Bishweshwor" and "Gariblai Byayasaya Sanchalan", are being implemented. The municipality is actively implementing poverty alleviation programs by giving technological and marketing support. The municipality is developing and implementing poverty-reduction policies. Some successful initiatives include identification of over 300 squatter families and data collection on marginalized and landless people. Discussions are already taking place to evaluate resettlement plans that will help their housing and living conditions.

---

26 Figure from National Population and Housing Census 2021, National Statistics Office.

27 Some trainings are done with the help of local NGOs like the Samriddhi group.

28 Enhanced Skills for Sustainable and Rewarding Employment (ENSURE) project, 2016 to 2025, is established under an agreement between the Government of Nepal (GoN) and the Swiss Agency for Development and Cooperation (SDC). The technical assistance for the project is provided by Helvetas. The project addresses the issue of unemployment, underemployment and unfair pay facing the Nepali labour market resulting from the mismatch in skills demanded by the industries and that which the workers possess through different training modalities such as apprenticeship and courses with robust on-the-job training (OJT) for the new job entrants and the training of existing workers on the principles of lifelong learning.

29 This program employed 62 people in the last fiscal year (2022/23), each of whom worked for a total of 100 hours and received a daily wage of NPR 577.

30 The municipality, under the guidance of Ministry of Finance, GoN, conducted a household survey. In this survey, questionnaires related to income, and purchasing capacity were assessed. The households were categorized as high, medium, and low income. The low income or the poor families were provided with identification card with the help of which they are provided various services to maintain their livelihood.

31 Garibsanga Bishweshwor is a community led program where funds are collected from communities at ward level (mostly implemented in wards 5 and 8) and used for social mobilization. Here social mobilization means creating self-help groups for people in the community for saving and credit, livelihood support, and infrastructure work that helps to empower them economically, socially, and culturally, directing local resources and means to bring about positive changes in their personal, familial, and social lives. Gariblai Byabasaya Sanchalan is a programme that is run by the municipality in association with the MEDPA (Micro Enterprise Development for Poverty Alleviation) of Ministry of Industry, Commerce, and Supplies. In this, technology and skill transfer are prioritized. Around 50 micro-enterprises are supported in the municipality by this programme.

While men are predominantly working aboard, women are clearly more active in the local markets like Thursday Haat market[32], as both buyers and sellers. Women's underrepresentation in leadership positions, particularly as the leaders of community development committees, results in insufficient attention to their concerns and needs, limiting budget allocation for women's empowerment.

The municipality's main ethnic groups include Kshetri, Athpahariya, Rai, Newar, and Tamang. To ensure that these diversified ethnic groups' rich cultural heritage continues to thrive, it is critical to prioritize the preservation and promotion of their unique languages, literature, and traditional costumes. Furthermore, there is an urgent need to support and promote the traditional skills and economic activities conducted by these ethnic communities in order to develop their economic sustainability and cultural relevance.

Dhankuta district is dealing with several serious social problems. Last year, five people committed suicide, age ranging from 14 to 15, focusing light on the crucial issue of depression and poverty. Another troubling issue is abuse of drugs, especially among adolescents in grades 9 and 10. Family disputes, particularly between couples, are common, and are frequently intensified by consuming alcohol. The risk of family disintegration due to foreign employment is on the rise, threatening household stability. Vehicle theft, particularly of motorcycles, shows security risk. Addressing these social issues is critical for the Dhankuta's well-being and stability.

Key Issues
1. Changing interest of youth for employment – preference of foreign employment among men and limited interest in agriculture.
2. Monkey menace/terror in agriculture affecting agricultural yield.
3. Insufficient mechanism for tourism promotion. Inadequate promotion of local culture and insufficient marketing of products made from traditional occupation (of marginalized communities)
4. Poor knowledge and awareness regarding loan related financial systems.
5. Lack of study of climate change impacts on agriculture.

3.2. Environment, Climate Change, and Disaster Responsive Development

3.2.1. Environment and Ecosystem
The increasing usage of pesticides in wards 6, 8, and 9[33] is one critical issue in Dhankuta that requires quick response. The Environment Section of the municipality, in coordination with the Agriculture Service Section of the municipality and concerned stakeholders should take effective measures to prevent excessive use of chemicals that puts people's health at risk as well as causes significant damage to the natural biodiversity. It is critical to launch a comprehensive study and monitoring program to determine the environmental and public health implications of this concerning trend.

Likewise, the municipality struggles with unreliable water supply, which has an impact on water quality, especially during the summer. The municipality is promoting rainwater harvesting projects and further advocates including it in construction permits and legislation to improve water resilience. For a greater impact, ongoing projects[34] in rainwater harvesting and watershed protection need to be expanded. To guarantee that the public has access to clean drinking water, it is imperative to address the lack of regular water testing, with an emphasis on encouraging the use of rainwater harvesting techniques. It is worth nothing that rainwater harvesting is not only a solution for drinking water problems, but also an essential technique for groundwater recharge with addition of recharge pits into the water harvesting systems.

The Environment Section of the municipality is primarily responsible for works related to the environment and ecosystem including solid waste management, environment management, and Disaster Risk Reduction (DRR). The limited human resources have however impacted the effective operation of this section.

3.2.2. Solid Waste Management
Dhankuta's solid waste management facility is recognized as one of the best practices in the country. The frequent visits of officials from various local governments who come to learn from the facility's efficient operations illustrate this distinction. This facility has an excellent opportunity to be developed into a dedicated learning center focused on sustainable waste management principles. Currently, 12-15 tons of waste are collected daily from 6000 households[35]. The site is projected to be useful for the next 20 years. On-site waste separation is carried out. The center solely gathers inorganic waste, while organic waste is composted at homes. To cover the waste, soil is brought in from the surrounding region, and the planting of trees is done on top of the waste to create garden areas. There is equipment that can aid inorganic waste management as well as generate revenue for the municipality. Septic tank cleaning services are also available.

Furthermore, the municipality has a track record of partnering[36] with various development partners, NGOs, and INGOs including UNDP on projects targeted at improving awareness of effective waste management among school children.

However, challenges persist. There have been cases of inappropriate plastic waste disposal, particularly among underprivileged Dalit communities in Wards 4 and 7. Due to lack of awareness, people in these communities are often found to be burning plastic waste. To address these concerns properly, there is a need for continuous awareness, research, and investment in future solid waste management projects.

---

32 There are primarily two Haat Market locations, one at Hile and another at ward 5 where there is a covered space for the market (near the Athpahariya Marga temple).
33 These wards produce tomatoes and pesticides are used for pest control, disease management, weed management, and increasing yield and quality.
34 Development partners like ICOMOD have been carrying out various water conservation related projects in the municipality.
35 Figure derived from Dhankuta Municipality Environment Section Officer.
36 Discussions have begun with the Swiss Public Service Project (PSP) to improve solid waste management, with a special focus on Koshi Province. The World Bank has also played an important role in advancing solid waste management practices in Dhankuta.

Figure 3-1 Solid Waste Management Facility of the municipality which is also a landfill site with public garden area

3.2.3. Natural Disasters

The occurrences of different kinds of hazards are common in the hills due to coupling effect of seismo-tectonic activities and strong monsoon along with anthropogenic activities. Dhankuta Municipality lies in a geographically stable zone however this municipality has experienced different hazards over the years. For example, the Udaypur earthquake (1988) had a severe impact on Dhankuta District.

According to UNDRR DesInventar website[37], a total of 93 deaths, and 878 injuries were recorded in Dhankuta district. A total of 3308 houses were destroyed and 5268 houses were affected by the earthquake in Dhankuta District. The first building code of Nepal was developed following this devastating earthquake that impacted Dhankuta severely. It is imperative that the building construction practices in the municipality comply with the national building code to prevent severe damage to lives and property in future earthquakes.

It is important to note that the municipality has seen multiple fire incidents, with bushfires and forest fires being the primary causes. The fire susceptibility map was prepared using Frequency Ratio (FR) method. Different thematic layers i.e., Aspect, Slope, Topographic Wetness Index (TWI), Curvature, Distance to Drainage, Distance to road, Soil type, Distance to Settlement, Normalized Difference Vegetation Index (NDVI), Normalized Difference Moisture Index (NDMI) and wind speed were analyzed in the ArcGIS environment. The susceptible map was further divided into Low, Medium, and High susceptible zones. More than 48% of the area of the municipality lies in the medium fire susceptibility followed by high and low. The number of buildings is high in the low fire susceptibility area (53%) followed by medium (40%) and high (7%). In addition, urban fires have been recorded in places including Sidhuwa, Patlekhola, and a press building.

Susceptibility class	Area (sq. km)	%	Building	%
Low	24.84	22	10521	53
Medium	53.26	48	7999	40
High	32.38	29	1312	7
Total	**110.48**	**100**	**19832**	**100**

Table 3-1 Number of houses and area in different fire susceptibility classes

---

37 https://www.desinventar.net/DesInventar/showdatacard.jsp?clave=4610&nStart=0

These fires have a variety of origins, including short circuits and gas leaking, highlighting the many issues that the municipality has in fire prevention and management. There are measures in place to tackle fire in the municipality. Two fire trucks are stationed on the same premises of the SWM center with two drivers standing by. However, there is a lack of fireproof gear for the firefighting force, which includes municipal and Nepal police. Water is brought in from a pond near an avocado plantation and collected from town fire hydrants[38]. The municipality is considering the installation of a specialized firefighting water tank for efficient water supply during firefighting.

