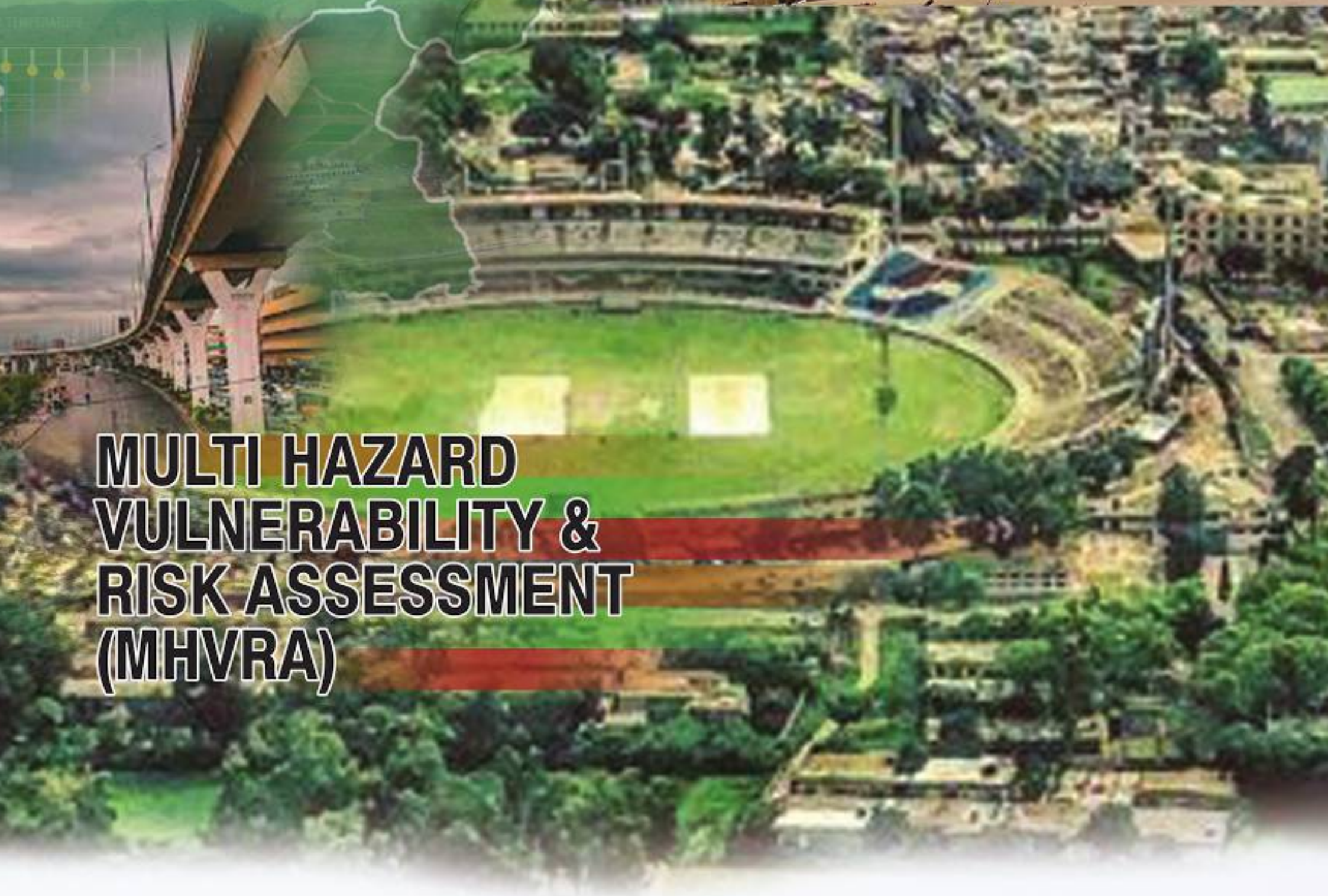
DISTRICT
RAWALPINDI

PUNJAB - PAKISTAN

Developed by: Plans Wing,
National Disaster Management Authority,
Islamabad, Pakistan



MULTI HAZARD VULNERABILITY & RISK ASSESSMENT (MHVRA)

UN-HABITAT

ADAPTATION FUND

DISTRICT RAWALPINDI

PUNJAB - PAKISTAN

MULTI HAZARD VULNERABILITY & RISK ASSESSMENT (MHVRA)

National Disaster Management Authority (HQ),
Main Murree Road Near ITP Office, Islamabad
www.ndma.gov.pk

The National Disaster Management Authority (NDMA) is the lead federal agency to deal with the whole spectrum of Disaster Management in Pakistan. It was established in 2007 through NDM Ordinance and was finally provided parliamentary cover by an act of Parliament in 2010. The NDMA is the executive arm of the National Disaster Management Commission (NDMC), which was established under the Chairmanship of the Prime Minister of Pakistan, as an apex policy making body in the field of Disaster Management. The NDMA aims to develop sustainable operational capacity and professional competence to coordinate the emergency response of Federal Government in the event of a national disaster.

Developed by
Plans Wing
National Disaster Management Authority, Prime Minister's Office
Published in Pakistan (2025)

Disclaimer

The designation employed and the presentations of material in this Atlas do not imply the expression of any opinion or official endorsement on the part of NDMA. While every effort has been made to ensure the accuracy and correctness of materials presented for this publication, the NDMA and its partners, disclaim any responsibility for the accuracy or correctness of the information and makes no representation of warranty as to information accuracy, and in particular, their accuracy in labeling, dimensions, contours, boundaries, or placement or location of any map features thereon. The areas depicted by maps are approximate, and are not necessarily accurate to surveying or engineering standards. The maps and tables shown here are for illustration purposes only and are not suitable for site-specific decision making. NDMA acknowledges and accepts all limitations, including the fact that the information and maps are dynamic and in a constant state of revision.

We appreciate your feedback

Questions and comments concerning this publication may be addressed to the Plans Wing, National Disaster Management Authority, Pakistan vide contact details given below.

Contacts
Plans Wing
National Disaster Management Authority (HQ),
Main Murree Road Near ITP Office, Islamabad
www.ndma.gov.pk,
dirimp@ndma.gov.pk

FOREWARD

The National Disaster Management Authority (NDMA) is committed to fostering sustainable social, economic, and environmental development in Pakistan by reducing risks and vulnerabilities while ensuring effective disaster response and recovery.

Pakistan remains highly susceptible to both natural and human-induced disasters due to its geographic location, diverse topography, complex hydrological patterns, and active fault lines. These recurring disasters pose a significant challenge to the country's long-term development goals, with vulnerabilities increasing in both urban and rural areas, putting lives and livelihoods at greater risk.

As the principal body responsible for disaster management in Pakistan, NDMA remains steadfast in its mission to build a disaster-resilient nation. Substantial efforts have been made to mitigate vulnerabilities across multiple hazards. The National Disaster Risk Reduction (DRR) Policy and the National Disaster Management Plan (NDMP) 2012–2025 have been instrumental in transitioning towards a proactive disaster risk management approach. To operationalize key interventions under NDMP, NDMA developed an implementation roadmap (2016–2030), with a particular focus on Multi-Hazard Vulnerability & Risk Assessment (MHVRA).

MHVRA plays a critical role in integrated DRR planning and mainstreaming risk reduction strategies at Local, Provincial, and National levels. The insights gained from these assessments support land-use planning, inform national programs tailored to community vulnerabilities, and contribute to a robust knowledge management framework for long-term socio-economic sustainability.

NDMA has successfully conducted MHVRA studies in three selected Districts, Islamabad, Rawalpindi & Nowshehra leveraging in-house technical expertise. This initiative showcases NDMA's advanced capabilities in data processing and visualization, ensuring informed decision-making for all stakeholders. Furthermore, it strengthens NDMA's institutional capacity to undertake similar initiatives in the future.

Moving forward, NDMA is committed to expanding MHVRA studies across other provinces and regions, incorporating advanced geospatial technologies and predictive analytics to enhance the accuracy and effectiveness of disaster preparedness measures. By integrating real-time data from satellite feeds, early warning systems, and community-driven insights, NDMA aims to refine risk assessment methodologies and strengthen national resilience against disasters.

Additionally, NDMA continues to foster collaboration with national and international partners, academic institutions, and research organizations to develop innovative solutions for disaster risk management. This includes capacity-building programs, policy reforms, and technological advancements that will enable a more robust and adaptive disaster management framework.

I extend my sincere gratitude to the Plans Wing of NDMA for the endorsement of this study. A special acknowledgment goes to the United Nations Human Settlements Programme (UN-Habitat) Pakistan for their unwavering support in pioneering MHVRA initiatives and their continued assistance.

Together, through continued collaboration, innovation, and proactive planning, we can build a safer and more resilient Pakistan, ensuring that communities are better prepared to withstand and recover from disasters in the years to come.

Lieutenant General
Inam Haider Malik, HI (M)
Chairman, National Disaster
Management Authority (NDMA)

ACKNOWLEDGEMENT

NDMA is pleased to introduce the Multi-Hazard Vulnerability and Risk Assessment (MHVRA) Atlas for three selected districts—Islamabad, Rawalpindi, and Nowshera. This Atlas serves as a dynamic planning tool for Disaster Risk Management (DRM) officials, humanitarian agencies, and development partners at provincial and district levels, enhancing Disaster Risk Reduction (DRR), preparedness, and contingency planning efforts.

We extend our sincere appreciation to the Chairman of NDMA, Lieutenant General Inam Haider Malik, HI(M) for his visionary leadership, strategic direction, and unwavering support throughout this project. His guidance has been instrumental in ensuring its successful execution.

Our profound gratitude also goes to Program Manager (UN-Habitat) Mr. Javed Ali Khan and Project Manager (UN-Habitat) Mr. Khalil Ahmad for their continued support and collaboration, which have been invaluable to the success of this initiative.

We extend heartfelt thanks to Member (DRR), Mr. Idrees Mahsud, Executive Director (PLANS) Brigadier Muhammad Umar Chattha (Retd), and Senior Director (PLANS-A)Mr. Raza Iqbal TI(M) for their steadfast commitment, expert guidance, and invaluable contributions, which have greatly enriched this project.

We also recognize and appreciate the significant contributions of institutions and individuals at district, provincial, and national levels, who provided essential data and insights, ensuring the seamless execution of this initiative. The expertise of consultants from various disciplines played a crucial role in maintaining precision and quality throughout the assessment.

Lastly, we express our deepest gratitude to all stakeholders who actively participated in and supported this study. Their dedication, collaboration, and invaluable contributions are sincerely acknowledged and appreciated.

PREFACE

Pakistan's diverse topography makes it highly vulnerable to a wide range of natural and human-induced disasters. The country has witnessed numerous catastrophic events in the past, underscoring its susceptibility to such hazards. Until recently, disaster management in Pakistan primarily followed a reactive emergency response approach. However, the devastating impact of disasters on the nation's economy, human lives, and environment highlighted the urgent need for a strategic shift toward Disaster Risk Reduction (DRR). Recognizing this necessity, Pakistan transitioned from a response-based model to a proactive disaster management approach through the enactment of the National Disaster Management Ordinance in 2007, which was later formalized as the National Disaster Management (NDM) Act of 2010.

In accordance with the provisions of the NDM Act 2010 and in alignment with the DRR Policy, the National Disaster Management Authority (NDMA) developed National Disaster Management Plan (NDMP) 2012–2025. This plan identified ten priority areas and outlined 118 specific interventions and projects for implementation over a decade. Notably, priorities 3 and 4 emphasized the need for executing the Multi-Hazard Vulnerability and Risk Assessment (MHVRA) across the country. To operationalize this initiative, NDMA introduced the NDMP Implementation Roadmap 2016–2030, which provides a phased strategy for conducting MHVRA at the micro level, extending down to the Union Council level across all districts of Pakistan and Azad Jammu & Kashmir (AJ&K).

Given Pakistan’s vulnerability to multiple hazards, the implementation of MHVRA is essential for fulfilling national and international commitments, including the Millennium Development Goals (MDGs), Sustainable Development Goals (SDGs), the Sendai Framework for Disaster Risk Reduction (SFDRR), the Climate Change Policy 2012, the National DRR Policy 2013, NDMP 2012–2025, and Pakistan Vision 2025.

Recognizing the significance of MHVRA, NDMA, as the apex body for disaster management in Pakistan, has undertaken the development of a structured and holistic methodology tailored to the country’s specific needs. The primary objective of this study is to accurately assess and map disaster risks faced by communities across the selected Districts.

This MHVRA Study has been carried out under the Umbrella of MHVRA Guidelines through Plans Wing of NDMA and with support from the UN-Habitat under Adaptation Fund Project titled, “Enhance community, local and national-level urban climate change resilience to water scarcity, caused by floods and droughts in Rawalpindi/Islamabad and Nowshera".

This MHVRA Study Involved inputs from technical agencies in Pakistan, including representatives from the respective Provincial, State, and Regional Disaster Management Authorities (PDMAs, SDMA & GBDMA), Pakistan Meteorological Department (PMD), the Planning Commission, the Planning, Development & Reforms Division, the Finance Division, the Economic Affairs Division, the Ministry of Water & Power, the Ministry of Climate Change, the Federal Flood Commission (FFC), the Geological Survey of Pakistan (GSP), the Space & Upper Atmosphere Research Commission (SUPARCO), and the Survey of Pakistan (SOP), alongside representatives from academia.

By integrating a scientific and data-driven approach to disaster risk assessment, NDMA aims to enhance the country’s resilience to disasters, ensuring better preparedness, mitigation, and response strategies in the future.

Methodology

This study involved the identification and analysis of prevalent hazards in the selected districts through extensive field consultations with local stakeholders and a thorough review of historical records. Three key hazards—drought, floods, and earthquakes—were selected for analysis due to their frequent recurrence in the study areas. The project encompassed various scientific and technical activities, including an assessment of past and ongoing studies related to hydrological, seismological, and geological phenomena. Exposure has been mapped in the dimensions of population, physical elements, life lines, essential facilities, transportation facilities, socio-economic aspects, economic activities, environmental elements, critical infrastructure, agriculture and livestock elements; being termed as elements at risk. Various statistical tools such as projection equations, dissimilarity index, have been employed in the Project to extrapolate information beyond the available frame.

Vulnerability analysis has been conducted considering three dimensions i.e. physical, social and agriculture (Food Insecurity). For physical vulnerability, fragility curves have been developed using available technical and statistical tools (Probabilistic or Empirical fragility models). For social vulnerability, several technical tools such as Principal Component Analysis (PCA) and Social Vulnerability Indicator (SoVI) have been utilized to obtain possible driving factors contributing to the social vulnerability in the study area. Vulnerability analysis in the context of agriculture and food security have also also been undertaken to determine sets of contributing factors to food insecurity and agricultural vulnerability. The stressor covered epidemic, endemic, biotic and edaphic factors and sudden shocks such as earthquake, flood and drought.

Coping capacity has been anticipated by assessing existing capacities of organization to manage disasters. The coping capacity has further been divided into three main factors i.e. capacity to anticipate risk, capacity to respond and capacity recover. Adaptive capacity has been evaluated using fifteen indicators.

For Risk Assessment, Analytical Hierarchy Process (AHP) and Multi Criteria Decision Making approaches have been employed in the Study. The risk assessment has been carried out using qualitative, quantities or semi quantitative approach. On basis of these factor components, the cumulative riskrofile of the study districts (risk indexing down to UC Level) have been developed. Various DRR intervention and mitigation measures have formulated and finally Cost Benefit Analysis (CBA) of proposed DRR interventions have been performed to estimate their economic feasibility.

Close linkages with the National, provincial and district organizations have been established through stakeholder consultation arrangements in order to facilitate secondary data collection, hazard specific information exchange, and sharing of any other relevant data. For this purpose, several data collection tools have been utilized in the Study such as focus group discussion, key informant interviews, participatory rural appraisal, semi structured interviews and one-to-one interviews with community level stakeholders and line departments.

ABOUT THIS ATLAS

Accurate, easily interpretable, and up-to-date information is a fundamental pillar of effective decision-making. In the field of disaster management, timely and precise information plays a crucial role in risk-informed Disaster Risk Reduction (DRR) planning. It equips relevant authorities with insights into potential losses, vulnerabilities, exposure, and impending disaster risks within a given area, enabling them to implement proactive prevention, mitigation, preparedness, and response measures before or during an emergency.

However, compiling and visualizing Multi-Hazard Vulnerability & Risk Assessment (MHVRA) data presents a significant challenge, as it requires a multi-dimensional analysis of various natural processes and their cumulative impacts on the study area. Additionally, conveying the findings of an MHVRA study in a user-friendly format demands the development of advanced data visualization tools, graphical aids, interactive charts, and effective cartographic representations. This Atlas marks a major step toward achieving these objectives by presenting complex data in an accessible and comprehensible manner.

The Atlas offers detailed baseline maps of the study district, covering diverse aspects such as geology, climatology, land use, land cover, elevation, population, settlements, infrastructure (transportation, telecommunication, health, education, irrigation), industries, agriculture, and livestock. To enhance readability, a variety of graphical tools—including pie charts, histograms, bar charts, matrix diagrams, line graphs, 3D charts, and informative tables—have been employed. The Atlas also provides an overview of hazard assessment methodologies for three key hazards: drought, earthquakes, and floods, along with hazard maps for various return periods. Exposure matrix tables have been developed to identify at-risk elements, supplemented by exposure maps. Additionally, a concise risk assessment methodology is outlined, along with risk maps. This study has been conducted at a micro level, down to the Union Council level, making it the first of its kind. It reflects a high level of technical expertise, rigorous analytical work, and a collaborative, cross-sectoral approach.

This Atlas will serve as an invaluable resource for policymakers and practitioners, supporting risk-informed land-use planning, the integration of DRR into development initiatives, and the implementation of national-scale programs grounded in comprehensive data. It provides a critical baseline for future micro-level DRR planning and serves as a cutting-edge tool for resource mapping within the study district.

List of Officers/Officials involved in MHVRA Punjab Study

Technical Team

Name	Designation/Position
Mr. Syed Muhammad Tayyab Shah	General Manager (Risk Assessment)
Ms. Zahra Hassan	General Manager (GIS)
Mr. Sheikh Rafay Ehsan	Deputy Manager (Geology)
Mr. Hafiz Muhammad Haris Mir	Deputy Manager (MHVRA / GIS)
Mr. Abdul Hanan Hamid	Deputy Manager (Hydrology / GIS)
Mr. Asfandyar Farooqi	Assistant Manager (GIS)

Administrative Team

Name	Designation/Position
Mr. Zohaib Durrani	Manager (Policy)
Mr. Owais Khan Yousafzai	Manager (Development Organizations / Finance)
Mr. Farhan Ahmad	Manager (United Nations)
Mr. Ghulam Rasool	Admin & Accounts Associate
Mr. Shahid Malik	Field Surveyor

TABLE OF CONTENTS

RAWALPINDI

HAZARD ANALYSIS

EXPOSURE ANALYSIS

EXPOSURE ANALYSIS

VULNERABILITY ASSESSMENT

RISK ASSESSMENT

A BASELINE INFORMATION

1 RAWALPINDI DISTRICT OVERVIEW

Rawalpindi, commonly referred to as "Pindi," is one of the most significant districts in Punjab, Pakistan. It serves as the administrative headquarters of the Rawalpindi Division and is the fourth-largest city in Pakistan. Located adjacent to the federal capital, Islamabad, Rawalpindi plays a crucial role in the country's military, economic, and cultural landscape.

The district features a mix of urban, suburban, and rural areas, with a diverse topography that includes plains, hills, and riverbanks, particularly along the Soan River. The Murree Hills, part of the Himalayan foothills, add to the district's natural beauty. The climate of Rawalpindi varies from hot summers and mild winters to snowfall in the Murree region.

Rawalpindi is a historical and military hub, home to the Pakistan Army's General Headquarters (GHQ), numerous cantonments, and important national institutions. The city has a vibrant economy driven by trade, industry, tourism, and agriculture. It is well-connected by motorways, railways, and an international airport (Islamabad International Airport).

Rawalpindi City View

Histroy

Rawalpindi has a rich historical background that dates back to the ancient Gandhara civilization (6th century BCE). It was once part of Taxila, a renowned center of learning and Buddhism, and played a significant role in the region's cultural and trade networks. Archaeological findings indicate that this area was inhabited by early civilizations that thrived along the trade routes connecting Central Asia and the Indian subcontinent.

During the Mauryan Empire (322–185 BCE), Rawalpindi and its surroundings saw the expansion of Buddhism under Emperor Ashoka. The influence of Buddhism persisted through the Kushan Empire (1st-3rd Century CE), during which Taxila became an educational and religious hub. Numerous stupas, monasteries, and artifacts from this period have been discovered in and around the district. However, with the decline of the Kushan Empire, the region gradually came under Hindu Shahi rule (9th-11th Century CE) before falling to the Ghaznavid and Ghurid dynasties, which introduced Islam to the region. The Mughal period (16th-18th Century) saw the development of trade, military installations, and road networks in the area. Rawalpindi's strategic location made it an important military outpost for Mughal rulers. However, after the decline of the Mughal Empire, the Sikh rulers, under Maharaja Ranjit Singh, took control of Rawalpindi in 1818. The Sikhs fortified the city, and it remained under their rule until the British annexed Punjab in 1849 after the Second Anglo-Sikh War.

During British rule (1849-1947), Rawalpindi was transformed into a major military cantonment, which remains one of the largest in South Asia today. The British constructed railways, roads, and administrative buildings, making Rawalpindi a key center for governance and military operations. It also served as Pakistan's temporary capital (1959-1963) while Islamabad was under construction.

After Pakistan's independence in 1947, Rawalpindi continued to grow as an economic, military, and educational hub. The establishment of Pakistan's General Headquarters (GHQ) in the city further strengthened its strategic importance. Today, it is a modern metropolis, blending historical heritage with contemporary urban development, serving as a crucial link between Punjab and Khyber Pakhtunkhwa.

Land Scape

Rawalpindi's landscape is characterized by a mix of plains, rolling hills, and riverbanks, with the Soan River flowing through the district, playing a vital role in its geography. The Margalla Hills lie to the north, providing a scenic backdrop and acting as a natural boundary between Rawalpindi and Islamabad. The district features fertile agricultural lands, particularly in the Potohar Plateau, known for its undulating terrain and scattered rocky outcrops. The Leh Nullah, a seasonal stream, runs through the city and has historically been prone to flooding during monsoon seasons. Overall, Rawalpindi's landscape is a blend of urban expansion, military cantonments, and rural settlements, reflecting its strategic location and historical significance.

Culture

Rawalpindi has a rich and diverse cultural heritage shaped by its historical influences, ethnic diversity, and strong military presence. The city is a melting pot of traditions, where Punjabi, Potohari, and Kashmiri cultures blend seamlessly. Punjabi and Potohari are the dominant languages spoken, though Urdu serves as the lingua franca, and English is commonly used in official and business settings.

Rawalpindi is known for its bustling bazaars, particularly Raja Bazaar, Moti Bazaar, and Saddar, where traditional handicrafts, textiles, and spices are widely available. The city's cuisine reflects the rich flavors of Punjabi and Mughlai traditions, with popular dishes including nihari, paya, saag, and chapli kebabs. Street food, such as samosas, pakoras, and gol gappay, is an integral part of daily life.

The city's religious and cultural landscape is marked by its diverse places of worship, including historic mosques, Hindu temples, and Sikh gurdwaras, reflecting its pluralistic past. Festivals such as Eid-ul-Fitr, Eid-ul-Adha, Basant, and Urs celebrations bring vibrant gatherings, music, and traditional performances to the city.

Rawalpindi has a thriving arts and entertainment scene, with theaters, music concerts, and traditional storytelling (dastaangoi) still playing a role in cultural expression. The city has also contributed to Pakistani film and television, producing notable actors, musicians, and writers. Additionally, the presence of the Pakistan Army General Headquarters (GHQ) has influenced a disciplined and patriotic culture, with military parades and ceremonies being a common sight. Overall, Rawalpindi's culture is a dynamic mix of historical richness, modern urban life, and deep-rooted traditions, making it a significant cultural hub in Punjab.

Languages

Rawalpindi is a linguistically diverse city where multiple languages are spoken due to its historical significance and cultural diversity. The predominant language is Punjabi, particularly the Potohari dialect, which is widely spoken by the local population. Urdu, as the national language of Pakistan, serves as the lingua franca, facilitating communication among different ethnic groups. English is also commonly used, especially in education, business, and official matters. Due to the presence of Pashtun communities, Pashto is spoken in certain areas, along with traces of Kashmiri and Hindko, reflecting the city's multi-ethnic composition.

Traditional Crafts

Rawalpindi has a rich tradition of handicrafts and artisanal skills, reflecting its deep-rooted cultural heritage. Some of the most well-known traditional crafts include:

- Brass and Copper Work – The city is famous for its handcrafted brass and copper utensils, which are used in households and as decorative pieces.
- Pottery and Ceramics – Artisans create intricately designed clay pots, vases, and tiles, which are popular in local and international markets.
- Handwoven Textiles – Rawalpindi has a strong tradition of producing khaddar (handwoven cotton), embroidered shawls, and Kashmiri pashmina.
- Wood Carving – Skilled craftsmen in the city create beautifully carved wooden furniture and decorative items, often showcasing floral and geometric patterns.
- Jewelry Making – The markets of Rawalpindi, especially Raja Bazaar and Sarafa Bazaar, are known for their gold and silver jewelry, embellished with traditional designs and gemstones.
- Truck and Rickshaw Art – Like many other cities in Pakistan, Rawalpindi embraces truck and rickshaw art, where vehicles are decorated with vibrant colors, floral motifs, and poetic inscriptions.

Notable People

Rawalpindi has been home to many influential figures in politics, literature, sports, and entertainment. Some of the most notable personalities include:

- Liaquat Ali Khan, First Prime Minister of Pakistan
- Benazir Bhutto, Former Prime Minister of Pakistan
- Gen. Ayub Khan, Former President of Pakistan
- Gen. Qamar Javed Bajwa, Former Chief of Army Staff
- Sheikh Rashid Ahmed, Former Interior Minister
- Chaudhry Nisar Ali Khan, Former Interior Minister
- Rauf Klasra, Journalist and Columnist
- Adnan Siddiqui, Actor
- Shoaib Akhtar, Former Pakistani Fast Bowler
- Amanat Ali Khan, Classical Singer

Tourist Attractions

- Liaquat Bagh
- Ayub National Park
- Rawalpindi Golf Club
- Raja Bazaar
- Saddar
- Murree Road
- Pakistan Army Museum
- Garrison Church
- Rawalpindi Food Street (Kartarpura)

DISTRICT RAWALPINDI AT A GLANCE

Geography

Location

Lat: 33°36'0"N
Long: 73°02'0"E

Neighbouring Districts

- **North** — Haripur, Abbottabad (Khyber Pakhtunkhwa)
- **East** — Islamabad, Kahuta
- **West** — Attock
- **South** — Chakwal, Jhelum

Administrative Setup

Area	5,286 sq. km
District Capital	Rawalpindi City
Language	Punjabi

7	112	1127	6
Tehsils	Union Councils	Mouzas	Muncipal Committees

Population Distribution

Total Population in District

540,5633	2017 Census
574,5964	2023 Census

Population Density (Person per sq.km)

1022	2017 Census
1087	2023 Census

Growth Rate

2.10%
(2023 Census)

Educational Facilities

Govt. Schools	Colleges	Universities
1247	33	17

Public Health Care Facilites
(Numbers)

130

Tourist Attractions

Picnic Resort
Ayub National Park, Jinnah Park, Pepsi Jungle Kingdom

Shrines
Darbar & Jamia Masjid Hazrat Shah di Talian, Darbar Hazrat Mast Qalander, Darbar Hazrat. Masoom Shah Kalaa Saidin, Darbar Hazrat Baba Gohar Shah, Darbar Hazrat Budhu Shah, Darbar Sandohari Badshah

Forts
Rawat Fort, Pharwala Fort, Sangni Fort

Historical Sites
Texila Museum, Jaulian Buddhist Stupa & Monastery, Sirkap Remains, Purana Qilla, Raja Bazar

Agriculture

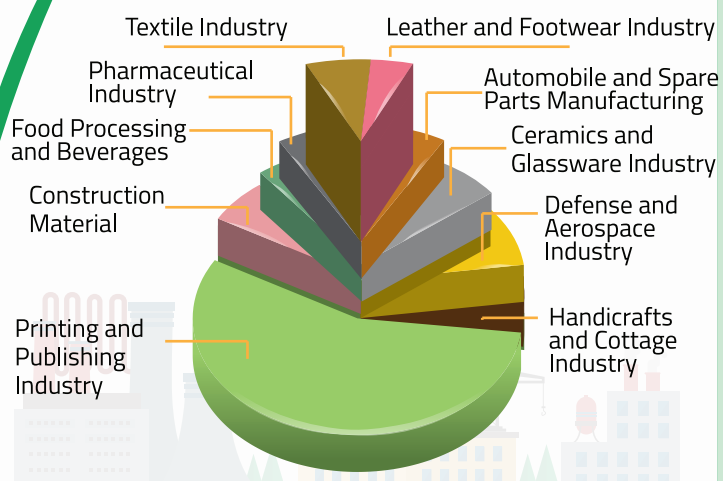
Major Crops
Wheat, Barley, Gram, Mustard, Maize, Bajra , Sorghum, Groundnut

Major Fruits
Citrus (Oranges, Kinoo), Guava, Pomegranate, Jujube (Ber), Figs

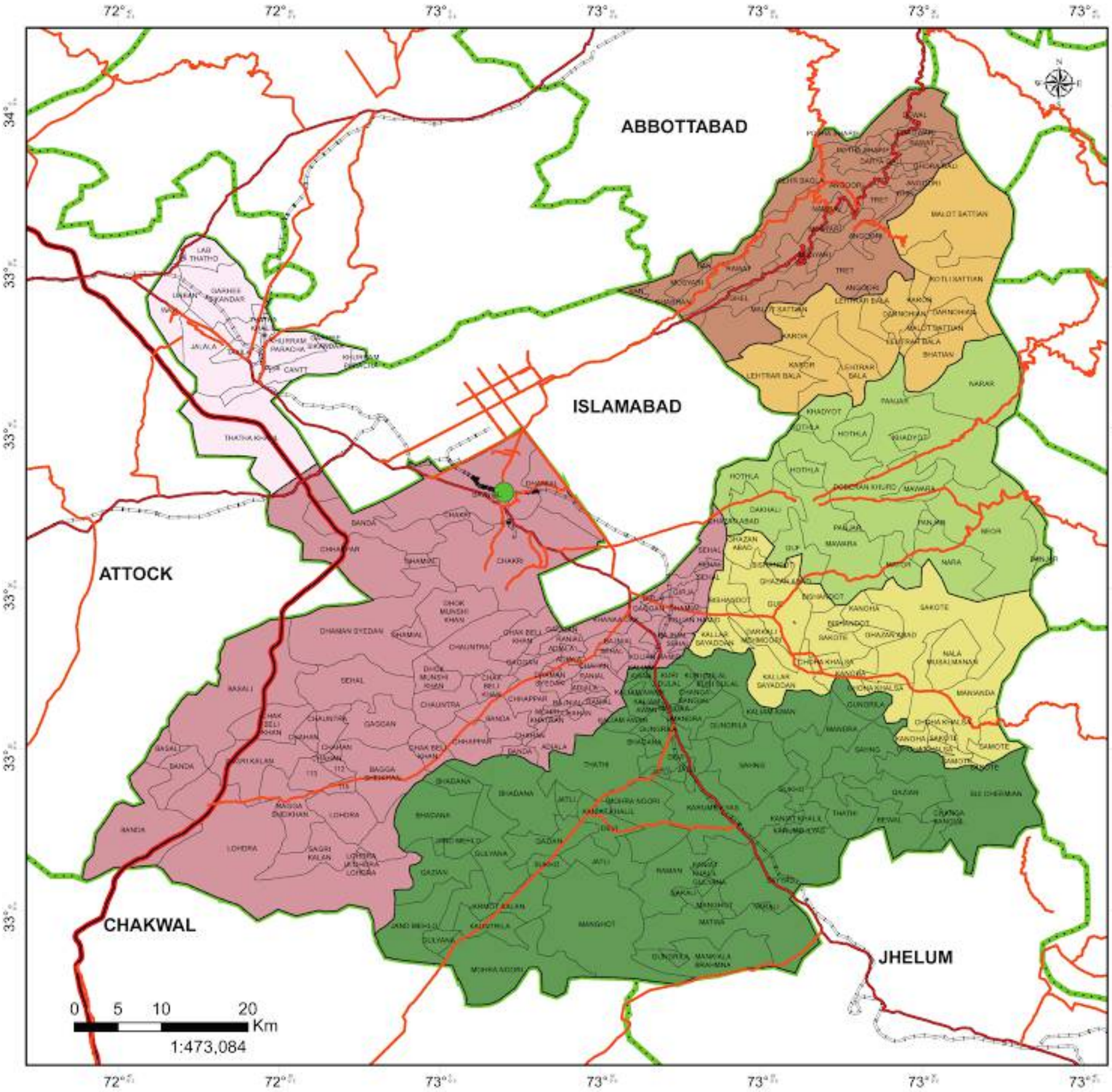
Major Vegetables
Potatoes, Onions, Tomatoes, Carrots, Cauliflower