The landslide susceptibility map was prepared using Frequency Ratio (FR) method. Different thematic layers i.e., aspect, slope, curvature, distance to drainage, distance to road, soil type, geology and relative relief were analyzed in the ArcGIS environment. The susceptibility map was further divided into Low, Medium, and High susceptible zones. The distribution of landslides in the municipality is very low as the geomorphology of the municipality is generally stable. However, there are some landslides along the road and streams. Most of the area of the municipality (49%) lies in the low susceptibility class followed by medium (48%) and low (11%). The high number of buildings falls in the low susceptibility class (77%) followed by medium (22%) and low (1%). Most of the landslides are controlled by slope and proximity of roads and streams.

Figure 3-2 Forest Fire Susceptibility Map of Dhankuta Municipality

The landslide susceptibility map was prepared using Frequency Ratio (FR) method. Different thematic layers i.e., aspect, slope, curvature, distance to drainage, distance to road, soil type, geology and relative relief were analyzed in the ArcGIS environment. The susceptibility map was further divided into Low, Medium, and High susceptible zones. The distribution of landslides in the municipality is very low as the geomorphology of the municipality is generally stable. However, there are some landslides along the road and streams. Most of the area of the municipality (49%) lies in the low susceptibility class

followed by medium (48%) and low (11%). The high number of buildings falls in the low susceptibility class (77%) followed by medium (22%) and low (1%). Most of the landslides are controlled by slope and proximity of roads and streams.

Susceptibility class	Area (sq. Km)	%	Building	%
Low	53.96	49	15281	77
Medium	44.44	40	4365	22
High	12.03	11	185	1
Total	**110.43**	**100**	**19831**	**100**

Table 3-1 Number of houses and area in different fire susceptibility classes
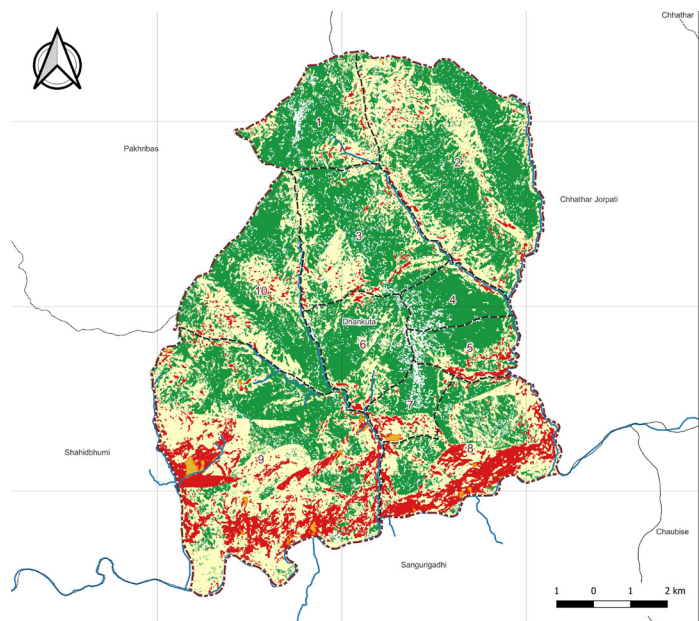
Figure 3-3 Landslide Susceptibility Map of Dhankuta Municipality

Ward no 9 is more prone to landslide compared with other wards. The landslides are affecting the roads in the monsoon season. The slope along the Dharan-Dhankuta road near Guthitar area is challenging in terms of transport safety. Retaining walls that were constructed just a year ago are now collapsing because of uneven settlement of land. The landform contains stones that crumble when it rains. The uneven settlement of the hilly land has caused many structural damages to the houses in the area. There are structural cracks in some houses. Some houses have their doors jammed due to uneven settlements. Some houses have been evacuated.

Flooding and landslides in some areas had caused considerable damage to numerous houses in 2020/21. The September 2020 landslide[39] triggered by heavy rain forced 15 families in Dhankuta Municipality to seek refuge in safer locations, displaced families and put dozens of houses at risk of further landslides. Several attempts have been made in the following years to rebuild/reconstruct the damaged houses. However, about 40 houses still need to be rebuilt to rehabilitate the affected communities.

38 There are few fire hydrants located in the town that is used for firefighting purpose.
39 https://thehimalayantimes.com/nepal/50-families-displaced-over-100-houses-at-risk-due-to-landslides-in-dhankuta
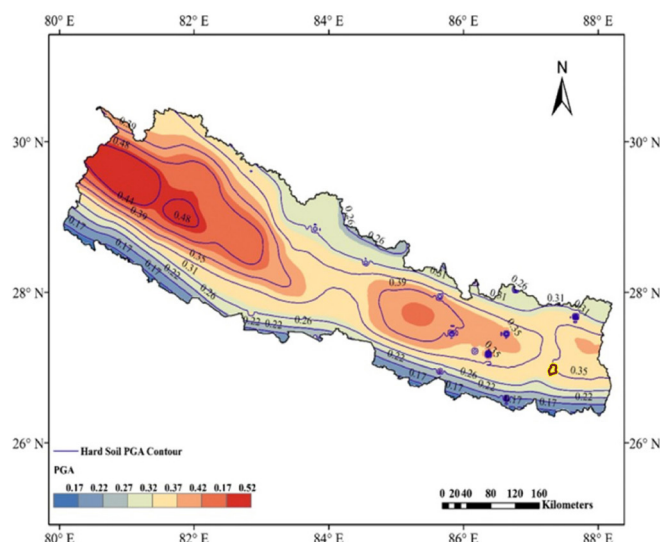
Figure 3-4 The location of the Dhankuta Municipality in the National Seismic map of Nepal (Contour for 10% probability in 50 years for hard soil)[40]

The seismic hazard map shows that the Dhankuta Municipality has 0.37 PGA. It suggests that that municipality receives relatively low ground vibration during the earthquake. However, the municipality has slopy terrain and even small vibration can damage houses as most of the non-engineered mud mortar buildings. In this context, proactive measures are required to mitigate the possible impact of seismic events in Dhankuta Municipality. These measures include enforcing strict construction rules, enacting community awareness campaigns, and retrofitting existing vulnerable structures. The joint engagement of local officials, people, and relevant stakeholders is critical for strengthening the municipality's overall resilience to seismic vulnerability.

It is important to note that mapping of environmentally sensitive areas and disaster/hazard mapping has not been done in the municipality. Such mapping is essential to provide guidance for interventions against disaster effects as well as to protect the natural resources that could be threatened by further urbanization or urban sprawl.

DEOC[41] (District Emergency Operation Centre) is an important institution for disaster information and disaster response for the municipality. Only one cutter is available at the DEOC. When needed, the army and police often provide disaster response equipment, highlighting the need for increased local preparedness and resources. There is a lack of any kind of early warning system in the center. Coordination with the NEOC (National Emergency Operations Center) and the PEOC (Provincial Emergency Operation Center) has proven difficult, with email correspondence serving as the primary form of communication. There is also a need to establish Local Emergency Operation Centre[42] (LEOC).

3.2.4. Climate Change Effects

Several symptoms of climate change effects can be seen in Dhankuta municipality, despite absence of substantive formal study on climate change effects. A 2019 review[43] of studies on climate change in Nepal showed increasing annual mean temperature trend and decreasing pre-monsoon trend in Dhankuta district.

Climate change appears to be having an increasing influence on agriculture in Dhankuta Municipality. Notably, conventional agricultural belts have shifted significantly, with the orange belt and other crop belts shifting to higher elevations. Furthermore, the agriculture sector is facing problems from climate-related incidents such as droughts and high-intensity rainfall, which have had a negative impact on agricultural production. Furthermore, the municipality's farmers face additional challenges because of the decreased frequency of moderate to low-intensity rains.

Similarly, due to changing climates, there is a possibility of an increase in the spread of invasive plant species. Observations from a recent study[44] in 2023 showed 30 invasive alien plant species, classified into 13 families and 28 genera. Of the 30 invasive species, 40 percent were present in agro-ecosystems, 30 percent in residential regions (examples include Amaranthus spinosus L. or Kunde Lude and Bidens Pilosa L. or Kalo kuro), 30 percent in grasslands, and 27 percent in woods and shrublands. An IUCN Nepal Field Survey[45] of 2002-2003 had identified 5 common alien species in the Dhankuta Cropland Ecosystem.

To mitigate the effects of climate change, Dhankuta Municipality has started development of Climate Smart Village in the Nigale and Kagate areas, which contains roughly 2,100 residents. To improve overall sustainability, this unique initiative includes smart solutions in water management, electricity, agriculture, and sanitation. Around 100 families have been supplied with smart energy solutions as part of this project. These families use biogas and do not need to rely on liquified petroleum gas from the market. Furthermore, innovative technology and smart farming practices have been implemented within the smart village, with roughly 100 farmers from the municipality participating. Some practices include use of greenhouses, and use of improved seeds. To help these proactive farmers, the municipality gives technical and financial assistance on a regular basis, supporting the development of sustainable practices and community resilience. One of the areas of interest for the municipality in this respect is rainwater harvesting. Rainwater harvesting can become a viable and sustainable solution for various water related issues in the municipality.