Major Livestock
Cattle, Buffaloes, Goats, Sheep, Poultry

Major Industries



DISTRICT ADMINISTRATIVE MAP



Legend

- District Headquarter
- Major Roads
- National Highway
- Strategic Road
- Motorways
- Railway Tracks

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

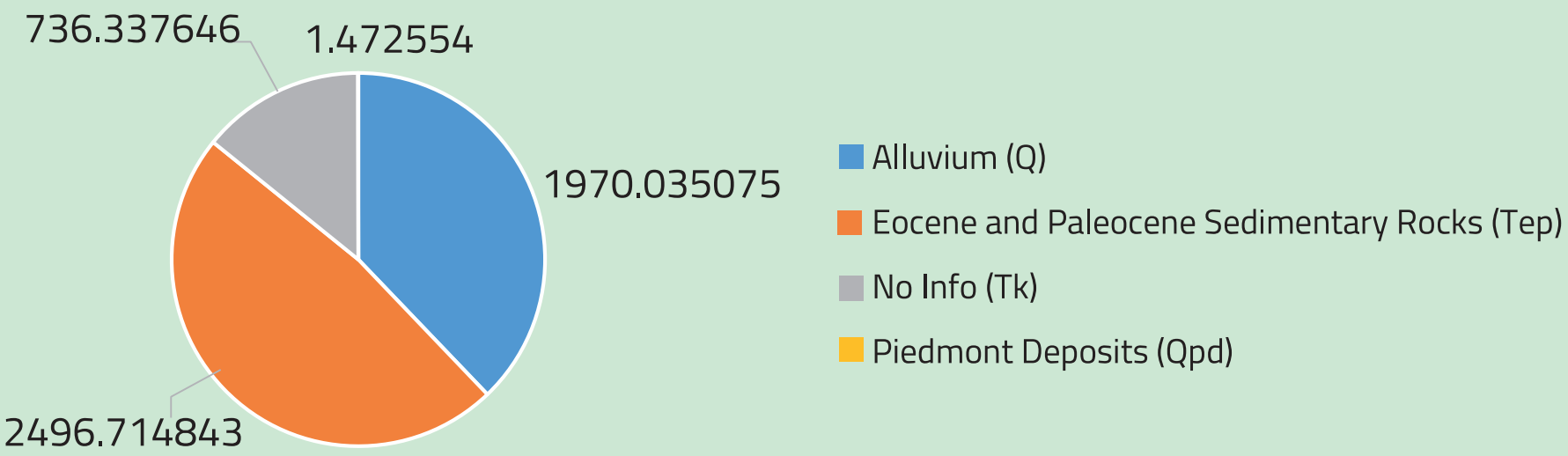
UN-HABITAT

2 GEOLOGY

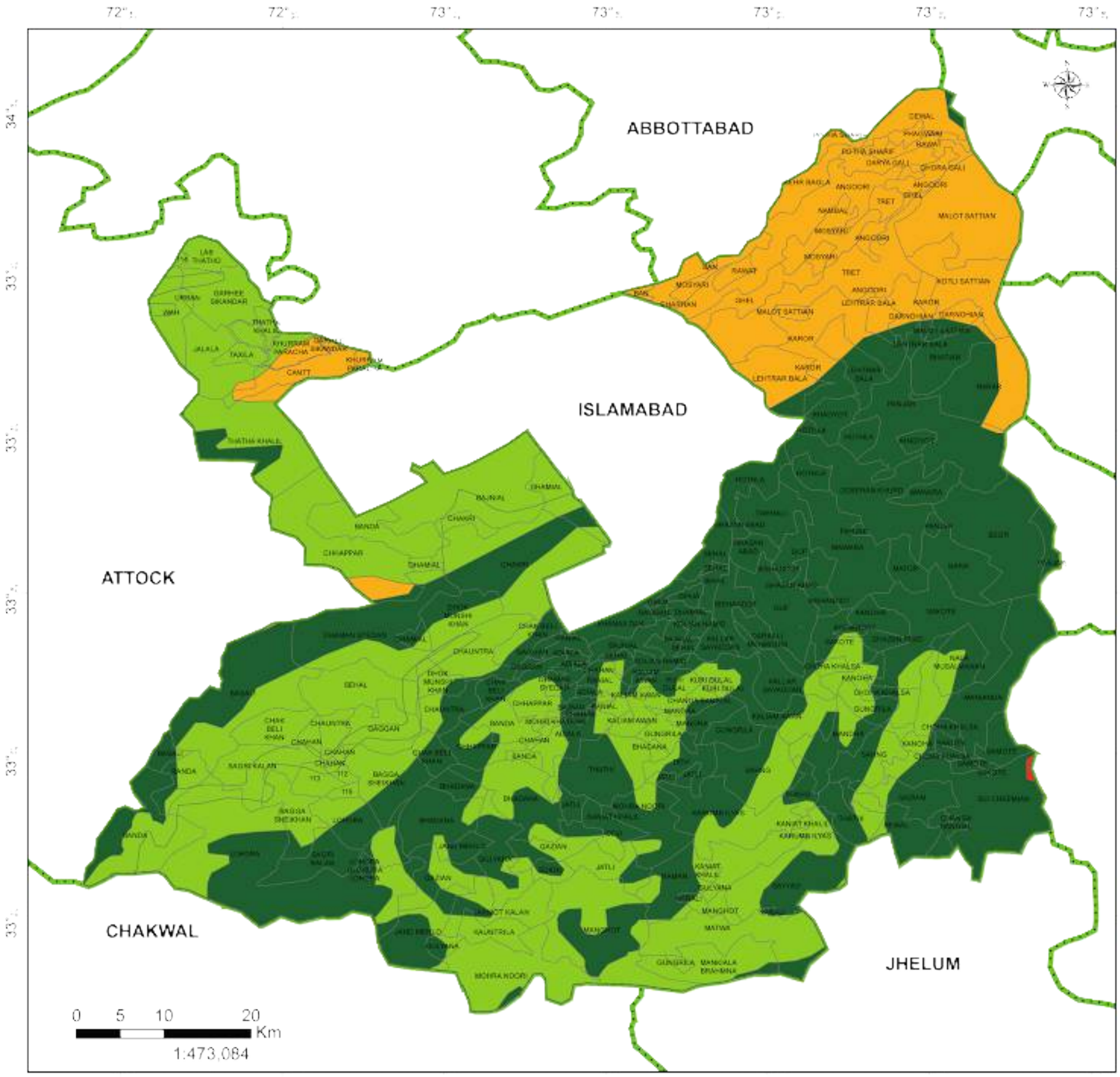
The geology of Rawalpindi District is characterized by a diverse range of rock formations, including sedimentary rocks such as sandstone, shale, and limestone, primarily belonging to the Siwalik and Murree formations. These formations date back to the Miocene and Pliocene epochs and are known for their rich deposits of clay, gravel, and conglomerates. The district lies in the Pothohar Plateau, which features undulating terrain, steep slopes, and deep ravines shaped by erosion over millions of years. The presence of rich alluvial deposits in the plains supports agriculture, while the hilly areas contain mineral resources such as limestone, gypsum, and phosphate. The region is also seismically active due to its proximity to the tectonic boundary between the Indian and Eurasian plates, making it susceptible to earthquakes.

Geological Formation	Area (sq.km)	Composition
Alluvium (Q)	1970.035	38%
Eocene and Paleocene Sedimentary Rocks (Tep)	2496.715	47.96%
No Info (Tk)	736.3376	14.15%
Piedmont Deposits (Qpd)	1.472554	0.03%

Geological Composition



GEOLOGY MAP



Legend

- Alluvium
- Eocene and Paleocene Sedimentary Rocks
- No
- Piedmont Deposits
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

3 LAND USE & LAND COVER

The land use and land cover of Rawalpindi District exhibit a diverse mix of urban, agricultural, forested, and barren lands, shaped by both natural features and human activities. The district's central and southern regions, particularly around Rawalpindi city, are heavily urbanized, featuring dense residential settlements, commercial hubs, and industrial zones. These areas have witnessed rapid expansion in recent decades, leading to increased land conversion for infrastructure, housing, and business development.

Agricultural land is predominant in the district's outskirts, where wheat, maize, and vegetable cultivation provide sustenance to the local economy and food supply. Irrigation for these farmlands is primarily sourced from rivers, canals, and tube wells. Livestock farming is also integrated into rural land use, with dairy farming and poultry being significant contributors to the local economy.

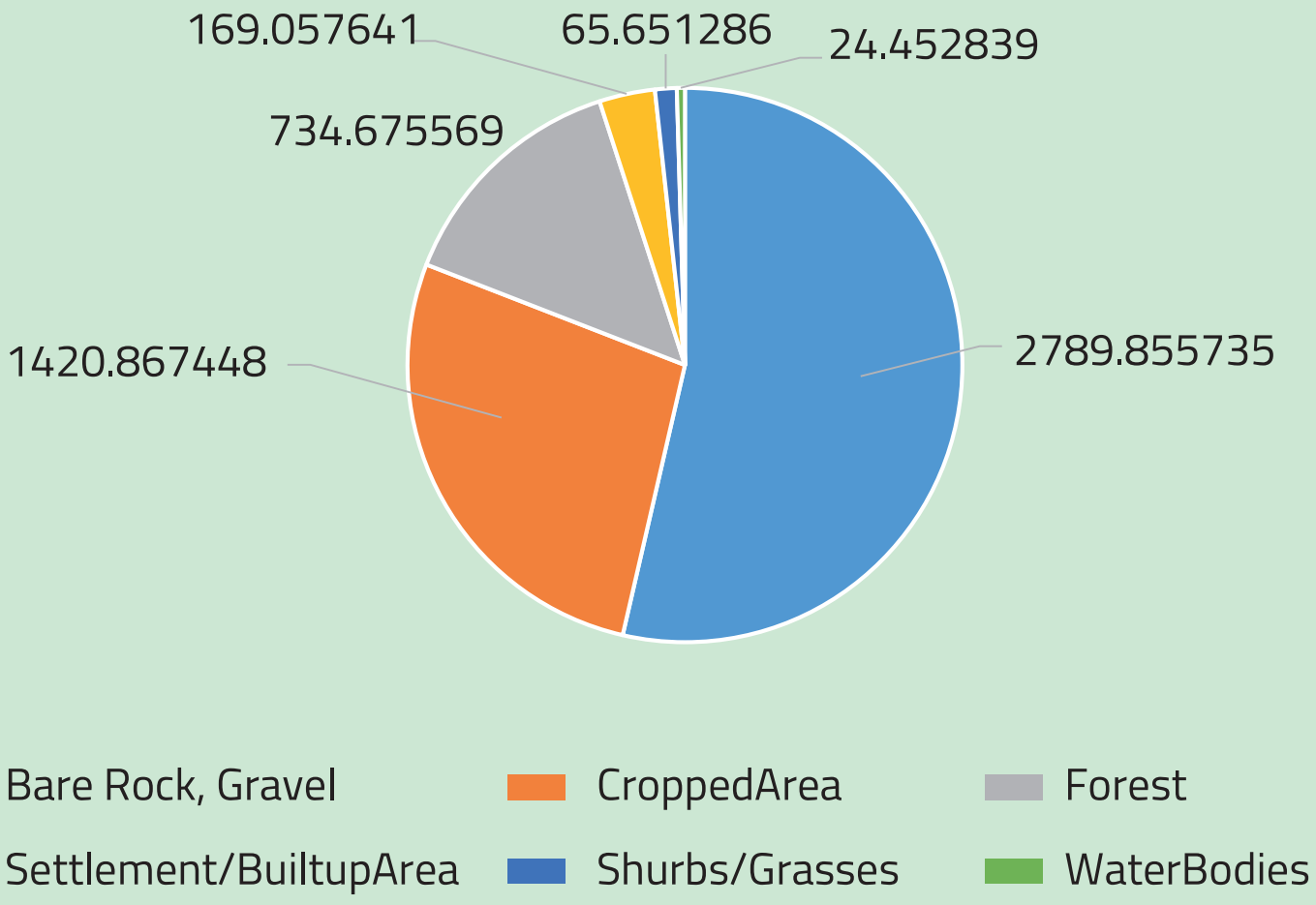
In the northern part of the district, particularly in Murree and the adjoining hilly regions, natural forests dominate the landscape. These forests, consisting of pine, oak, and deodar trees, play a vital role in preserving biodiversity, regulating climate, and preventing soil erosion. However, deforestation and encroachments pose challenges to sustainable land management.

Grasslands and scrublands are also present in various parts of Rawalpindi District, particularly in the Potohar Plateau region, where the undulating terrain supports grazing activities. Additionally, barren lands and rocky outcrops are common in areas with rugged topography, limiting agricultural productivity but providing opportunities for quarrying and mineral extraction.

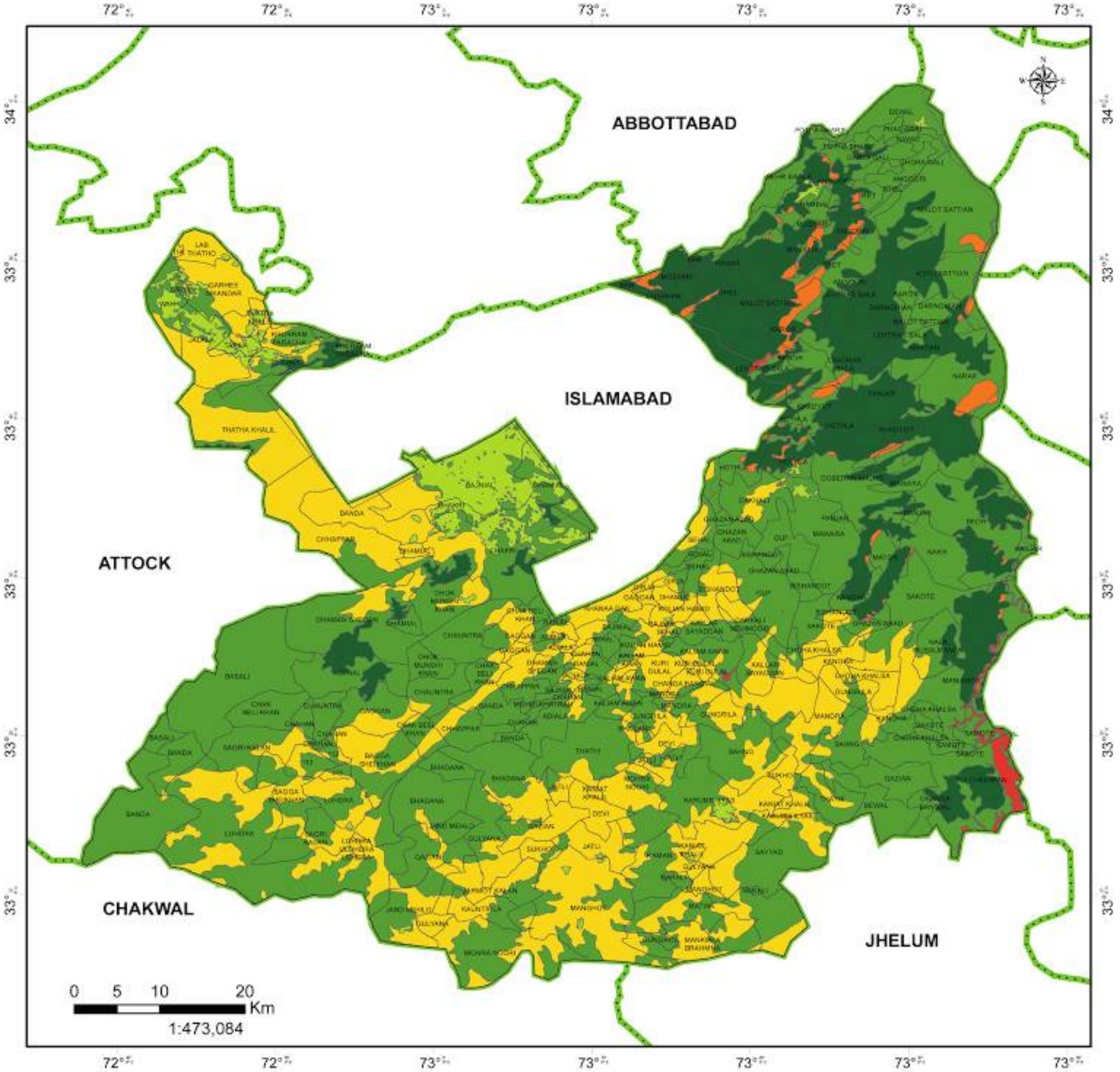
The district's land use is continuously evolving due to urban expansion, infrastructure development, and environmental conservation efforts. The construction of roads, highways, and housing schemes has reshaped the landscape, leading to increased demand for planned land management to balance urbanization with agricultural and environmental sustainability.

The study identifies different land cover classes, further subdivided into detailed categories based on analysis and validation of high-resolution satellite imagery. These images were segmented into homogeneous land units and classified using LCCS standards, ensuring accuracy in mapping the district's diverse landscape

Land Cover Distribution of Distrcit



LAND USE & LAND COVER



Legend

- Bare Rock, Gravel
- CroppedArea
- Forest
- Settlement/BuiltupArea
- Shurbs/Grasses
- WaterBodies
- Union Council Boundary

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

4 ELEVATION

Rawalpindi District, located in Punjab, features a diverse elevation profile ranging from approximately 400 meters to over 2,200 meters above sea level. The southern and central regions of the district, including Rawalpindi city and its surrounding areas, lie at an elevation of around 400–600 meters, forming part of the Potohar Plateau. In contrast, the northern part of the district, particularly in Murree and the Himalayan foothills, reaches elevations above 2,200 meters, creating a significant topographic variation.

The lower-lying Potohar Plateau is characterized by rolling terrain, dissected by numerous seasonal streams and small rivers, making it suitable for agriculture, urban expansion, and industrial development. Meanwhile, the Murree Hills in the north are covered with dense forests and serve as a major tourist destination due to their cool climate and scenic landscapes. The varying elevation influences the district's climate, land use, and economic activities, with agriculture and industry thriving in the plains and tourism and forestry dominating the highlands.

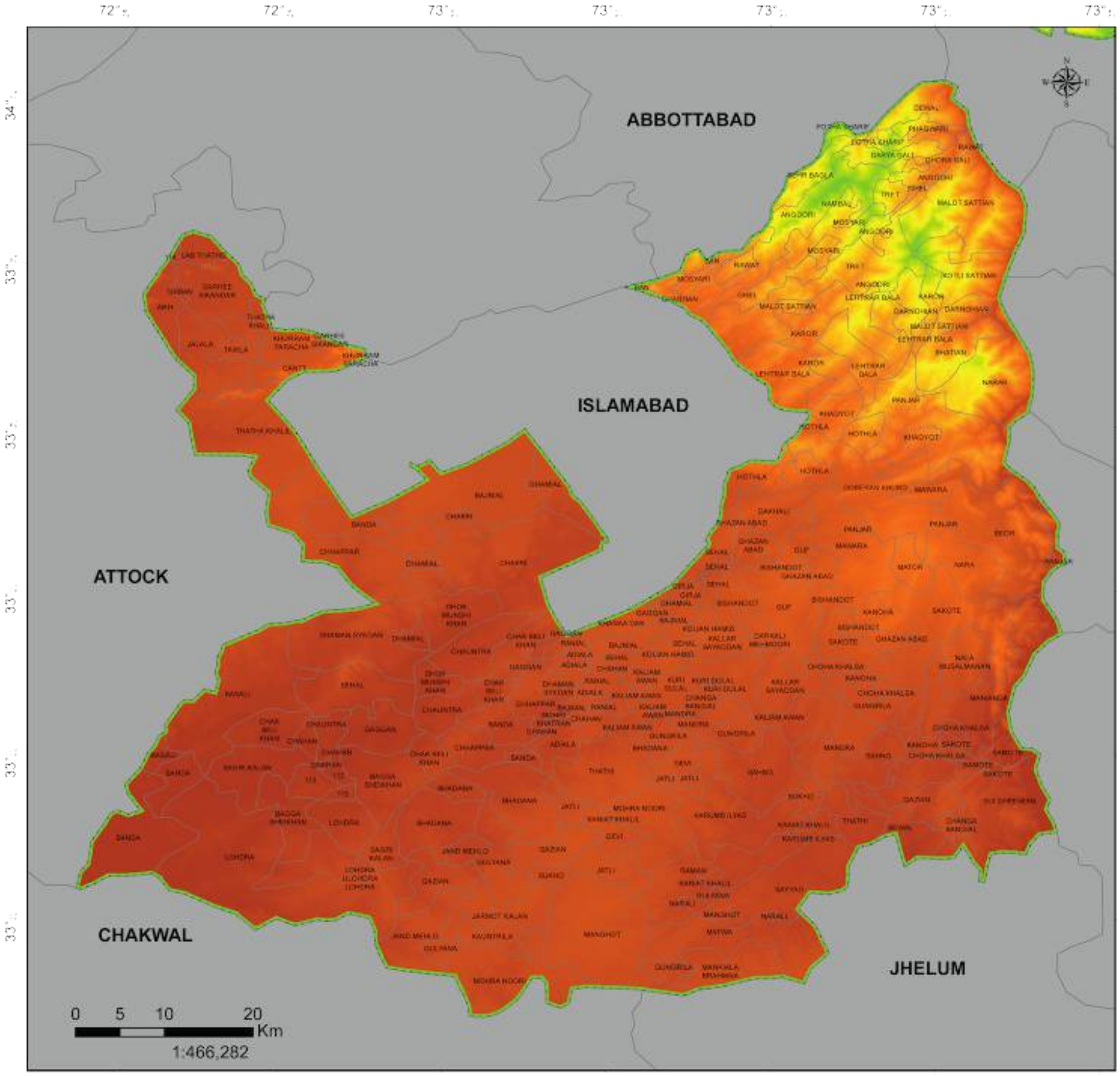
Tehsil-wise Elevation

Tehsil	Elevation Range (meters above sea level)	Terrain Type
Rawalpindi	400 – 600	Urbanized plains, Potohar Plateau, riverine areas
Gujar Khan	450 – 700	Rolling plains, agricultural lands, dry valleys
Kahuta	500 – 1,800	Hilly terrain, forested areas, agricultural settlements
Kallar Syedan	500 – 800	Semi-arid lands, plateau terrain, scattered vegetation
Taxila	450 – 600	Plains, rocky outcrops, archaeological sites
Murree	1,000 – 2,200	Steep mountains, dense forests, tourist zones
Kotli Sattian	800 – 1,800	Hilly and forested areas, rugged terrain

Elevation Distribution

Elevation Range (meters)	Area Coverage (%)	Description
400 – 600	45%	Low-lying plains, urban areas, agricultural land
600 – 1,000	30%	Rolling terrain, foothills, mixed agriculture and settlements
1,000 – 1,800	20%	Hilly regions, forested land, rural settlements
1,800 – 2,200	~5%	High-altitude Murree hills, dense forests, limited urbanization

ELEVATION MAP



Legend

Elevation (m)

Value

High : 8569

Low : -52

Union Council Boundary

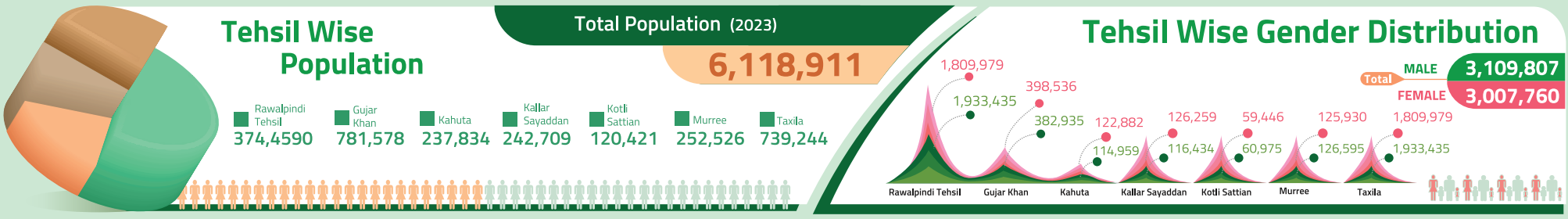
District Boundary

Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

5 POPULATION DISTRIBUTION

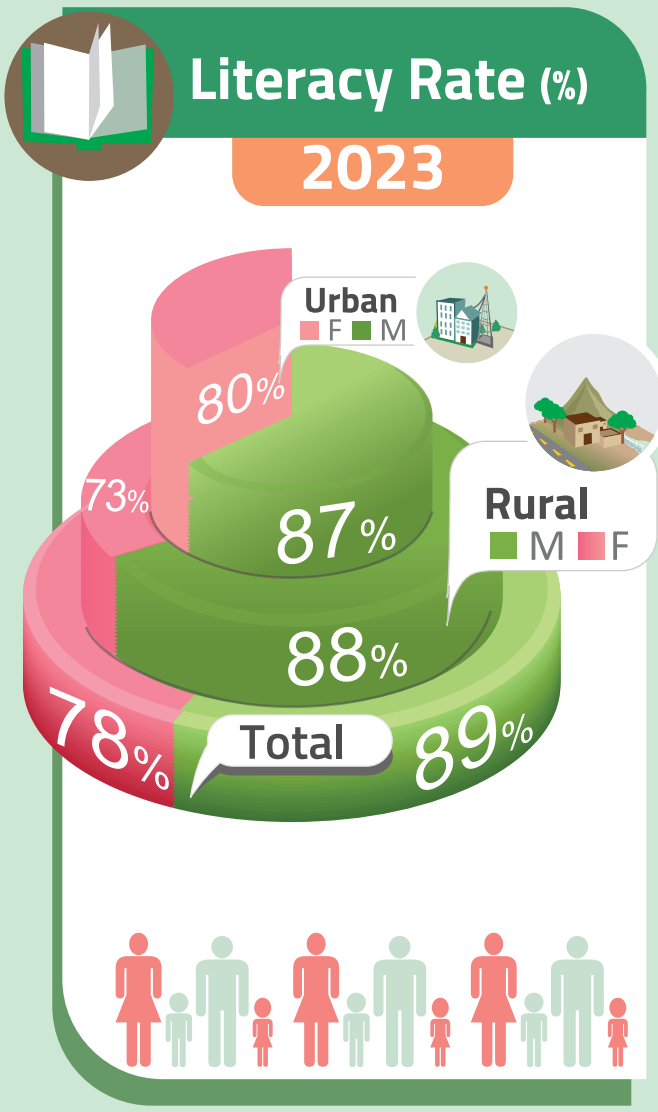
According to the 2023 census, Rawalpindi district has a total population of 6,118,911, comprising 3,109,807 males, 3,007,760 females, and 1,344 transgender individuals. The district's sex ratio stands at approximately 103.4 males for every 100 females.

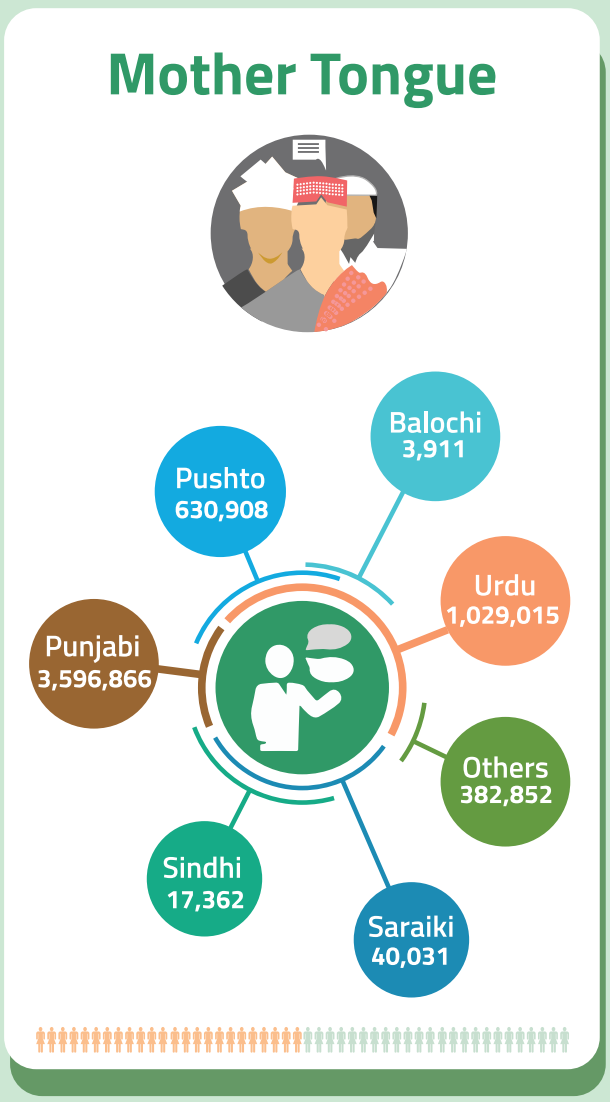


Population on Basis of Religion (1998)

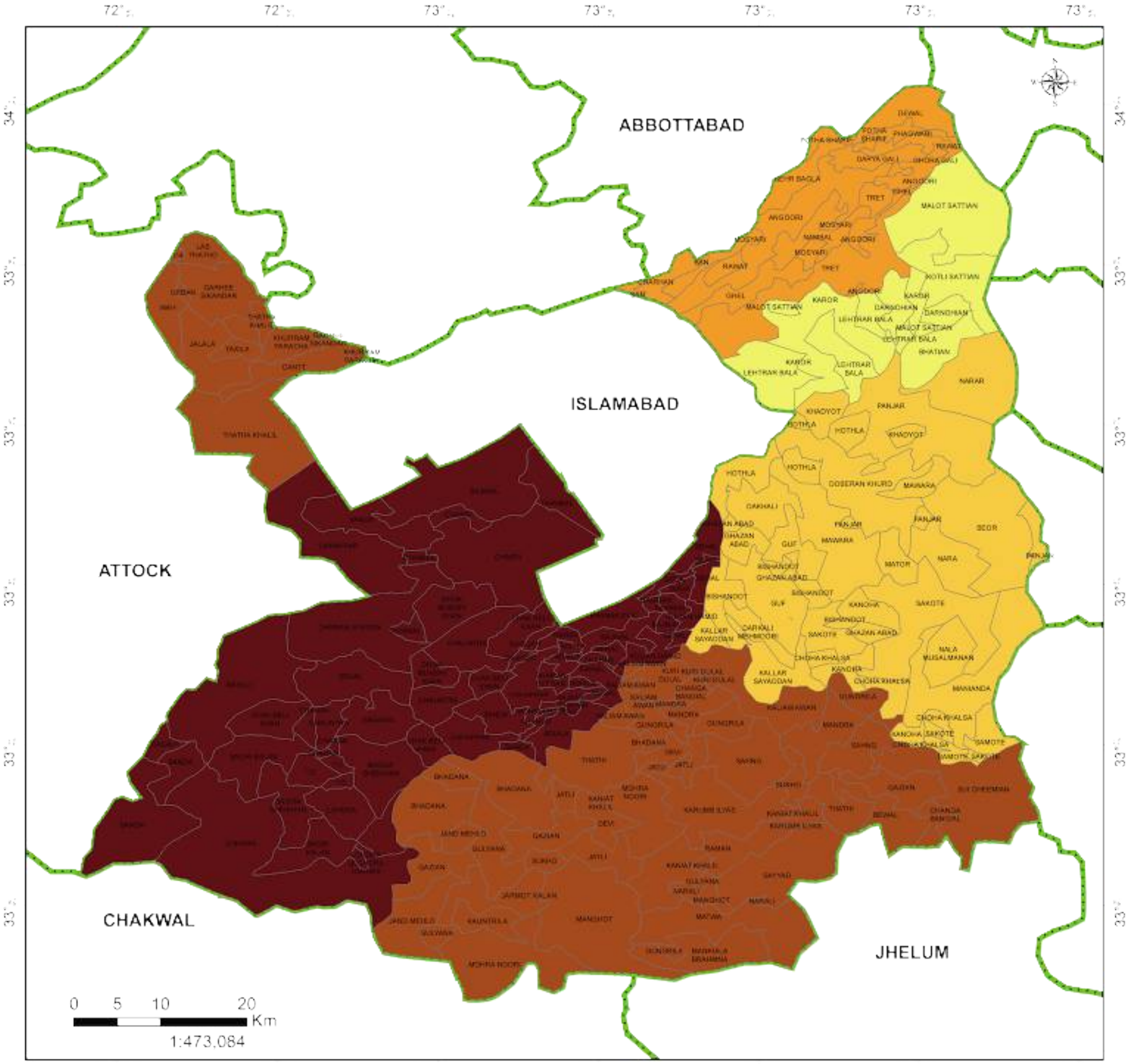
Muslims	Christians	Qadiani Ahmadi	Hindu / Jati	Others	Scheduled Castes
5,940,634	112,822	2,387	893	1465	120

3,363,911	1998 Census
5,402,380	2017 Projected
6,118,911	2023 Census





POPULATION DISTRIBUTION MAP



Legend

Population Distributiion

- < 120421
- 120422 - 242709
- 242710 - 252526
- 252527 - 781578
- 781579 - 3744590
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