Key Issues

1. Increased use of chemical pesticides that harm soil productivity and biodiversity.
2. Insufficient rainwater harvesting initiatives.
3. Insufficient attention of concerned authorities (other than the municipality) in upgrading SWM facility.
4. Insufficient preparedness against disasters: Lack of mapping of

40 Parajuli, et al. (2021). Seismic zonation of Nepal probabilistic seismic hazard analysis, Arabian Journal of Geoscience,14.
41 DEOC is located in the premises of District Administration Office of Dhankuta.
42 Government of Nepal has mandated the establishment of LEOC in all municipalities. In absence of sufficient workplan, budget, and technical manpower, this has not been effectively implemented.
43 Ghimire, P. (2019). A Review of Studies on Climate Change in Nepal. The Geographic Base, 6, 11–20. https://doi.org/10.3126/tgb.v6i0.26163
44 Shrestha, S. (2023). Status of Invasive Alien Plant species in Dhankuta Municipality. Journal of Research and Development, 6(01), 68–75. https://doi.org/10.3126/jrdn.v6i01.55240
45 Tiwari, S., Siwakoti, M., Adhikari, B. & Subedi, K. (2005). An Inventory and Assessment of Invasive Alien Plant Species of Nepal, IUCN - The World Conservation Union, Nepal. viii+114 pp. https://portals.iucn.org/library/sites/library/files/documents/2005-054.pdf

environmentally sensitive areas and disaster-prone areas, and a lack of early warning systems and limited equipment at DEOC for disaster response. Lack of systems and equipment for firefighting: no dedicated water tank or water storage system, no fire-fighting equipment (like hazmat suit)

5. Lack of implementation of effective initiatives to relocate communities that are vulnerable to landslides.

3.3. Accessible and Adaptive Infrastructure and Services

3.3.1. Building Construction Practices

The building permit has become mandatory in the current federal setup. The ward offices have become more vigilant to enforce the building permit system. However, the building design and construction follows the thumb rule as prescribed by the National Building Code. The municipality is enforcing building permits[46] and NBC. People in post Gorkha Earthquake have become more aware of NBC compliance construction. Despite the rigorous efforts, about 40-50 percent of the building construction abide by the NBC. Nevertheless, the vulnerability is declining as minimum column size, stirrups spacing, ductile detailing and provisioning complies with NBC. Further, the old buildings are registered and recorded at the municipality. The municipality has been advocating for universal design in public buildings with ramp, inclusive toilet facilities, disabled, and Dalit[47] friendly office environment.

Access to decent housing is being ensured for deprived/marginalized community through Janata Awas Yojna[48] and Surakshit Nagarik Awas[49]. Provincial government supported 16 families from Dalit community in ward no 1,4,7 and 9 with financial aid of NPR. 3,36,000 each for construction[50] of their houses under Janata Awas Yojna.

Another initiative by Project Office of Urban Development and Building Construction (PUDBC) is the Surakchit Nagarik Awas. The Surakchit Nagarik Awas initiative, which promotes safer building construction, provides NPR 75,000 in financial assistance to the shortlisted families. This financial aid is given in installments, with a 60% down payment and the remaining 40% given following a final inspection to confirm compliance with safety standards and rules.

3.3.2. Infrastructure Development Practices

The development of infrastructure is the highest priority for the municipality. It spends about 80 percent of its annual budget on developing infrastructure like roads and drinking water. All wards and communities are connected to road networks; however, the quality of road and other infrastructure is poor. Not all roads are engineered

properly and lack drainage and water management systems. The poor roadway network[51] affects linkage of the agricultural products to the market.

The municipality's Physical Infrastructure Division is led by a team of one engineer and five overseers overseeing various infrastructure projects. The division has digitized the majority of its infrastructure-related activities to improve efficiency. However, there is no fixed repair schedule for public buildings at the moment. Efforts to construct an inventory system[52] to properly manage these structures began last year by the PUDBC located in the municipality.

The PUDBC is in the process of establishing its own laboratory to certify the quality of infrastructure development projects. Currently, test results are obtained with the help of private laboratories. However, the setting up of an in-house dedicated lab will improve the municipality's ability to examine and ensure the quality of its infrastructure development projects.

3.3.3. Service Sectors

3.3.3.1. Electricity

The city is connected to the national grid. Every household is connected to electricity provided by NEA; however, the low voltage and few hours of load shedding is a common feature due to old transformers and transmission lines. The service quality is improving though at a very slow pace. The city does have potential for micro hydro but still to be harnessed. Some of the households are using solar power not only for heating water but also for lighting and small businesses.

3.3.3.2. Drinking Water

There is an issue of regular water supply in the municipality. Especially in the summer, the water is scarce and polluted and the problem of water becomes more acute. The spring waters are drying because the groundwater table is depleting. The Environment Section of the municipality is focusing on ensuring ground water recharge for which the concept of rainwater harvesting needs to be well instilled as a practice. It could be integrated into the building byelaw of the municipality and building permit process. Projects of watershed conservation[53] and rainwater harvesting have been practiced in some locations. For example, ICIMOD has been implementing a project entitled "Reviving drying springs in the Nibuwa-Tankhuwa Watershed, Dhankuta" to improve water security, access to safe drinking water, reduce water-related conflicts among local communities, enhance ecosystem services and reduce climate risk. Such activities need to be expanded and upscaled to all the wards of the municipality for the watershed management.

---

46 In order to issue loans, submission of the building permit from the municipality is mandatory to the banks, as per the directives of Nepal Rastra Bank.

47 Any office can become inclusive by the nature of its openness. The doors of the municipal sections are all open and easy to approach. There are outdoor spaces where people can sit, rest, and have conversations with one another. Such an arrangement promotes inclusion of all the service-seekers.

48 The Janata Awas Yojana is a housing scheme addressing the needs of the general public, focusing on the economic development of marginalized communities as per Article 42, Clause 2 of the Constitution. The government started allocating budgets, starting from the fiscal year 2066/67 B.S. (2010/11 A.D.), to address the housing needs of marginalized communities through strategic implementation. The houses provided are of good quality in terms of material and workmanship, and are easy to maintain.

49   In Nepal, the term "Surakshit Nagarik Awas" refers to the constitutionally guaranteed right to safe and ecologically friendly housing, as made explicit by the Right to Housing Act, 2018. It recognizes individuals' safety, well-being, and dignity by providing safe homes for households impacted by disasters. The objective of the program is to support people whose houses are damaged or are at risk by providing them financial support for repairs, building materials, and technical assistance.

50 The construction procedure follows the DUDBC (Department of Urban Development and Building Construction) manual for stone and/or brick houses. Individuals often construct their own modifications, such as animal shelters.

51 Discussion with the Athpahariya community in ward 8, in presence of ward 8 chairperson, revealed that the roadway is not reliable, especially during rainy season.

52 Currently, the Building Management Information System (BMIS) of PUDBC has taken the management of 16 structures spread over four districts.

53 Development partners like ICOMOD have been carrying out various water conservation related projects in the municipality.

Similarly, there is a lack of regular water-tests for drinking water in the municipality. Some communities drink water directly from water sources like natural wells (kuwa) without any treatment. This could lead to serious health hazards in the future. The municipality should proactively take necessary actions to ensure that its population is consuming safe drinking water.

3.3.3.3. Education
Dhankuta district was once the most literate district in the eastern region and hub of education for north-east region of the nation. Students from the hills and mountains used to study in the city. However, students are now migrating to Dharan, Biratnagar and Kathmandu for quality education. There are some places in the municipality where students have to travel over 1 hour to reach school. The Municipal Profile (2018) shows that there are 83 community based/governmental academic institutions, and 29 private institutions in the municipality. The municipality's education section informed that there is a provision in government schools for free lunch up to grade 10 in order to encourage students to attend school. Free sanitary pads are also distributed in schools for girls. To help the students from marginalized families, there are provisions for free books, and Dalit scholarships.

Schools in Dhankuta Municipality implement a practical education approach that varies by grade level[54]. Furthermore, teachers receive periodic training to improve overall educational quality, which is supported by a dedicated Teachers Training Center inside the municipality.

The physical infrastructure of the schools in the municipality includes old vulnerable buildings, as well as newly constructed NBC compliant buildings. There are separate toilets for male and female students, however, there are limited first aid kits, and open spaces. Students and teachers get oriented through earthquake awareness campaigns with exercises like 'duck cover and hold'. But the schools do not have disaster focal persons or any regularly occurring disaster orientation program to keep teachers and students sensitive to various types of disasters and DRR.

3.3.3.4. Health
The municipality faces significant health challenges. Some of the challenges include prevailing higher priority on curative health measures over preventive measures, a lack of public health awareness among officials and the public, insufficient healthcare infrastructure, limited access to primary care institutions (present in only two wards), decentralized healthcare management with local capacity constraints, and a shortage of skilled healthcare personnel, all of which have a detrimental effect on the quality and accessibility of healthcare. The municipality confronts budgetary constraints when it comes to organizing regular health camps, and despite having only five healthcare facilities, managing operational expenditures is challenging.

Several major actions are required to fortify the healthcare system such as constructing a municipal hospital, providing at least one primary care facility per ward, and considerably expanding the availability of trained healthcare staff. These approaches are essential to improving the municipality's healthcare resilience.

There is also a critical need to address the issues of mental health and drug abuse[55] in the municipality. For this, coordination with the security forces, mental health experts, and other relevant stakeholders is necessary.

Key Issues
1. Limited access to affordable housing.
2. Unmanaged drinking water – shortage during dry seasons and lack of lab-tests of drinking water sources
3. Lack of proper quality roadway in some wards (e.g.: ward 8) that prevent easy transport of agricultural products
4. Insufficient investments in awareness and preventive healthcare system
5. Non-adaptive and non-accessible public buildings – lack of universal accessibility, lack of maintenance schedule. Insufficient open spaces in public buildings (especially in public schools).
6. Inadequate initiatives to address the issues of mental health and drug abuse.

3.4. Effective Governance and Investments
The issue of Dhankuta's development is marked by a shift in dynamics affecting its development because of newly introduced federal system of governance. Individuals from adjacent regions used to travel to Dhankuta for government-related activities. However, with the introduction of federalism, each local government can function independently, reducing the need for individuals to travel to Dhankuta for such purposes. This shift has impacted the municipality's position vis a vis other centers and its own development prospect

3.4.1. Institutional Capacity and Diversity
Dhankuta Municipality is well equipped and adaptive when it comes to use of information technology. It maintains an up to date[56] municipal website that posts the most recent notifications as well as pop-up displays for important announcements. The municipality has put in place a paperless group SMS system to facilitate communication among ward and municipal members. However, there is currently no disaster early warning alert system in use. Additionally, the municipality owns and maintains an FM radio station. Access to the internet is generally good in the municipality and municipal offices, facilitating effective communication and information dissemination.

Several improvements are required, however to enhance its effectiveness including the implementation of an intranet system to improve workplace efficiency, the adoption of an e-attendance management system for improved attendance tracking, the promotion of digital boards for information display, the digitization of record-keeping processes, and the extension of the CCTV backup duration, which is currently only one week. These upgrades aim to improve the municipality's overall operating efficiency and security measures.

---

54 rades 1–3 emphasize practical learning, and Grades 4–8 maintain a 50–50 mix of practical and conceptual study. In Grades 9–12, the focus shifts towards conceptual learning, with 25% practical and 75% conceptual education.
55 The district police headquarters of Dhankuta reported that school children, people from marginalized communities and the youth are primarily affected by mental health issues and drug abuse.
56 A dedicated IT Officer in the municipality office is responsible for updating the websites and dissemination of information and notice via the website, as well as Facebook.

Gender and social inclusion issues present challenges for Dhankuta Municipality's office staffing. Most of the sections are led by men and the women officials often feel that their voices are not adequately heard during various discussions. Furthermore, internal coordination regarding Gender Equality and Social Inclusion (GESI) issues is weak, and the issues of people with disabilities are not fully addressed throughout the development of plans and policies. Improving inclusion and representation in municipal decision-making processes is critical for effectively addressing these concerns.

The municipality received an average score of 62.5% in Local Government Institutional Capacity Self-Assessment (LISA[57]) in the year 2022/23. The breakdown of the indicators is shown in Figure 3-5. It is clear that prioritizing infrastructure development, optimizing budget processes, and strengthening social inclusion programs are essential. Strengthening financial management processes promoting collaboration and coordination, and prioritizing environmental sustainability are all possible measures to strengthen overall governance.

3.4.2. Coordination

Dhankuta Municipality demonstrates the importance it attaches to the private sector involvement in infrastructure development. Users committees known as "Upavokta Samiti" contribute[58] 10% in cash and labor to major development initiatives done by the municipality. However, effective coordination and communication with both the provincial and federal governments have been challenging. This issue is highlighted by incidents such as a settlement area flooding three years ago, where 24 homes were initially chosen for resettlement, but the actual need exceeded 40 households, underlining the significance of better intergovernmental coordination and response mechanisms.

Dhankuta Municipality and the Dhankuta Chamber of Commerce and Industry (CCI) have been experiencing coordination issues. While the CCI has proactively submitted a concept paper to the municipality concentrating on agriculture and tourism development, their partnership has been restricted by a lack of effective coordination. Furthermore, the CCI is not appropriately contacted or included in discussions about municipal budgeting. Enhancing participation and communication across such organizations is critical for more effective local development activities and partnerships.

Likewise, despite its proximity to the Nepal Agricultural Research Council (NARC), Agriculture Research Station at Pakhribas, Dhankuta Municipality has yet to grasp the benefits of this institution. The facility offers students valuable on-the-job training opportunities as well as facilities for personal and professional development. Furthermore, the municipality has the opportunity to use these training facilities to increase the productivity of local agricultural enterprises. Additionally, the municipality could potentially use the center's seminar halls to coordinate agriculture-related programs and training seminars, striving to boost agricultural productivity, marketability, and profitability in the municipality's agricultural sector.
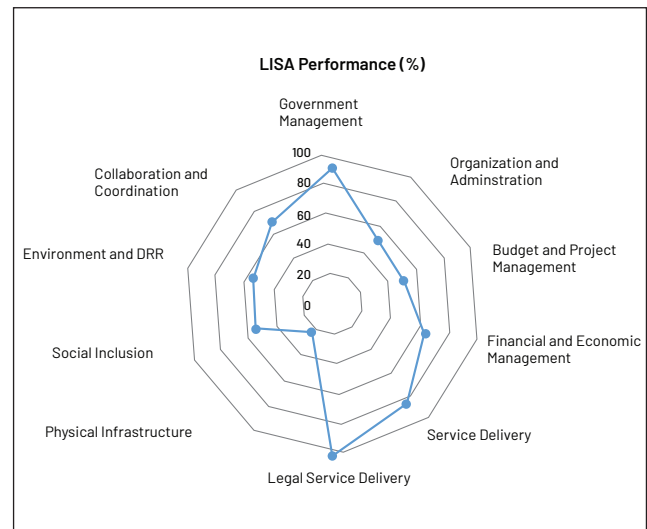

Figure 3-5 Figure 3 5 LISA Performance of Dhankuta Municipality
(LISA website: lisa.mofaga.gov.np)

3.4.3. Budget and Investments

Dhankuta Municipality had a total budget of NPR 758 million in fiscal year 2022/23, of which 83.93% was spent, excluding social security budget[59]. A total of NPR 120 million was set aside for social security, with an extra NPR 465,000 thousand set aside for poverty alleviation. In terms of disaster risk reduction, the municipality allocated NPR 1 million per year as disaster management fund, with each of the ten wards contributing additional cash ranging from NPR 50,000 to 200,000 for disaster relief. Likewise, NPR 1 million was allocated in the current budget, with an additional NPR 3.575 million set aside for disaster-related expenses. Furthermore, the federal government dedicated NPR 1 million to clean and green energy projects, including biogas programs in the municipality.

The municipality generated NPR 35 million as own-source revenue (OSR) in the fiscal year 2022/23, accounting for approximately 4.6% of the entire budget. A working strategy has been developed to improve this source of revenue. Residents pay taxes to the municipality, including home and property taxes, which contribute to its OSR. Several action plans are under development to improve OSR generation.

The municipality's budget is largely reliant on the federal and provincial grants[60]. This translates into dependence of municipality on the federal and provincial levels for allocation of budgets for climate change adaptation and disaster risk reduction, GESI, infrastructure development, thereby affecting the overall resilience of the municipality.

Key Issues

1. Insufficient digitization and automation of government works and poor transition towards e-governance
2. Insufficient internalization of GESI issues (including poor women's participation)
3. Inadequate capacity and skills of the municipal officials for project development, implementation and service delivery
4. Inadequate coordination with NARC Pakhribas and other institutions to harness various opportunities for the betterment of agricultural and other economic sector

---

57 Local Government Institutional Capacity Self-Assessment (LISA) is carried out annually to assess capacity of LGs in different aspects.
58 Contributions have been made in road construction and other developmental works.
59 Based on data provided by Account Section of the municipality office.
60 These include equalization, complementary and conditional grants from federal and provincial governments.

RESILIENCE ROADMAP E:
STRATEGIES AND ACTIONS

4.1. Resilience Strategy

For making Dhankuta Municipality a resilient hill city, a multifaceted approach that can address social, economic, environmental, and infrastructure challenges in local context is needed. Here are some general strategies:

1. **Integrated Urban Planning:** Review/Develop and implement comprehensive urban planning that integrates land use, infrastructure, and environmental considerations.
2. **Resilient Housing and Infrastructure:** Build and maintain code compliant housing and infrastructure that can withstand the impacts of climate change and disasters.
3. **Smart Technology Integration:** Harness technology for early warning systems, efficient resource management, and improved communication during emergencies.
4. **Participatory and Inclusive Planning:** Involve communities in decision-making processes and empower them to actively participate in resilience-building initiatives.
5. **Gender Equity and Social Inclusion:** Ensure that resilience strategies address social inequalities and include marginalized communities.
6. **Diverse Local Economy:** Encourage a diverse and sustainable economy to reduce vulnerability to economic shocks.
7. **Education and Awareness:** Promote education and awareness programs to build a knowledgeable and prepared community.
8. **Forest and Slope Conservation:** Preserve and enhance green spaces to promote biodiversity and provide ecological services.
9. **Public Health and Healthcare Access:** Ensure access to quality healthcare services for Dalit and marginalized communities such as Aathpahariya.
10. **Collaboration and Partnerships:** Foster collaboration with local communities, private sector, federal and provincial institutions and international development partners for shared knowledge and resources.

4.2. Thematic Strategies and Action Plans

Urban resilience of Dhankuta Municipality is decoded into four major themes. A set of strategies for each theme are developed to address the issues identified and accordingly actions are proposed. Accordingly, two sets of matrices for each theme are developed. The first set of matrix includes theme-wise issues, actions, and milestones (Table 4-1) and the second set includes priority actions, activities, and interventions (Table 4-2).