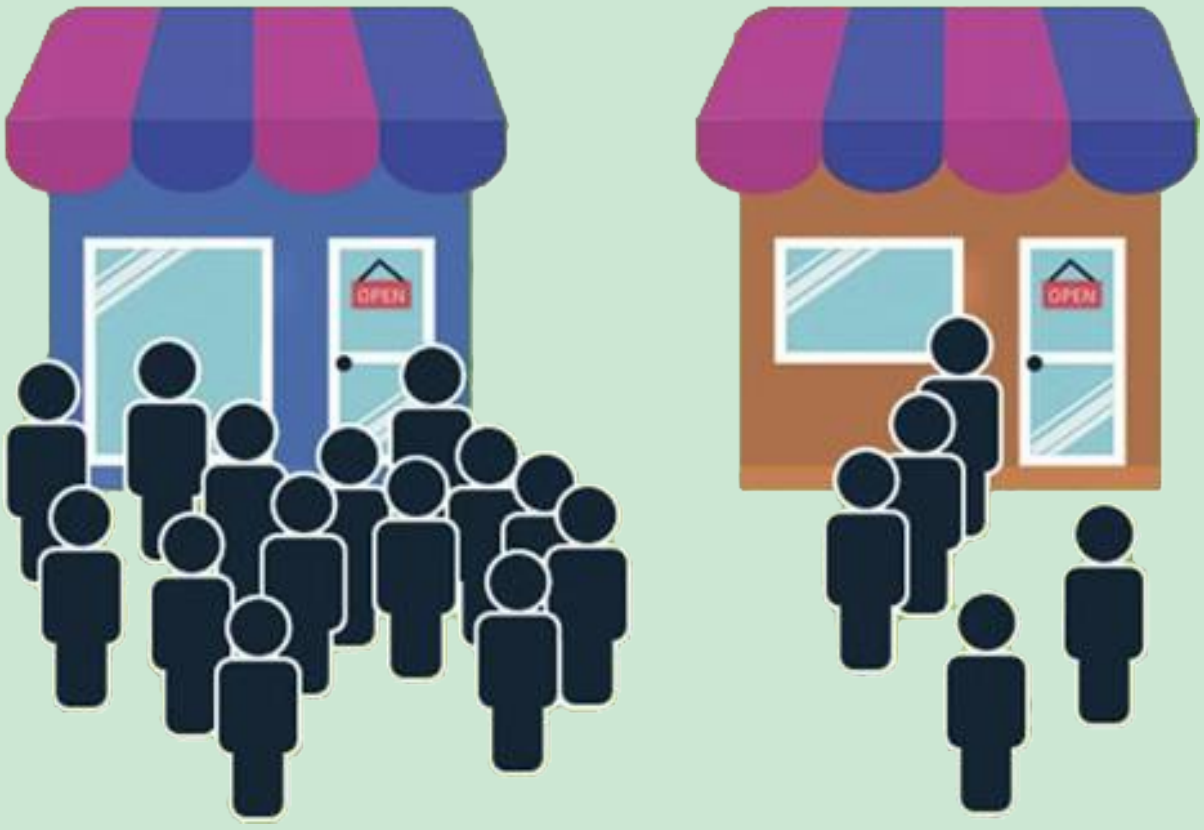
6 POPULATION DENSITY

Rawalpindi District, located in the northern part of Punjab province, Pakistan, encompasses an area of 4,547 square kilometers and, as of the 2023 census, has a population of 5,745,964. This results in a population density of approximately 1,868.79 individuals per square kilometer. The district is divided into five tehsils, each varying in area, population, density, and literacy rate.

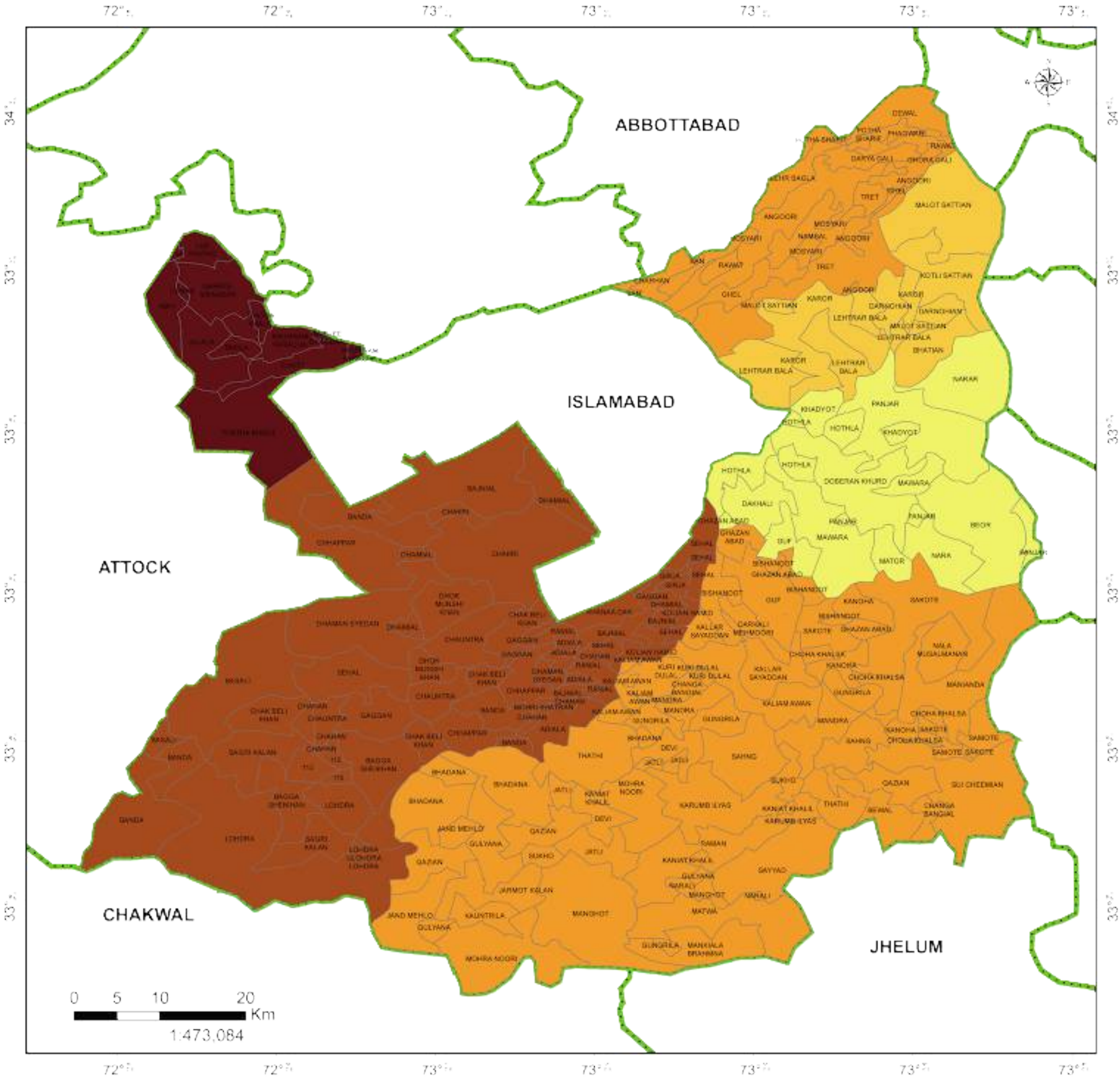
Tehsil-wise Elevation Population Density

Tehsil	Area(Km²)	Population (2023	Density (people/km²)	Literacy Rate (%)
Gujar Khan	1,457	781,578	536.43	79.72
Kahuta	637	237,843	373.38	84.05
Kallar Syedan	459	242,709	528.78	82.23
Rawalpindi	1,682	3,744,590	2,226.27	83.97
Taxila	312	739,244	2,369.37	81.98

Indicator	Estimated Value for Rawalpindi (2023)
Unemployment Rate	6.1% (National: 6.3%)
Family Member Working Outside Village/Town	27% (Provincial trend)
Household Members Having More Then 2 Possessions	93% (Based on PSLM trends)
Reciving Remittances from Pakistan	21% (Similar to KPK average)
Receiving Remitances from Abroad	4.2% (Provincial trend)



POPULATION DENSITY MAP



Legend

Population Density (Person/Sq.Km)

- < 370
- 371 - 396
- 397 - 581
- 582 - 1157
- 1158 - 2369
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

7 SETTLEMENTS

Rawalpindi District consists of a mix of urban and rural settlements, including tehsils, union councils, cities, and villages. The distict has experienced significant urban growth due to its proximity to Islamabad, the capital of Pakistan. However, rural settlements remain prominent, particularly in the tehsils of Gujar Khan, Kahuta, Kallar Syedan, Kotli Sattian, and the outskirts of Taxila.

Urban expansion in Rawalpindi has been rapid over the past two decades, especially along major highways, such as the Grand Trunk (GT) Road, the Islamabad Expressway, and the Murree Road corridor. The development of housing societies, commercial hubs, and industrial zones has transformed land use patterns. While agricultural land remains a significant part of the district, urbanization and infra-structure development have reduced barren land and increased the built-up area.

Land Use Pattern (2000 & 2023)

Land Use Class	Area		Change
	Year 2000	Year 2023	
Built-Up Area	15.8%	21.3%	5.5%
Agriculture	62.5%	69.1%	6.6%
Water Bodies	0.22%	0.18%	-0.04%
Barren	21.5%	9.4%	-12.1%

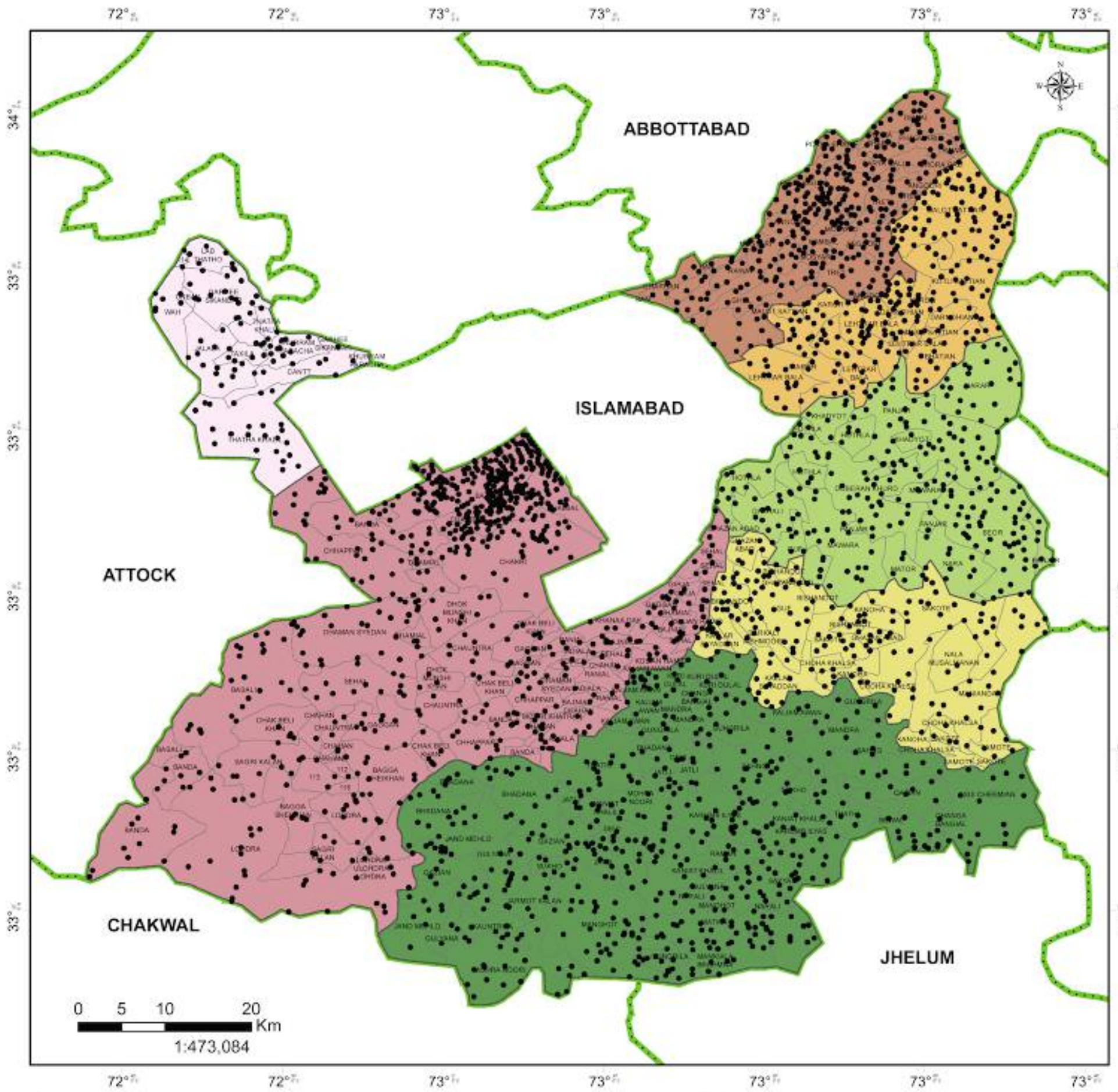
Between 2000 and 2023, the built-up area in Rawalpindi District increased substantially, reflecting population growth, migration, and economic development. The conversion of barren land into residential, commercial, and industrial areas has been a key trend, particularly in Rawalpindi city, Taxila, and the outskirts of Islamabad. Meanwhile, the Murree and Kotli Sattian regions have maintained their forest cover, serving as a natural buffer against urban sprawl.

Rawalpindi's strategic location as a gateway between Punjab and Khyber Pakhtunkhwa, along with its connectivity to Islamabad and key transport routes, has fueled its transformation into a major metropolitan area.