4.2.1. Strategies for Diverse and Inclusive Socio-Economic Opportunities

Promoting diverse and inclusive socio-economic opportunities in Dhankuta Municipality involves a combination of targeted strategies aimed at addressing social disparities, fostering economic development, and ensuring equal access to resources. Here are a few strategies:

- Entrepreneurship Development Programs: Establish Business Promotion Center that provides training, mentorship, and financial support to individuals from diverse backgrounds.
- Skills Training and Capacity Building: Implement skills development training programs that cater to various sectors, including agriculture, cottage industry and handicrafts.
- Gender-Inclusive Economic Empowerment: Promote gender-inclusive economic opportunities by creating women's cooperatives, leadership training and business training for women.
- Easy Access to Finance for Marginalized Communities: Improve access to financial services for marginalized communities, including women and ethnic minorities, by establishing Gramin bank or microfinance programs.
- Agricultural Diversification and Innovations: Encourage citrus fruit farming along with floriculture, iskush (Sechium edule) and promote organic farming practices.
- Tourism Development: Develop Hile as a tourist hub with quality hotels and restaurants. Preserve the local culture and involve the community in the tourism value chain.
- Inclusive Hiring Practices: Encourage businesses and government institutions to adopt inclusive hiring practices that consider diversity in the workforce.

4.2.2. Strategies for Environment, Climate Change, and Disaster Responsive Development

- Forest, Watershed and Slope Conservation: Promote conservation linking with livelihood of local communities.
- NBC and Building Byelaws Implementation: Enforce NBC and climate responsive Building byelaws and adopt green building technology.
- Sustainable Water Resource Management: Implement sustainable water resource management practices like water harvesting at household and community level, and recharge pits at household level.
- Better and Smart Irrigation Systems: Introduce drip or sprinkler irrigation system to conserve water.
- Participatory Disaster Risk Management: Engage local communities in identifying and mitigating disaster risks through community-based disaster risk reduction (CBDRR) initiatives.
- Risk Assessment of Public Buildings: Conduct risk assessments of public buildings and critical infrastructures and advocate for retrofitting practices.
- Sustainable Farming Practices: Introduce drought-resistant crops, promote agroforestry, and provide farmers with training on sustainable farming techniques and climate-resilient crop varieties.
- Increased Environmental, Disaster and Climate Change Awareness: Raise awareness about environmental conservation, climate change, and disaster preparedness through education and outreach programs.
- Promotion of Waste Management: Strengthen the waste management practices and replicate through clustering of wards.

4.2.3. Strategies for Accessible and Adaptive Infrastructure and Services

- Securing Water: Protect the water sources, springs and prioritize recharging the groundwater table.
- Maintained Water Quality: Ensure water quality with establishment of water testing lab or a mechanism of quality testing at consumer end.
- Ensuring Affordable Housing for all: Collaborate with provincial government and other development partners for development of housing for marginalized communities.

- Effective Disaster Preparedness and Response: Enhance the capacity for emergency preparedness and response to disaster in the water supply, sanitation, and health sectors.
- Improved Preparedness and Response System at District Hospital: Strengthen the district hospital with emergency preparedness and response system.

4.2.4. Strategies for Effective Governance and Investments

- Strengthening Transparency: Implement public private dialogue (PPD) forums, and online platforms to gather input from residents. Establish mechanisms for regular reporting on municipal activities.
- Promoting Digital Governance and Smart City Solutions: Develop and operate digital platforms for service delivery, develop and enforce digital payment systems, develop online platforms for fee collection, and utilize data analytics to identify areas for revenue enhancement. Leverage technology for more efficient tax administration.
- Investment in Sustainable Infrastructure: Direct funds toward green infrastructure, public transportation, public health, waste management and agriculture sector.
- Public-Private Partnerships (PPPs): Foster collaboration between the public and private sectors to leverage resources, expertise, and innovation. Develop frameworks for successful PPPs ensuring fair and transparent agreements. Encourage private investment in areas such as agro-industry, dairy and horticulture and floriculture.
- Capacity Building for Effective Governance: Strengthen the capacity of municipal officials to effectively implement and manage PPP and other urban development projects.
- Property Tax Enhancement: Optimize property tax collection by regularly updating property assessments and ensuring fair valuations.
- Asset Management: Conduct a comprehensive inventory of public assets, explore opportunities for leasing or selling underutilized assets, and implement asset management strategies to maximize returns.

4.2.5. Action Plans

Table 4-1 Urban Resilience Roadmap Framework Matrix I: Theme-wise Issues, Causes and Action Formulation(LISA website: lisa.mofaga.gov.np)

Urban Resilience Roadmap of Dhankuta Municipality: Issues and Priority Actions

THEME/COMPONENT	PROBLEMS AND ISSUES	UNDERLYING CAUSES	ACTION FORMULATION	PRIORITY ACTION
DIVERSE AND INCLUSIVE SOCIO-ECONOMIC OPPORTUNITIES	Changing interest of youth for employment – preference of foreign employment among men and limited interest in agriculture.	Lack of employment opportunity and poor entrepreneurship	Develop a Business Promotion Center (BPC) or Business Incubation Center. Provide training and skills to the youth and support with seed money. Promote women cooperatives and youth cooperatives for agriculture and trading. Encourage youth to view agriculture as a lucrative career option.	Priority Action 1 (PA 1) – Develop Business Promotion Center in the municipality.
		Low wages	Provide incentives to marginalized group in dairy and agriculture related industries and business and develop plans on value chain.	
		Lack of infrastructure and technology in agriculture	Introduce incentivized programs to promote the adoption of modern agricultural practices. Facilitate public-private partnerships to leverage private sector expertise and resources in upgrading agricultural infrastructure.	
	Monkey menace/terror in agriculture affecting agricultural yield	Decreasing habitat for monkeys	Carry out some empirical research to manage wild animals' threat to agriculture. Scare Tactics: Set up scarecrows that resemble predators. Hang reflective objects, such as CDs or aluminum foil, to create visual disturbances.	PA 2 – Carry out some empirical research to manage wild animals' threat to agriculture.
		Fruits and food farming near to the habitat of monkeys	Create buffer zone between forest and farm. Apply commercially available animal repellents to crops. These can be sprayed directly on plants and often have odors or tastes that are unpleasant to monkeys. Ensure that the repellents are safe for both monkeys and humans.	
		Disturbed forest ecosystem	Provide alternative food sources: Set up feeding stations away from the farm with food that monkeys find attractive. This may divert their attention from the crops and reduce the damage.	

Urban Resilience Roadmap of Dhankuta Municipality: Issues and Priority Actions

THEME/COMPONENT	PROBLEMS AND ISSUES	UNDERLYING CAUSES	ACTION FORMULATION	PRIORITY ACTION
	Insufficient mechanism for tourism promotion. Inadequate promotion of local culture.	Poor marketing	Conduct research and publication of tourism promotional materials.	PA 3 – Conduct feasibility study of water sports and other tourism products in Dhankuta.
			Create a social media campaign to promote tourism in Dhankuta.	
			Conduct effective marketing of tourism related activities that are possible in Dhankuta (like hiking, bird watching, water sports, cultural tour, etc.).	
			Promote Hile as Hill Station with restaurants and hotels.	
		Inadequate research on traditional communities and their cultures	Develop and promote tourism products that include engagement of communities like Aathpahariya.	
			Carry out research and publish in social media about the various ethnic cultures in Dhankuta.	
		Poor tourism infrastructure and limited tourism products	Promote tourism activities like bird watching, forest walking (including trial assessment).	
			Promote water sports in rivers by conducting feasibility study.	
	Poor knowledge and awareness regarding loan related financial systems	Limited financial literacy and education	Conduct capacity building trainings and workshops on financial literacy.	PA 4 – Promote rural urban linkage for markets within and outside of the Municipality
			Make financial resources more accessible and friendly to people who are not financially literate.	
		Few people from Dalit and marginalized groups in business	Support micro-financing and Gramin bank mechanism.	
			Promote business insurance.	
			Promote rural–urban linkage including linkage with market.	

Urban Resilience Roadmap of Dhankuta Municipality: Issues and Priority Actions

THEME/COMPONENT	PROBLEMS AND ISSUES	UNDERLYING CAUSES	ACTION FORMULATION	PRIORITY ACTION
	Lack of study of climate change impacts on agriculture	Inadequate research on climate change impacts	Conduct contextual research on the impact of climate change on agriculture and possible opportunities.	PA 5 – Conduct research on crops possible in water scarcity zone in association with Agriculture Research Station at Pakhribas.
			Conduct qualitative interviews to gather experiential stories related to the effects of climate change on agriculture.	
		Limited exploration on possible collaboration with Agriculture Research Station at Pakhribas	Recognize that Pakhribas NARC can play pivotal role in research works on agriculture for Dhankuta Municipality.	
			Conduct research on crops that grow in low-water conditions so that good yield can be gained even during dry seasons.	
ENVIRONMENT, CLIMATE CHANGE, AND DISASTER RESPONSIVE DEVELOPMENT	Increased use of chemical pesticides that harm soil productivity and biodiversity.	Limited awareness about less harmful alternatives	Conduct awareness training and exposure visit to the best sites to observe organic farming.	PA 1 – Conduct research and trainings on environmental protection and integrated pest management.
		Increasing pests' problems in agriculture	Improve integrated pest management	
			Establish early pest detection and. Monitoring	
			Promote research and development in pest control.	
	Insufficient rainwater harvesting initiatives.	Insufficient research and study	Conduct a comprehensive assessment to identify specific gaps in rainwater harvesting.	PA 2 – Prepare municipal byelaws on rainwater harvesting, water source conservation and groundwater recharge.
			Allocate funding for research.	
			Conduct public awareness campaigns.	
		Ineffective institutional framework for implementation (e.g. inclusion in byelaws)	Advocate the inclusion of rainwater harvesting in municipal byelaws and conduct public awareness campaigns.	
			Explore and learn from national best practices in rainwater harvesting regulation and implementation.	
		No incentives for industries and businesses	Introduce financial incentives such as credits, rebates, grants, or low-interest loans for business that implement rainwater harvesting systems.	

Urban Resilience Roadmap of Dhankuta Municipality: Issues and Priority Actions

THEME/COMPONENT	PROBLEMS AND ISSUES	UNDERLYING CAUSES	ACTION FORMULATION	PRIORITY ACTION
			Facilitate partnership between businesses and government agencies and non-profit organizations to implement rainwater harvesting projects.	
			Provide certification for institutions promoting rainwater harvesting and sustainable water practices.	
		Inadequate technical support and training	Conduct technical training programs.	
			Provide subsidy for the rainwater harvesting technical equipments.	
	Insufficient attention of concerned authorities (other than the municipality) in upgrading SWM facility.	Poor advocacy and public awareness	Develop a public awareness campaign to highlight the importance of upgrading solid waste management facilities.	PA 3 – Establish a good partnership with environmental organizations to leverage expertise and support for sustainable solid waste management practices.
		Insufficient appropriate data	Collaborate with engineering experts and urban planners to conduct a technical assessment of solid waste management needs.	
		Ineffective regulatory compliance	Establish a good partnership with environmental organizations to leverage expertise and support for sustainable solid waste management practices.	
	Insufficient preparedness against disasters: lack of mapping of environmentally sensitive areas and disaster-prone areas, and a lack of early warning systems and limited equipment at DEOC for disaster response. Lack of systems and equipment for firefighting: no dedicated water tank or water storage system, no fire-fighting equipment (like hazmat suit)	Unavailability of GIS map showing all disaster-prone areas	Initiate a comprehensive GIS mapping project to identify environmentally sensitive areas and disaster-prone zones.	PA 4 – Develop Risk and Inclusion Sensitive Land Use Planning (RISLUP) adopting multi hazard risk assessment and sustainable risk reduction.
		Lack of hazard and vulnerability assessment	Conduct a detailed hazard and vulnerability assessment to identify potential risks and vulnerabilities in mapped areas.	
			Conduct a compressive fire hazard assessment to identify areas with a high risk of wildfires and other fire-related disasters.	
		Lack of early warning systems	Establish EWS and implement technologies such as sirens, mobile apps, and automated messaging systems to disseminate timely warnings to the affected populations.	

Urban Resilience Roadmap of Dhankuta Municipality: Issues and Priority Actions

THEME/COMPONENT	PROBLEMS AND ISSUES	UNDERLYING CAUSES	ACTION FORMULATION	PRIORITY ACTION
		Insufficient rescue and recovery equipments at DEOC	Assess and enhance the capacity of DEOC including training personnel on disaster response, coordination, and communication.	
			Conduct regular simulation exercises and drills to test the readiness and efficiency of DEOC operation.	
		Insufficient and irregular simulation and drill exercise	Conduct regular simulation exercises and drills in public institutions, schools, etc.	
		Lack of water storage and firefighting equipments	Initiate inter-municipal collaboration for improved firefighting equipments and water storage tanks.	
			Aware concerned authorities about importance of firefighting equipments and set out channels for procurement of firefighting equipments.	
		Ineffective legislation and regulation	Advocate for and enforce legislation that mandates fire safety measures and preparedness in vulnerable areas.	
	Ineffective initiatives to relocate communities that are vulnerable to landslides.	Absence of comprehensive landslide vulnerability assessment	Identify vulnerable areas and communities (with gender and social disaggregated data) to disaster and climate risks	PA 5 – Identify vulnerable areas and communities (with gender and social disaggregated data) to disaster and climate risks engaging local communities.
		Inadequate risk communication	Engage local community for a comprehensive landslide vulnerability assessment to identify high-risk areas and communities.	
			Provide training on disaster preparedness and risk reduction strategies for the relocated communities.	
		Absence of alternative site identification	Identify suitable relocation sites that are safe from landslide risks and meet the needs of the communities.	
			Establish a legal and regulatory framework that supports the relocation process.	
			Facilitate collaboration among the communities, various government agencies, INGOs and community-based organizations involved in the relocation process.	

Urban Resilience Roadmap of Dhankuta Municipality: Issues and Priority Actions

THEME/COMPONENT	PROBLEMS AND ISSUES	UNDERLYING CAUSES	ACTION FORMULATION	PRIORITY ACTION
ACCESSIBLE AND ADAPTIVE INFRASTRUCTURE AND SERVICES	Inadequate and unmanaged drinking water – shortage during dry seasons and poor quality of potable water.	Drying of water sources	Conserve water source (springs, river and ground water) by harnessing nature-based solutions with the help of various developmental partners and community participation. Assess demand and supply of drinking water for sustainable conservation, management and use of water resources. Conduct research to explore alternative sources of water.	PA 1 – Conserve water sources and recharge ground water including spring conservation and implement the concept of one ward–one pond.
		Long distance of water intakes	Recharge ground water (including the concept of one ward – one pond).	
		Lack of lab-tests of drinking water sources	Establish Water Quality Testing Lab and conduct periodic water quality check at consumers end.	
	Poor accessibility that prevents easy transport of agricultural products	Dispersed settlement	Link all wards to municipal office with all-weathered road network. Improve the quality of road network including concepts of green roads (bio-engineering) with roadside bank erosion control measures. Promote public transport with small buses.	PA 2 – Construct road networks connecting municipal office to ward offices.
		High road construction cost due to terrain but limited budget	Integrate low-cost nature-based solutions in soil retention against landslides. Promote voluntary labor contribution, material donations, and community-based initiatives where appropriate.	
	Insufficient investments in awareness and preventive healthcare system	Low health sector literacy	Raise awareness through campaigns and Information, Education, Communication (IEC) materials. Launch multimedia health communication campaigns and grab attention of relevant institutions in promotion of preventive health.	PA 3 – Raise preventive health awareness through campaigns and Information, Education, Communication (IEC) materials.
		Low priority on community health	Carry out preventive health campaigns in schools under health education. Carry out awareness against water borne diseases. Bring attention of the decision-making authorities by crafting compelling narrative, building effective coalitions, and leveraging social media.	

Urban Resilience Roadmap of Dhankuta Municipality: Issues and Priority Actions

THEME/COMPONENT	PROBLEMS AND ISSUES	UNDERLYING CAUSES	ACTION FORMULATION	PRIORITY ACTION
	Inadequate initiatives to raise awareness on mental health and drug abuse	Inadequate discussion about mental health issues and drug abuse	Conduct various mental health camps in coordination with the health section and various prevailing health related organizations. Advocate for integration of mental health services into primary healthcare settings to make them more accessible.	PA 4 – Conduct campaigns for mental health awareness and drug abuse awareness at and community levels.
		Stigmatization of mental illnesses	Conduct campaigns for mental health awareness and drug abuse awareness at school and community levels. Challenge stigmas, myths, and misconceptions regarding mental health through series of storytelling initiatives, media campaigns.	
	Non-Adaptive and non-accessible public buildings – lack of universal accessibility, lack of maintenance schedule. Insufficient open spaces in public buildings (especially in public schools).	Architect and engineers not sensitive enough towards inclusion	Develop capacity of municipal staffs on universal design standards and techniques. Create ramps and/or lifts in all public buildings to make it inclusive. Design and construct inclusive public toilets in public institutions. Design footpaths with tactile tiles and ramps.	PA 5 – Design and construct inclusive public toilets and make public institutions accessible (include in the building byelaws for public buildings).
		Local/provincial technical staffs unaware of universal design standards	Conduct capacity building and sensitization programmes for universal accessibility. Provide technical assistance and consultation to integrate universal design.	
		Poor enforcement of NBC and byelaws in fringe areas Limited access to land and loan for marginalized community.	Improve capacity building for NBC enforcement. Provide incentives to individuals or institutions complying with the byelaws. Conduct regular inspection and monitoring.	
	Limited access to affordable housing.		Promote and implement environmentally friendly housing aligning with the assistance provided by Janata Awas or Surakshit Nagarik Awas. Promote effective microfinance and credit programs that are regularly monitored and evaluated.	PA 6 – Promote and implement environmentally friendly housing aligning with the assistance provided by Janata Awas or Surakshit Nagarik Awas.