List of Settlements of Rawalpindi

Sarja	Dhok Maisami	Sakruta	Dhok Dabriwali	Haji Borgi	Mohra Shahan	Las	Kharang Kalan
Raman	Jatal Darab	Bindi	Dhok Dhamial	Rattala	Purtali	Sain	Chhapar
Ghik Budhal	Dhok Thalla	Sanpal	Dhok Ghazi	Panjgaran	Lalhal	Gai	Kharang Khurd
Guliana	Dhok Gujar	Pind Bala	Dhok Kahal	Kotiam	Kurnali	Chhatrana	Paike
Milam ki Dhok	Dhok Saiyidan	Paimal	Dhok Panah	Miani Dheri	Mohra Chaudhrian	Khalr	Mawara
Dhok Ghamiaran	Dhok Badhalan	Mohra Shera	Gujar Khan	Gojra	Dungi Kalan	Kaloian	Tarnoch
Chapar	Dhok Shamas	Taragarh	Isar	Matua Banglara	Dungi	Seri	Janjur
Kuntrila	Dhok Baba Murad Bakhsh	Pothi	Kala Gujran	Duman	Mohra Fatma	Chak Panhatti	Kalana
Dhok Jarha	Kabil	Mandra	Kalriala	Bher Rattial	Dhok Kashmirian	Sattian na Chanor	Ghalamman Kas
Dhok Mohal	Dhok Gujaran	Bhangali Khingar	Machhia	Bains	Dora Badhal	Sail	Paniali
Mohra Barkhurdar	Dhok Kanjar	Sarahdre	Mari Bir	Bher Ahir	Karumb Usman	Barathian	Khuian
Dokuhli	Dhok Husang	Mungar	Mochian ki Dhok	Mohra Paji Gul	Pind Thikerian	Jan Hattai	Usmanpur
Hayat Sar	Dhok Jerah	Harial	Mughal	Wahabi ki Dhok	Mohra Rohdan	Nala	Kalial
Jand Mehlu	Dhok Chhunian	Gurha	Nautheh Gul Baz	Jawal	Dariala Khaki	Khail	Sihali Ferozel
Missa Keswal	Chak Begwal	Derkala	Rawalpindi Division	Niko	Dhok Jand Gujran	Anor	Gagari
Dhok Baba Nemat	Dhok Mirza	Bijnial	Rahun	Thatta Khurd	Dhok Imam Bakhsh	Soa	Asloha
Missa Keswal	Topian	Beharwala Kas	Rahun wali Kassi	Kalis	Mohra Bahawal Bakhsh	Piand	Sambal
Miara Dhudial	Sehtal Miana	Chak Sabz	Khanpur Malot	Jhangi Pheru	Parhal	Bela Kas	Baghar
Jhanda	Biruwala Mohra	Gar	Nalla Jung	Phimmal Miana	Dudhian	Bhaletar	Hanesar Protected Forest
Mohri Barsal	Mohra Thakra	Bandot	Thikarian	Kak	Parianwala	Bindla	Mori
Burj	Dhok Fazulian	Dhok Jandala	Tarkwal	Boken	Dhok Jara	Sun	Dhianpur
Nagail Sohal	Dhok Kashmirian	Darkali Khurd	Ser	Thatta Kalan	Dhok Shekan	Kajliban Reserved Forest	Batala
Pakka Khanpur	Partali Kalan	Darkali Kalan	Borh	Bhalesar	Dhok Karali	Kaleah	Sarot
Mal Maliar	Malikan ki Dhok	Jhungal	Churakhi	Mulhal	Guliana Bains	Rihan	Papin
Umnaka Nala	Budha ki Dhok	Haidarwali Dhok	Miana Potha	Notheh Alam Sher	Gumti	Qal	Hothla
Barki Badhal	Beharwala Kas	Dhok Mazullah	Fatehpur	Chechi Noor	Dhok Rajian	Nala	Aliot
Buner Keswal	Dokhuha	Dhok Fatahullah	Surakhi	Raiyan	Jarmot Kalan	Nala	Trekha
Changa	Dhok Dadu	Ranjaliwala Kas	Kund	Sood Bhidana Railway	Mamdal Khingar	Dobhala	Jagrot Khalsa
Dherian	Mohra Dhannal	Ranjali	Jhalluna Rotha	Station	Dhok Bolaqi	Bharuthi	Goghtiati
Gulin Kas	Kazla	Bher Kalial	Notla	Sud Padhana	Bishan Daur, Kas	Khaira	Chhanni
Harar	Muhri	Data Bhat	Dherian	Bawale Kalan	Dhok Ghulam Ali	Pana	Hanesar
Jhiak Qadar Bux	Mohra Fateh	Manghot	Randa	Bawale Khurd	Dhok Piran	Utrinna Protected Forest	Jandi
Kuri	Kanli Pakhral	Sakrila	Chak Tanyam	Punjgran Kalan	Mohra Nangrial	Paryakka	Baruta
Maira Shams	Ugahun	Jaggi Narali	Harno	Saiyid Kasran Railway	Dhok Landan	Seri Protected Forest	Darioha
Pakka di Saral	Moradi Janjil Railway	Jalhan Papin	Baliam	Station	Dhok Dhamial	Suheri	Thanda Pani
Qaziah	Station	Banth	Madal	Dhok Kathril	Nattha	Panjar	Pir Sonaba, Qubba
Saggar Kas	Kurnali	Jalhari Bhai Khan	Chak Land	Saiyid Hamid	Dhok Firoz	Bindla Protected Forest	Nathiot
Sangnor	Dhok Miana	Arjan	Kangar	Dhau	Kharali Bangial	Shaiknan na Nala	Jawa
Jabbar	Mohra Raman	Madi Kala	Patina	Khisa	Mohra Kalial	Las Protected Forest	Narala
Mohra Bhutia	Dhok Kashmirian	Kakri Murid	Thathi	Kaunt	Dhok Maira	Sail Suheri Forest	Sor
Gahia Chhappar	Usmanzada	Chhanni	Nautla	Baba Tahir Shah, Ziarat	Mohra Hayat	Tundul	Marhinian
Data Bhat	Sohawa	Natha Dolal	Bigam	Kasran	Nagail Umar Khan	Balrhia	Nalean
Darkaliwala Kas	Daultala Railway Station	Kuri Dulal	Hil	Ahdi	Dulmi Khatril	Salitha Reserved Forest	Sang
Dhok Gahia	Dhok Gotijan	Dhok Gakkharan	Bagham Reserved Forest	Mastala	Mohri Khatril	Maniand	Jnila
Dhok Khole	Karumb Alias	Charbian	Jabbo Kassi	Tarati	Dhok Adra	Dariot Waris	Sang Reserved Forest
Khanpur	Dhok Kayal	Parhal	Shaikhpur	Daultala	Dhok Chak Naban	Sambalgah	Karly
Dhok Sang	Dhok Farial	Khalsa	Mohra Kamian	Hasal	Dhok Dhamial	Pharwala Protected	Palian
Malot Pakhral	Mohra Maya	Jhangi Taju	Garmaia	Jatli	Chura	Forest	Chinochha
Palot	Natta Jattan	Jhangi Jalal	Uparli Adre	Madari	Kanial	Narail, Chak	Dera
Jand Gujaran	Miana Phumbal	Karumb	Chhina	Chak Bahadar	Mano ki Dhok	Dhanchhek	Danohi Reserved Forest
Rungte	Pandara	Karumb Keswal	Phamra Gujran	Lodhe	Partali Khurd	Talhetar	Hotar
Mohra Harian	Khingar ki Dhok	Karumb Baloch	Mughlwali Kas	Kanyat Ladhu	Shah Kamal	Sang Reserved Forest	Salgran
Dhok Raipa	Dhok Maliaran	Mohra Dhamialal	Kanshi	Kanyat Maluk	Mamdal Khingar	Jawa	Bund
Mohra Firoz	Mohra Pind	Mohra Ghazi	Dhok Guro	Kant Khalil	Ara	Dalhor	Bhagaun
Dhok Mari	Jarmot Khurd	Sajot	Chere	Kanyat Pir Bakhsh	Dhok Khokhran	Phir Phirian	Bariah
Kharali Matial	Mohri Barsal	Nodil	Duhman	Chak Naban	Malot Keswal	Salang Reserved Forest	Brahampura
Dhok Raja	Dhok Manna	Nautheh Kalial	Majotha	Chattar	Khalabat	Pathanna	Plah
Hafial	Chhokar	Dhok Muqaddam Budha	Narali Keswal	Nata Gujar Mal	Giddar Gala	Phir Phirian Protected	Khalol
Chechian	Hachiari	Jhag	Padhana Gujar	Susral	Bishandot	Forest	Batli

SETTLEMENTS MAP



Legend

- Settelments
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

10 TRANSPORTATION NETWORK

Transportation Network of Rawalpindi District

Rawalpindi District has a well-established transportation infrastructure, serving as a critical transit hub between Punjab, Khyber Pakhtunkhwa, and Azad Jammu & Kashmir. Its strategic location makes it a key center for trade, commerce, and connectivity with major cities in Pakistan. The district is well-connected through an extensive road and rail network, including major highways, motorways, and railway lines.

Road Length (km)

Number of Railway Stations in Rawalpindi District

Rawalpindi is a key railway hub, connecting different parts of Pakistan via an extensive rail network. Major railway stations include:

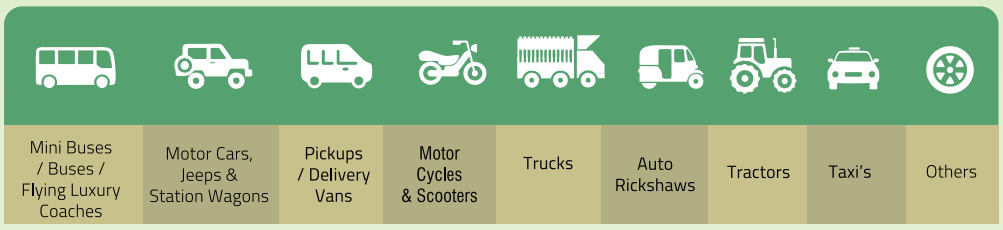
- Rawalpindi Railway Station (Main Station)
- Chaklala Railway Station
- Golra Sharif Railway Station
- Taxila Railway Station
- Gujar Khan Railway Station
- Mandra Railway Station
- Kahuta Railway Station

Major Roads in Rawalpindi District

Rawalpindi has a dense road network that facilitates movement within the district and to other parts of the country. Some of the major roads include:

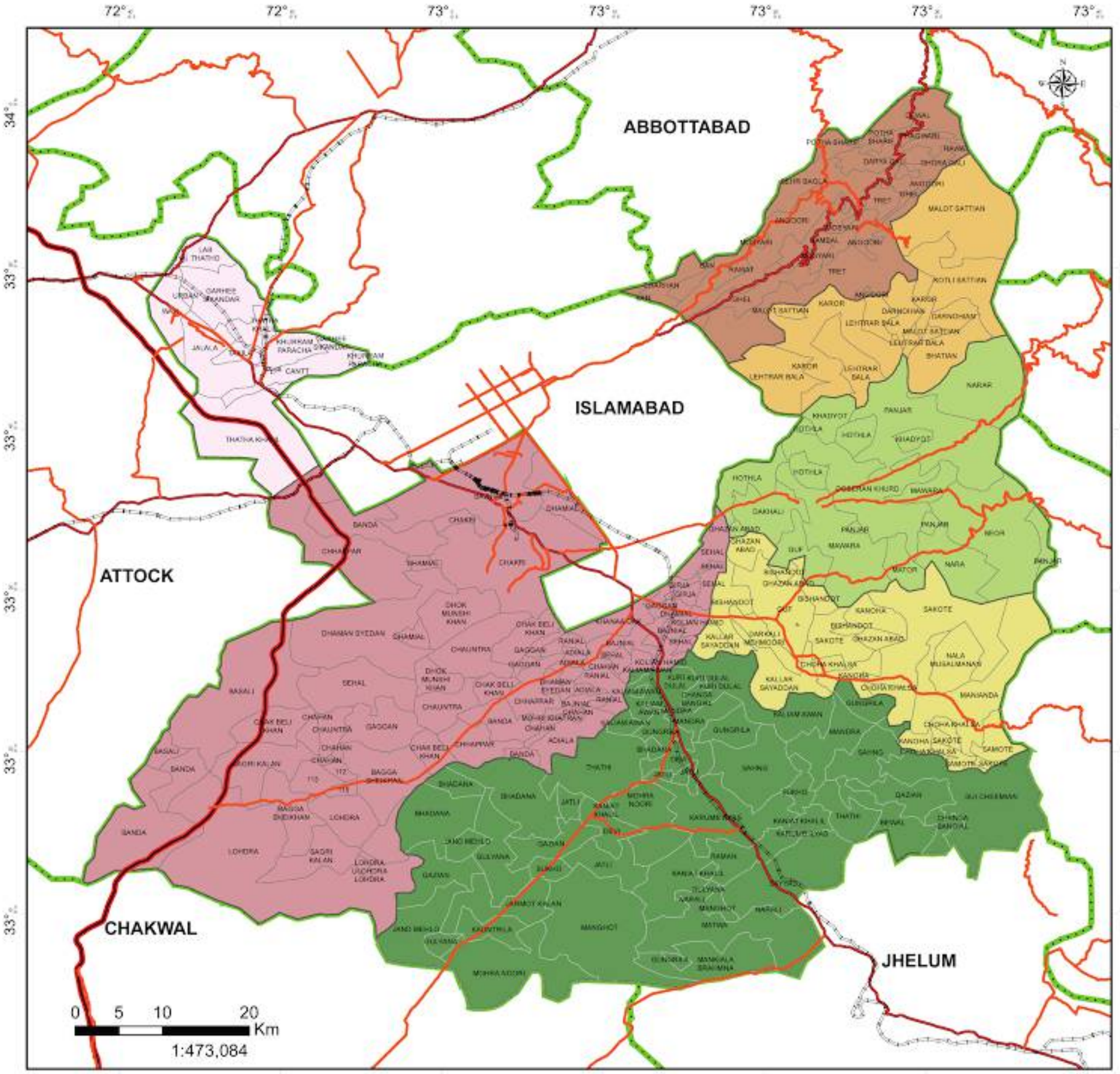
- Grand Trunk (GT) Road (N-5): Connects Rawalpindi to Peshawar, Lahore, and beyond.
- Islamabad Expressway: A key artery connecting Rawalpindi to Islamabad.
- M-1 Motorway: Links Rawalpindi to Peshawar and other parts of Khyber Pakhtunkhwa.
- M-2 Motorway: Provides a high-speed route from Rawalpindi to Lahore.
- Murree Expressway (N-75): Connects Rawalpindi with Murree and Azad Jammu & Kashmir.
- Rawalpindi-Kahuta Road: Facilitates travel between Rawalpindi and Kahuta.
- Rawalpindi-Taxila Road: Provides access to Taxila, Wah Cantt, and Haripur.

Type of Motor Vehicles



Nearest Major Airports from Rawalpindi City

TRANSPORTATION NETWORK MAP



Legend

- Railway Tracks
- Major Roads
- Motorways
- National Highway
- Strategic Road
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

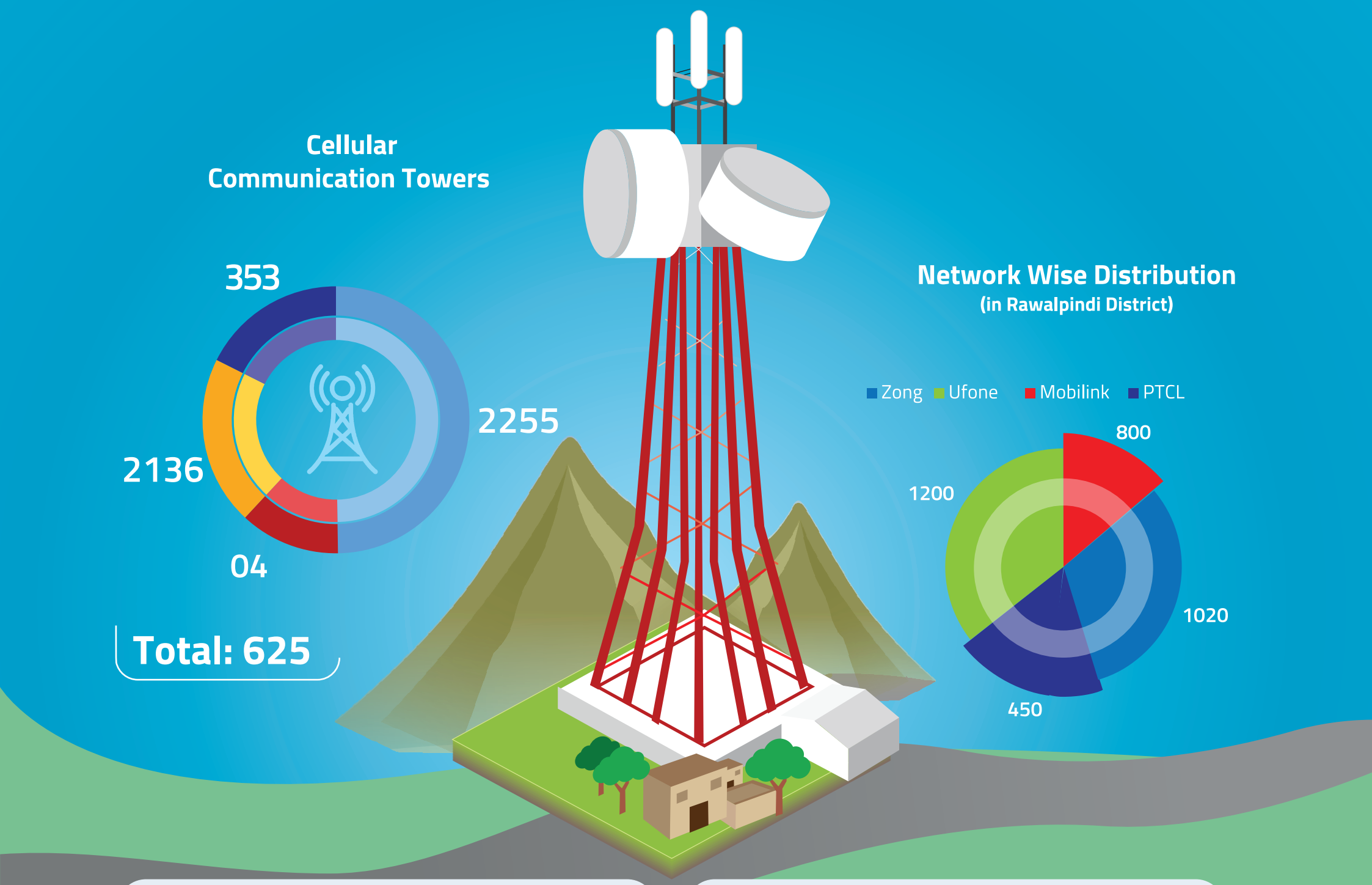
- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

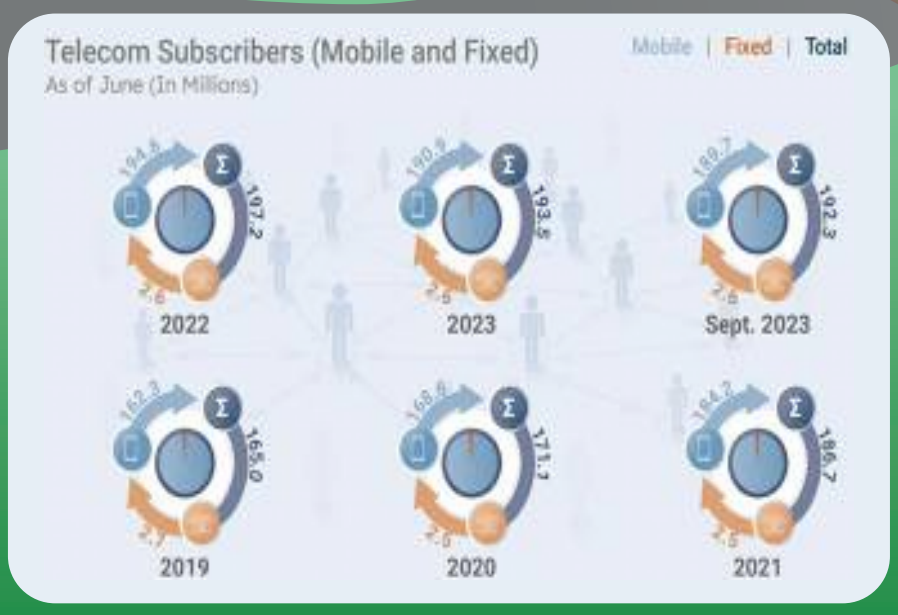
Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