Urban Resilience Roadmap of Dhankuta Municipality: Issues and Priority Actions

THEME/COMPONENT	PROBLEMS AND ISSUES	UNDERLYING CAUSES	ACTION FORMULATION	PRIORITY ACTION
EFFECTIVE GOVERNANCE AND INVESTMENTS	Insufficient digitization of government works and poor transition towards e-governance	Poor computer literacy	Assess needs of municipal staff in computer skills.	PA 1 – Implement online tax payment system.
			Conduct computer skills workshops with regular follow-ups as well as peer learning.	
			Promote feedback mechanism for continuous improvement.	
		Poor internet facility in the municipality	Invest in upgrading and expanding internet infrastructure.	
			Implement digital inclusion programs.	
			Explore community broadband solutions where possible.	
			Form partnerships with internet service providers and other private companies to invest and deploy internet infrastructure.	
		Inadequate data and system at municipal level	Utilize data analytics to identify areas for revenue enhancement.	
			Develop and operate digital platforms for service delivery.	
			Develop and enforce digital payment systems, develop online platforms for fee collection.	
			Leverage technology for more efficient tax administration.	
	Insufficient internalization of GESI issues (including poor women's participation)	Poor understanding of GESI	Conduct comprehensive GESI trainings for municipal staffs.	PA 2 – Develop and implement GESI actions for each project.
			Foster meaningful engagement and participation of marginalized and under-represented groups by creating platforms for dialogues, consultation.	
			Identify GESI focal person in each Division/Sub-division with clear work scope.	
		Practice of tokenism in GESI	Implement the GESI strategy and policy.	
			Utilize GESI as a major criteria for project selection.	

Urban Resilience Roadmap of Dhankuta Municipality: Issues and Priority Actions

THEME/COMPONENT	PROBLEMS AND ISSUES	UNDERLYING CAUSES	ACTION FORMULATION	PRIORITY ACTION
	Inadequate capacity and skills among the municipal officials for project development, implementation and service delivery	Inadequate human resource	Assess gaps in human resources in the municipal staffs and hire staffs accordingly.	PA 3 – Design and implement trainings on project planning and procurement.
		Poor technical skills for project development, procurement and implementation	Design and deliver trainings to relevant staffs on procurement and project development.	
			Promote interdisciplinary collaborations and knowledge sharing.	
	Inadequate coordination with NARC Pakhribas and other institutions to harness various opportunities for the betterment of agricultural and other economic sector	Weak communication between municipality and NARC	Carry out collaborative research on agriculture sector by the municipality and Agricultural Research Station Pakhribas.

Facilitate information sharing and knowledge exchange to improve linkage between the municipality and Agricultural Research Station Pakhribas. | PA 4 – Improve linkage of municipality to Pakhribas NARC and explore available resources. |

Table 4-2 Urban Resilience Roadmap Framework Matrix II: Details of Priority Actions for Dhankuta URR

PRIORITY ACTIONS AND INVESTMENT PLAN

SN	PRIORITY ACTION	MILESTONES	ACTIVITIES	BUDGET (NPR in million)[61]	IMPLEMENTING AGENCIES	TIMELINE (in years)
DIVERSE AND INCLUSIVE SOCIO-ECONOMIC OPPORTUNITIES						
PA1	Develop Business Promotion Center (BPC) in the municipality.	Completion of infrastructure setup and start of operation of BPC	Develop Guidelines to establish a BPC.	0.5	Municipality, CCI	2
			Establish BPC in collaboration with private sector by setting up necessary infrastructure and allocation of staffs.	2		
			Develop start-up (seed money) by engaging appropriate stakeholders.	50		
PA2	Carry out some empirical research to manage wild animals' threat to agriculture.	Threat of wild animals to agriculture minimized	Carry out research to understand examples of best practices.	0.5	Municipality, Pakhribas Agriculture Research Council	2
			Include wildlife and ecosystem experts in research to understand animal behavior, foraging patterns, movement corridors.	0.5		
PA3	Conduct feasibility study of water sports and other tourism products in Dhankuta.	Completion of Comprehensive Feasibility Study Report and presentation to stakeholders	Identify water sports with tourism potential and prepare a feasibility report.	2	Provincial Govt., Municipality, CCI	1
			Develop financial model, risk analysis, and explore funding sources and financing options.			
PA4	Promote rural-urban linkage for markets within and outside of the municipality.	Establishment of integrated supply chains and market access for rural producers	Develop Agricultural Market Centre in a suitable location including various spaces for storage, processing, market stalls in collaboration with the relevant stakeholders.	50	Provincial Govt., Municipality	2
			Incentivize farmers for agriculture/dairy production and horticulture by providing capacity building trainings, networking opportunities, and connecting the farmers with suppliers, service providers and other relevant actors.	5		
PA5	Conduct research on crops possible in water scarcity zone in association with Agriculture Research Station at Pakhribas.	Completion of Comprehensive Crop Suitability Study and Recommendations Report	Identify crop varieties that are drought-tolerant and suitable for arid/semi-arid conditions by conducting literature reviews, and further evaluation of various appropriate crop characteristics at NARC Pakhribas.	2	Municipality, NARC	3
			Perform field trials and experimentation to evaluate performance of crops, soil quality, and optimize production system.	5		

PRIORITY ACTIONS AND INVESTMENT PLAN

SN	PRIORITY ACTION	MILESTONES	ACTIVITIES	BUDGET (NPR in million)[61]	IMPLEMENTING AGENCIES	TIMELINE (in years)
ENVIRONMENT, CLIMATE CHANGE, AND DISASTER RESPONSIVE DEVELOPMENT						
PA1	Conduct research and trainings on environmental protection and integrated pest management.	Trained human resources on environmental protection	Develop training modules and conduct programmes for environmental protection.	5	Municipality, Wards	1-2
			Integrate practical sessions, field visits and hands-on training on integrated pest management.	2		
PA2	Prepare municipal byelaws on rainwater harvesting, water source conservation and groundwater recharge.	Establishment of rainwater harvesting schemes, water source conservation and groundwater recharge schemes	Identify key stakeholders to discuss the importance of rainwater harvesting and groundwater protection.	0.2	Municipality	1-1.5
			Form drafting committee to draft comprehensive byelaws that covers all relevant aspects, including rainwater harvesting system specifications, groundwater protection regulations, and enforcement mechanism.	5		
			Organize capacity building programs through engagement with organizations working in ground water protection and advocating for ground water preservation.	0.2		
PA3	Establish a good partnership with environmental organizations to leverage expertise and support for sustainable solid waste management practices.	Good relationship built between municipality and environmental organizations	Identify and initiate collaboration with the relevant organizations. Conduct goal setting exercises and project formulation.	0.5	Municipality, Development Partners	1-1.5
			Maintain effective communication and evaluation to track progress and effectiveness while conducting training and capacity building, community outreach programs.	0.5		
PA4	Develop Risk and Inclusion Sensitive Land Use Planning (RISLUP) adopting multi hazard risk assessment and sustainable risk reduction.	Identification and mapping of areas vulnerable to hazards and risks.	Conduct participatory hazard identification and assessment in coordination with local community and concerned stakeholders (participatory mapping). Prepare GIS maps including vulnerability and exposure assessment to propose risk mitigation strategies.	10	Municipality	1-2
			Develop Risk Maps. Overlay with cadastral map and prepare Risk and Inclusion Sensitive Land Use Plan.	10		

PRIORITY ACTIONS AND INVESTMENT PLAN

SN	PRIORITY ACTION	MILESTONES	ACTIVITIES	BUDGET (NPR in million)[61]	IMPLEMENTING AGENCIES	TIMELINE (in years)
PA5	Identify vulnerable areas and communities (with gender and social disaggregated data) to disaster and climate risks engaging local communities.	Community vulnerability to disasters minimized	Conduct comprehensive risk assessment and mapping to identify vulnerable communities prone to disasters and climate risks.	5	Municipality, Development Partners	1-2
			Pool resources from various sources (experts, networks of development partners) to ensure inclusion of diverse perspectives in risk reduction.	1		
			Engage communities in understanding their stories about vulnerability and build their capacity to understand eminent threats and risks.	1		

ACCESSIBLE AND ADAPTIVE INFRASTRUCTURE AND SERVICES

SN	PRIORITY ACTION	MILESTONES	ACTIVITIES	BUDGET (NPR in million)[61]	IMPLEMENTING AGENCIES	TIMELINE (in years)
PA1	Conserve water sources and recharge ground water including spring conservation and implement the concept of one ward–one pond.	Recharge of ground water	Identify and assess water resources such as springs and develop conservation plan.	2	Municipality, Development Partners	2-5
			Construct ponds and water harvesting infrastructure (catchments, storage tanks) including natural and ecological systems.	50		
			Conduct regular monitoring and evaluation that could be useful for adaptive management and scaling up of water conservation initiatives.	5		
PA2	Construct road networks connecting municipal office to ward offices.	Identification and prioritization of link roads	Conduct engineering and social survey for comprehensive site assessment, develop detailed project plans and prepare an estimate of financial resources to implement the project by including bioengineering and nature-based solutions.	20	Provincial Govt, Municipality	3-5
			Prepare a schedule for phase-wise construction of roads.	0.2		

PRIORITY ACTIONS AND INVESTMENT PLAN

SN	PRIORITY ACTION	MILESTONES	ACTIVITIES	BUDGET (NPR in million)[6]	IMPLEMENTING AGENCIES	TIMELINE (in years)
PA3	Raise preventive health awareness through campaigns and Information, Education, Communication (IEC) materials.	Improved preventive healthcare system	Create effective campaigns (including social media outreach) and community engagement events. (Annual events for 5 years)	1	Municipality	2–5
			Conduct capacity building and training programmes in partnership with relevant healthcare institutions.			
PA4	Conduct campaigns for mental health awareness and drug abuse awareness at school and community levels.	Improved mental health scenario and drug abuse prevention	Develop community and school levels campaigns focusing on mental health and drug abuse.	0.5	Municipality	2–3
			Promote peer education programs for training young people to educate their peers about mental health and substance abuse.	0.5		
			Invest in counseling and support services for mental health and drug abuse problems.	2		
PA5	Design and construct inclusive public toilets and make public institutions accessible (include in the building byelaws for public buildings)	Preparation of design catalogue and construction of accessible toilets and public institutions	Develop a design catalogue with a good collection of diverse and innovative design concepts that is in easily accessible format.	1	Municipality	5
			Understand community needs, procure materials, and build essential facilities in public institutions.	5		
PA6	Promote and implement environmentally friendly housing aligning with the assistance provided by Janata Awas or Surakshit Nagarik Awas.	Preparation of design standard and construction of 100 houses	Identify strategic locations and design and construct accessible infrastructures for public toilets.	10	Provincial Govt, Municipality	5
			Develop appropriate design standards for affordable housing and get necessary approval from relevant institutions.	1		
			Construct and distribute (with continuous ward and community level consultations) affordable housing for marginalized community.	200		

PRIORITY ACTIONS AND INVESTMENT PLAN

SN	PRIORITY ACTION	MILESTONES	ACTIVITIES	BUDGET (NPR in million)[61]	IMPLEMENTING AGENCIES	TIMELINE (in years)
EFFECTIVE GOVERNANCE AND INVESTMENTS						
PA1	Implement online tax payment system.	Software installed and system activated at the municipality	Develop appropriate applications and software to integrate online tax payment system into the municipal system.	1	Municipality	1
			Conduct orientation program for the relevant municipal staff as well as users of the system.			
			Implement the system in close coordination with relevant stakeholders considering the requirement of trial period and taking necessary precautions during this period.	0.5		
PA2	Develop and implement GESI actions for each project.	GESI considerations in project cycle institutionalized	Conduct GESI needs assessment and capacity building by engaging diverse stakeholders (Develop GESI strategy including mandatory provisions for GESI in each project		Municipality	1
			Develop GESI Action Plans aligned with various projects' goals, policies, legal frameworks, and international commitments. Assign individuals, teams or committees to monitor progress and accountability of implementation of action plan.	0.5		
PA3	Design and implement trainings on project planning and procurement	Successful delivery of training modules developed for Project Planning and Procurement	Prepare training methodology and curriculum to address the capacity building needs of participants.	3	PLGSP, PPC, Municipality	3
			Develop framework for regular evaluation and assessment of projects to understand the future needs of such trainings.	0.5		
PA4	Create a research fund to collaborate with Pakhribas and other educational institutions for local level research	Research fund available at local level	Conduct at least 2 researches in collaboration with local research institutions to address local challenges	1	Municipality, NARC	1-2

PA – Priority Action, BPC – Business Promotion Centre, GESI – Gender Equality and Social Inclusion, NARC – National Agricultural Research Centre, CCI – Chamber of Commerce and Industries, PLGSP – Provincial and Local Governance Support Programme, PPC – Province Planning Commission

CONCLUSION

Dhankuta Municipality situated in the hills of eastern Nepal has a unique history and character. Although the main economic sector of Dhankuta is agriculture, horticulture, and livestock, there is a growing shift to other activities mainly due to infrastructure development and out-migration of youths and workforce. The climate change impacts, mainly rise in temperature, have also affected agricultural production.

Dhankuta has a rich cultural heritage, with various ethnic groups residing in the region. The diverse cultural practices, festivals, and traditions of the people contribute to the vibrant tapestry of the municipality. Athpahariya is one of those ethnic groups found in the city. Until recently, Dhankuta used to be an educational hub, however it is gradually losing this position. Privatization of education and increased accessibility, people's growing aspirations have accelerated migration to bigger cities like Biratnagar and Kathmandu. Hile, with entirely different climatic conditions, provides an opportunity to develop the town into a hill station or gateway to mountains. Tourism has not developed yet despite its potential.

The fragile geology and steep slopes make the city vulnerable to landslides and earthquakes. The high damages and casualty in the earthquake 1988 demonstrated its vulnerability. Rise in non-compliance of building construction to NBC further makes it vulnerable to earthquake and fire. Climate change is posing threats to agriculture, dairy and livestock impacting the marginalized communities. Further, climate change is triggering short duration high intensity rainfall, ill-timed rainfall causing landslides and drought in the city.

The urban resilience roadmap of Dhankuta has outlined the risk-hotspots in the form of environmentally sensitive areas and disaster-prone areas along with the settlements of marginalized communities. Though Dhankuta has not faced major disasters in the last couple of decades, some parts of the municipality have faced landslides, floods, and fire besides the extended drought. Past trend reveals that incidents of fire, drought and landslides are increasing, albeit of small scales. Climate change has further increased risks to the agriculture sector. In this context, the roadmap has outlined four major thematic sectors to understand necessary intervened to make the city resilient.

By implementing the recommended activities, Dhankuta can create a more inclusive and adaptable urban environment that caters to the diverse needs of its residents. It is crucial to engage with local communities, government agencies, and advocacy groups to ensure that infrastructure and services are developed with inclusivity and adaptability in mind. Ongoing reviews, assessment and adjustment based on community feedback will help to address emerging issues and create a sustainable and responsive urban environment. Implementing these strategies requires careful planning, collaboration among government agencies at all levels, private sector partners, international development partners and the community. A system of regular monitoring, evaluation, and adaptation to changing circumstances can ensure sustainability, effectiveness of governance and enhanced investments thereby making Dhankuta a resilient city.

REFERENCES AND BIBLIOGRAPHY

Creating Livable Cities: Regional Perspectives. (2019). Asian Development Bank. https://www.adb.org/publications/creating-livable-cities

Cutter, S. L., Burton, C. G., & Emrich, C. T. (2010, August 4). Disaster Resilience Indicators for Benchmarking Baseline Conditions. De Gruyter. https://doi.org/10.2202/1547-7355.1732

Dobbs, R., J. Manyika, and C. Roxburgh (2011). Urban World, Mapping the Economic Power of Cities. McKinsey and Company. http://www.mckinsey.com/insights/urbanization/urban_world. Accessed on 17 August, 2014.

Dodman, D., B. Hayward, M. Pelling, V. Castan Broto, W. Chow, E. Chu, R. Dawson, L. Khirfan, T. McPhearson, A. Prakash, Y. Zheng, and G. Ziervogel, 2022: Cities, Settlements and Key Infrastructure. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 907–1040, doi:10.1017/9781009325844.008.

Economic losses, poverty & disasters: 1998-2017. (n.d.). Economic Losses, Poverty & Disasters: 1998-2017 | UNDRR. https://www.undrr.org/quick/11678

Gencer, E.A. (2013). "Natural disasters, urban vulnerability, and risk management: a theoretical overview." Pp.7-43 in The Interplay Between Urban Development, Vulnerability, and Risk Management: A Case Study of the Istanbul Metropolitan Area. edited by E. A. Gencer (ed.) New York: Springer.

Grimm, N.B., E.M. Cook, R.L. Hale, and D.M. Iwaniec, 2016: A broader framing of ecosystem services in cities: benefits and challenges of built, natural or hybrid system function. In: Routledge Handbook of Urbanization and Global Environmental Change [Seto, K.C., W. Solecki and C.A. Griffith (eds.)]. Rotledge, New York, pp. 202–212.
Poudel, D. P., Shrestha, A., Khatri, D., & Ensor, J. (2021, January 1). URBANISATION AND DISASTER RISKS IN THE HIMALAYA | New Angle: Nepal journal of social science and public policy. URBANISATION AND DISASTER RISKS IN THE HIMALAYA | New Angle: Nepal Journal of Social Science and Public Policy. https://doi.org/10.53037/na.v7i1.74

Schipper, E.L.F., A. Revi, B.L. Preston, E.R. Carr, S.H. Eriksen, L.R. Fernandez-Carril, B.C. Glavovic, N.J.M. Hilmi, D. Ley, R. Mukerji, M.S.

Muylaert de Araujo, R. Perez, S.K. Rose, and P.K. Singh, 2022: Climate Resilient Development Pathways. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2655–2807, doi:10.1017/9781009325844.027

UNDP. (2021, December). Urban Risk Management and Resilience Strategy. New York.

United Nations International Office for Disaster Risk Reduction (UNISDR) (2010). Local Governments and Disaster Risk Reduction: Good Practices and Lessons Learned. Geneva, Switzerland: UNISDR.

United Nations International Office for Disaster Risk Reduction (UNISDR) (2012). How to Make Cities More Resilient: A Handbook for Local Government Leaders. Geneva, Switzerland: UNISDR.

United Nations. (2019). World urbanization prospects - population division. United Nations. Retrieved March 8, 2023, from https://population.un.org/wup/

Urban Resilience Roadmap. (2017). USAID Adapt Asia-Pacific. http://www.adaptasiapacific.org/2017-forum/process-map-intro

Urban Resilience Roadmap. (2017, August 4). weADAPT. https://www.weadapt.org/knowledge-base/cities-and-climate-change/urban-resilience-roadmap

Weiss, M.A.(2001). Productive cities and metropolitan economic strategy. Paper presented to the United Nations International Forum on Urban Poverty (IFUP). Fourth International Conference, Marrakech, Morocco, 16-19, October, 2001. http://www.globalurban.org/prod_cities.htm.

Werners, S.E., R.M. Wise, J.R. Butler, E. Totin and K. Vincent, 2021: Adaptation pathways: a review of approaches and a learning framework. Environ. Sci. Policy, 116, 266–275.

World Bank. 2019. Building Urban Resilience: An Evaluation of the World Bank Group's Evolving Experience (2007–17). Independent Evaluation Group. Washington, DC: World Bank.