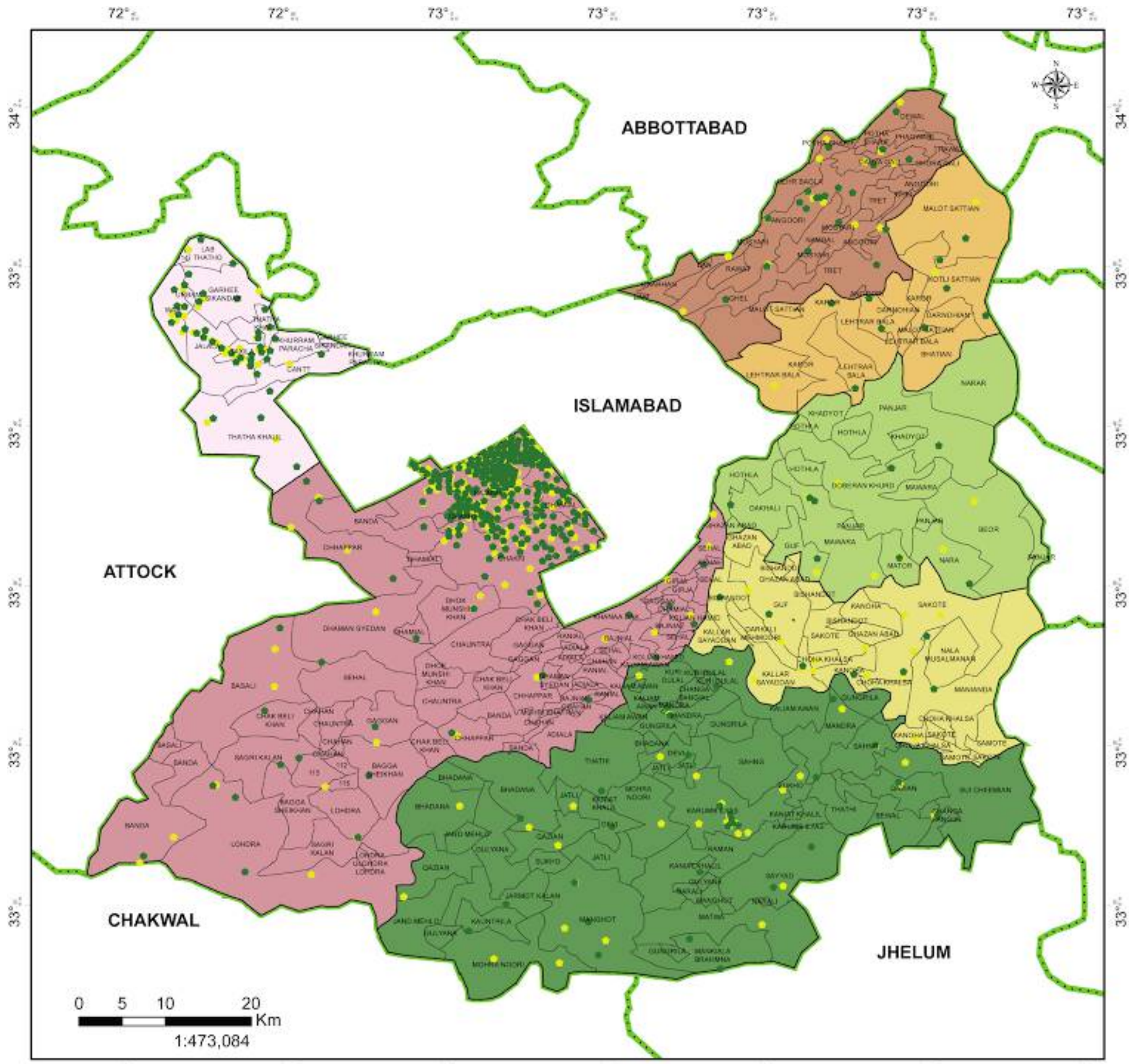
11 TELECOMMUNICATION

Rawalpindi District has witnessed remarkable growth in telecommunication services over the past two decades, shifting from traditional landline-based communication to an extensive mobile and broadband network. The widespread adoption of digital technology has enhanced connectivity, facilitating improved communication, business opportunities, and access to online services. The district has a well-established telecommunication infrastructure, with multiple telephone exchanges providing thousands of landline connections to residential, commercial, and institutional users. However, with the increasing reliance on mobile technology, landline usage has gradually declined, while cellular networks have expanded significantly. Major telecom operators have established extensive coverage in Rawalpindi, ensuring reliable connectivity in both urban and rural areas. Ufone leads with 2,255 towers, followed by Zong with 2,136 towers and Mobilink (Jazz) with 353 towers. This widespread infrastructure supports high-speed data services, stable voice communication, and enhanced internet accessibility throughout the district. In addition to mobile networks, Pakistan Telecommunication Company Limited (PTCL) remains a key provider of landline and broadband services, operating four PTCL exchanges across Rawalpindi. PTCL offers fiber-optic broadband, DSL, and other high-speed internet solutions, contributing to the district's expanding digital connectivity. As the adoption of 4G and fiber-optic broadband grows, Rawalpindi is set for further advancements in digital infrastructure, with future developments such as 5G technology, enhanced broadband penetration, and smart city solutions on the horizon. The robust telecommunication sector in Rawalpindi plays a pivotal role in economic development, fostering business expansion, and ensuring seamless connectivity for residents, ultimately strengthening the district's socio-economic landscape.





COMMUNICATION TOWER MAP



Legend

- Ufone
- Mobilink
- Zong
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

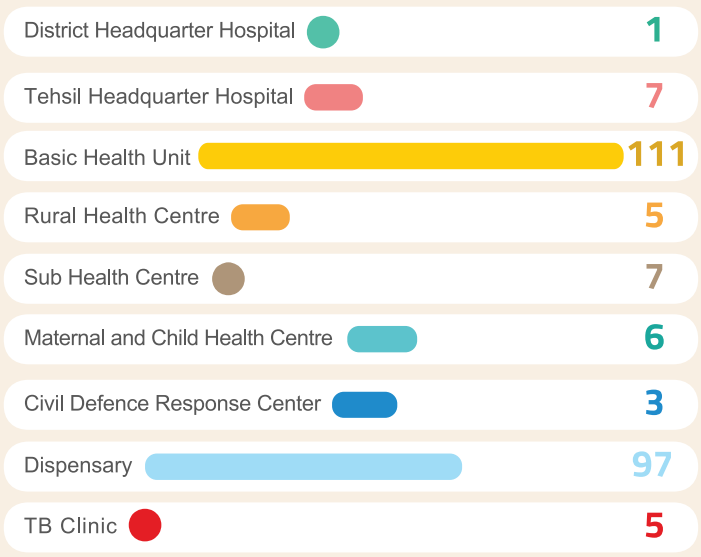
Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

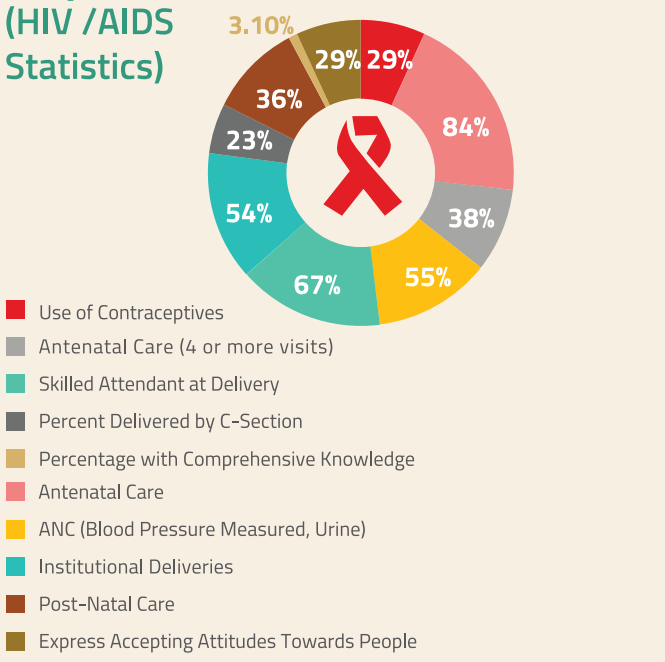
12 PUBLIC HEALTHCARE FACILITIES

The provision of easily accessible, affordable and quality Healthcare facilities is among the basic amenities of life that must be provided to the people for their wellbeing and health safety. Health facilities include hospitals, clinics, maternal & birth centers, dispensaries and other forms of health care centers.

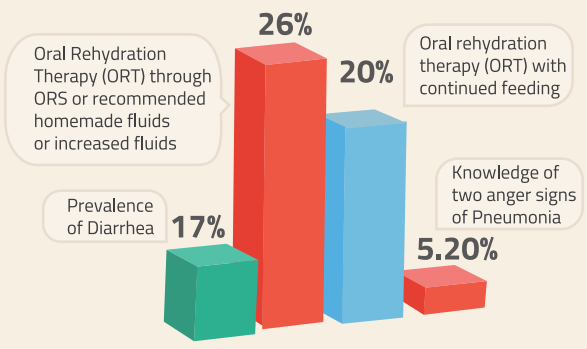
Health Facilities by Type



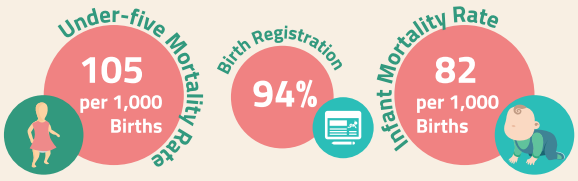
Reproductive Health (HIV /AIDS Statistics)



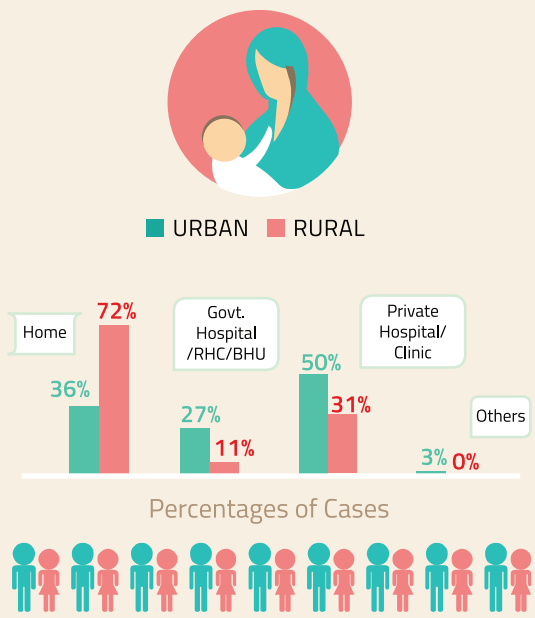
Statistics of Disease in Children



Child Mortality Statistics

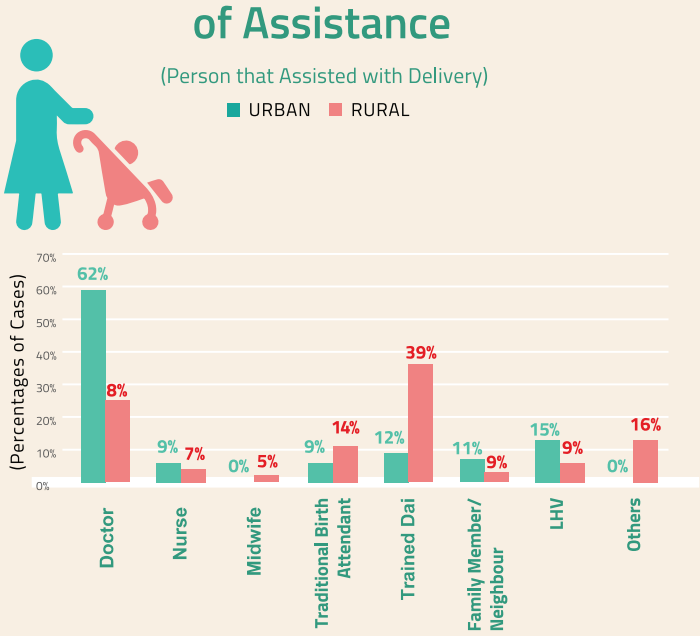


Child Delivery by Location



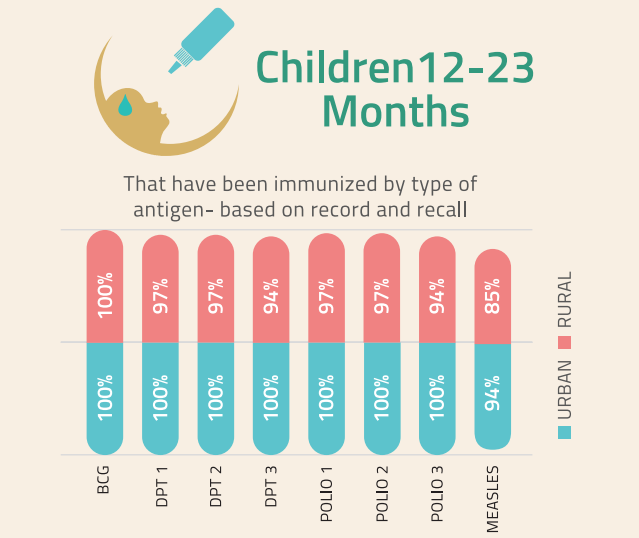
Child Delivery by Type of Assistance

(Person that Assisted with Delivery)

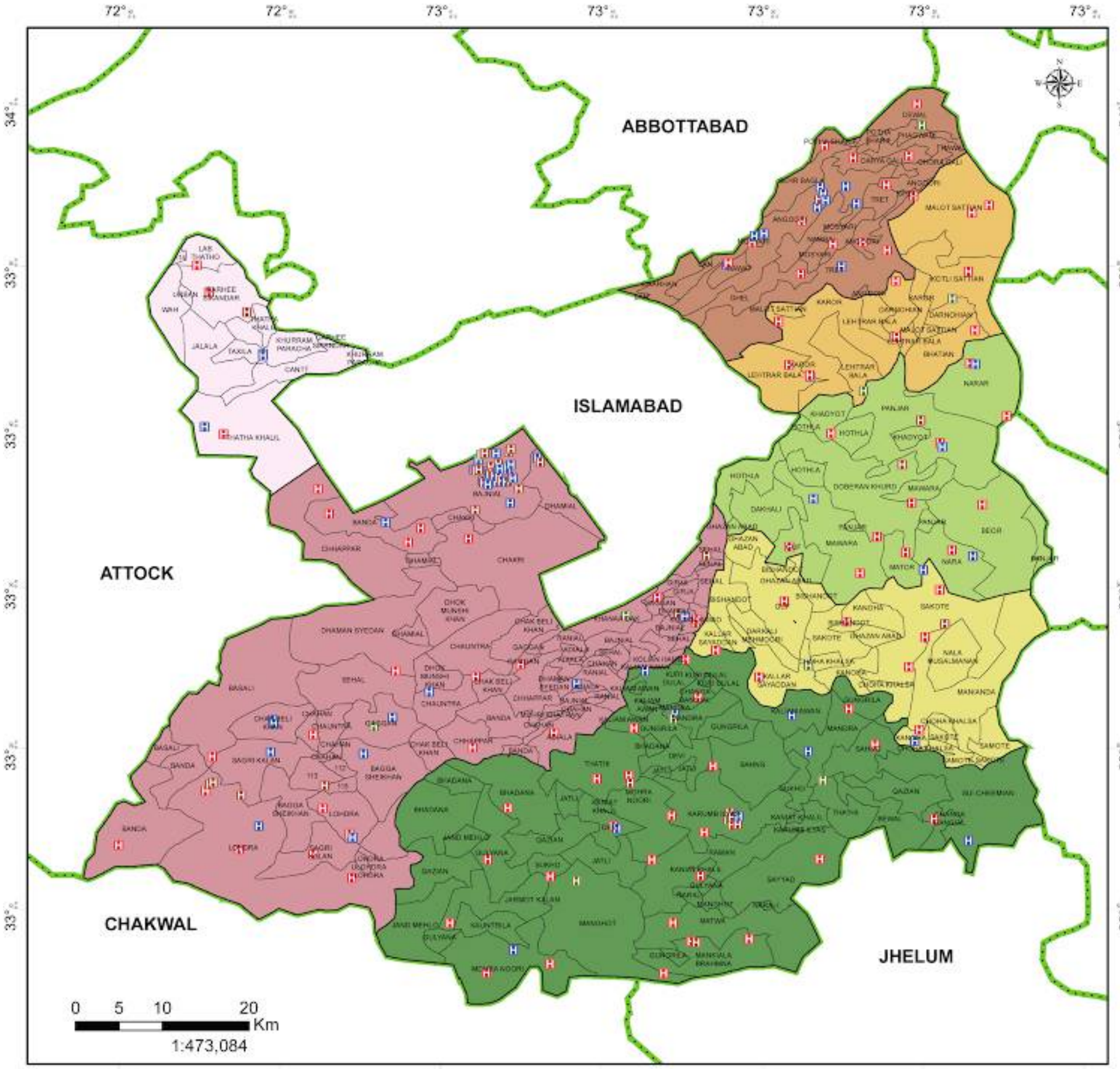


Children12-23 Months

That have been immunized by type of antigen- based on record and recall



HEALTH FACILITIES



Legend

- BASIC HEALTH UNIT
- DISPENSARY
- MATERNAL & CHILD HEALTH CENTRE
- RURAL HEALTH CENTRE
- TB CLINIC
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

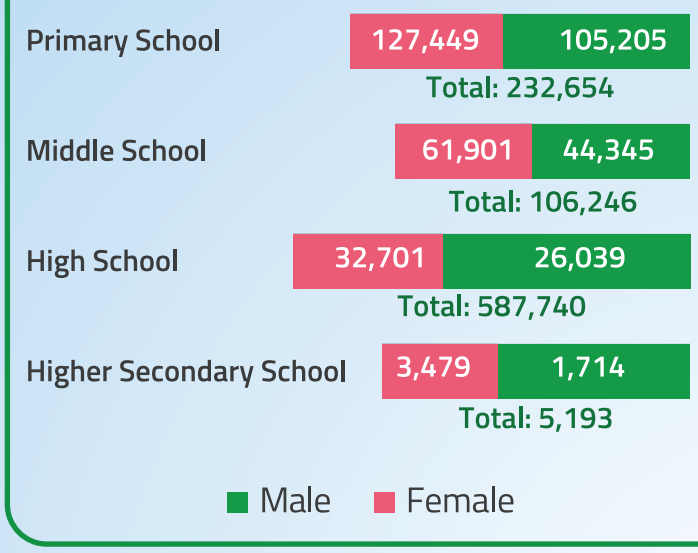
UN-HABITAT

13 PUBLIC EDUCATION FACILITIES

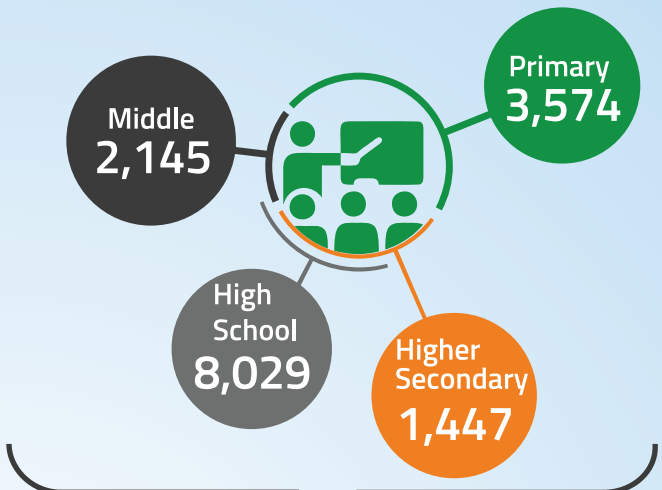
Education Facilities

Govt. Schools	Private Schools	Colleges	Universities
1804	4200	54	8

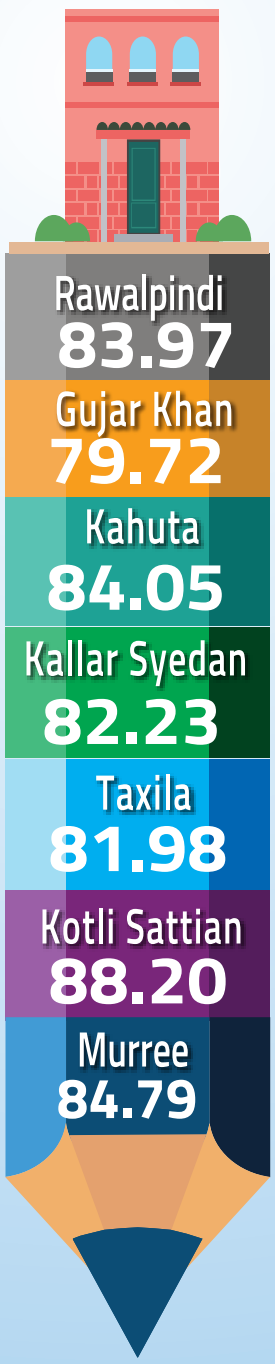
Total Enrollment by Type



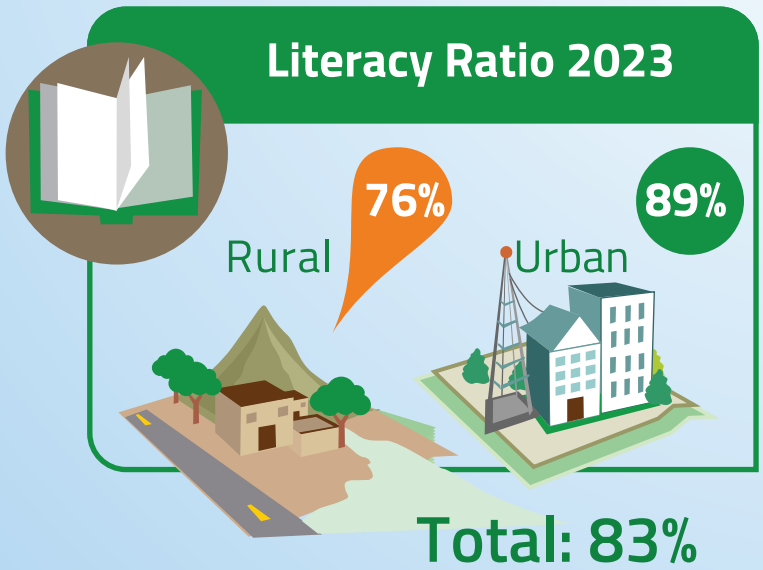
Number of Teachers



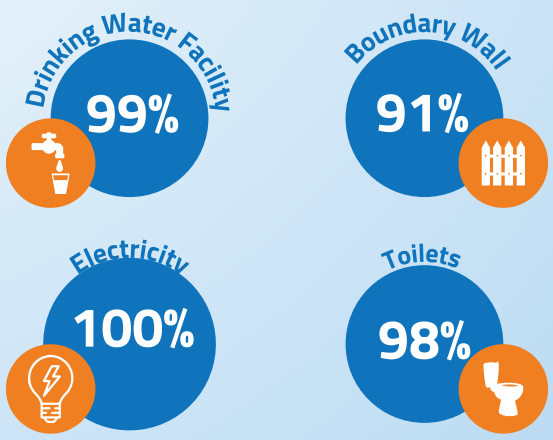
Tehsil Wise Literacy Rate



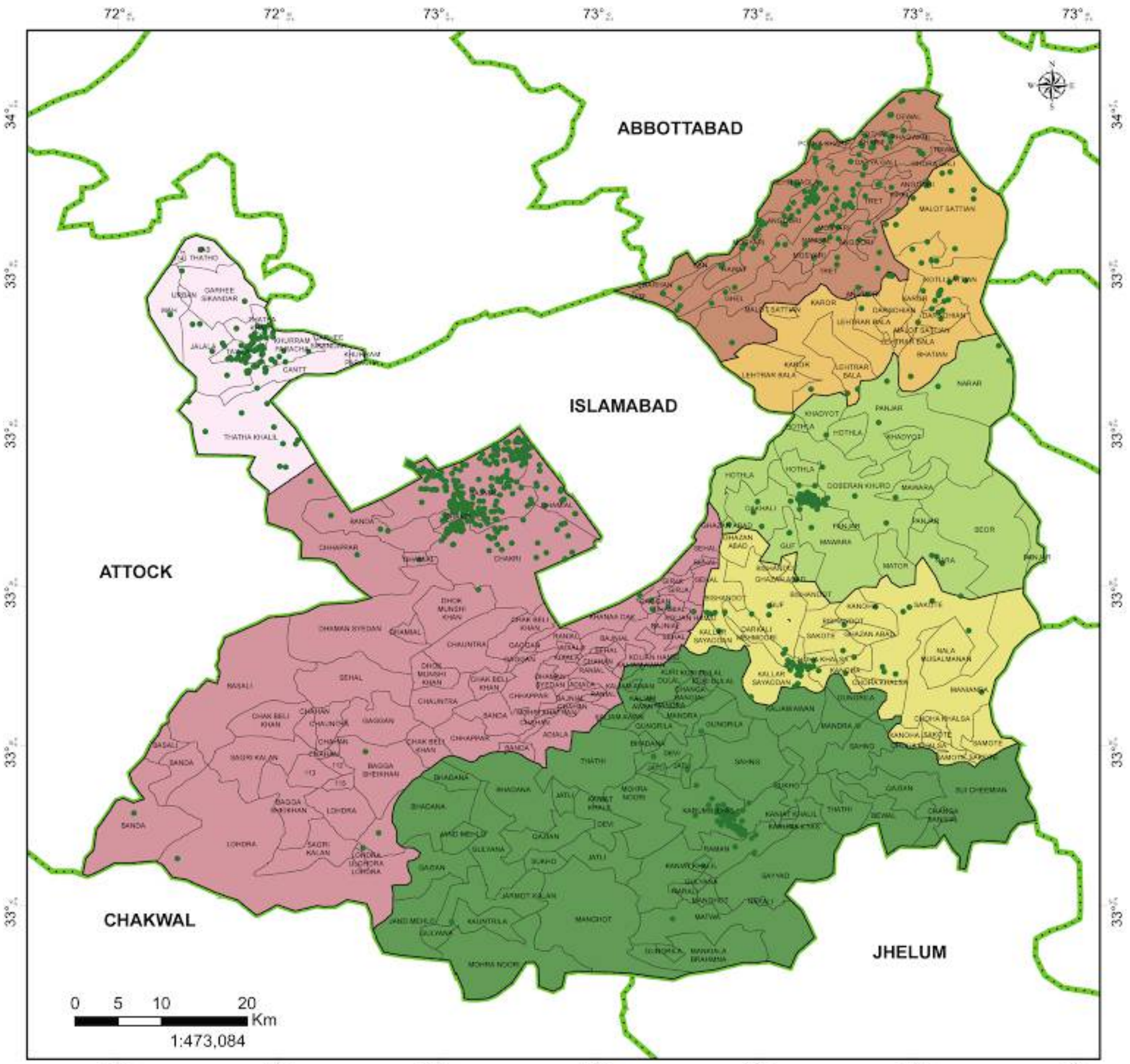
Literacy Ratio 2023



Tehsil Wise Facilities in Schools



EDUCATION FACILITIES MAP



Legend

- Education Facilities
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

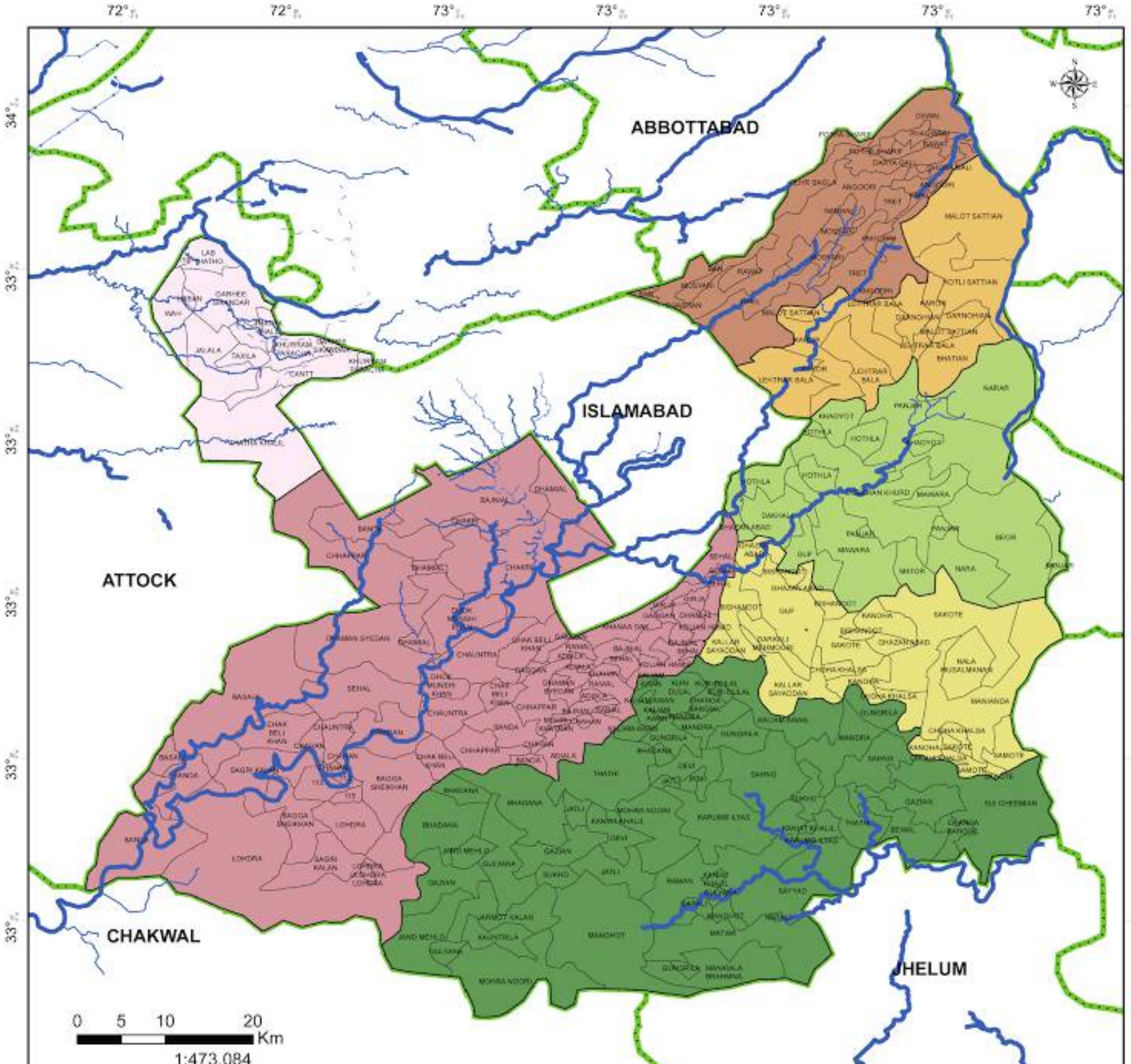
14 IRRIGATION INFRASTRUCTURE

Rawalpindi District has a well-developed irrigation system that supports its agricultural sector, primarily relying on surface water sources such as the Upper Jhelum Canal, Lower Jhelum Canal, and the Shahpur Branch Canal. The Upper Jhelum Canal, originating from the Mangla Dam, spans approximately 274 km and serves key agricultural areas in Rawalpindi and Jhelum by supplying water through various distributaries. The Lower Jhelum Canal, sourced from the Rasul Barrage on the Jhelum River, extends 273 km, providing irrigation to farmlands in Rawalpindi and neighbouring districts. The Shahpur Branch Canal, measuring 148 km, supports agricultural activities in eastern Rawalpindi, ensuring a stable water supply. Additionally, the Kasur Branch Canal and Pind Dadan Khan Canal further enhance irrigation coverage by channelling water to specific agricultural regions. These canals, along with minor distributaries, contribute to efficient water distribution, supporting the cultivation of staple crops such as wheat, maize, and vegetables. However, challenges such as seasonal water shortages, siltation, and the impacts of climate variability necessitate improved water management strategies. Ongoing efforts, including canal modernization, lining projects, and the introduction of water-efficient irrigation techniques, aim to ensure sustainable water use and long-term agricultural productivity in Rawalpindi District.

Canal System of District Rawalpindi

Canal Name	Source	Length (km)	Main Branches & Distributaries	Areas Served	Key Features & Remarks
Leh Nullah	Murree Hills	30 km	Various small tributaries	Rawalpindi City, Soan Basin	Seasonal stream, often causes urban flooding during monsoon.
Soan River Irrigation System	Soan River	50 km	Local distributaries	Rawalpindi District, Chakwal	Provides limited irrigation; mostly seasonal.
Khanpur Canal	Khanpur Dam	45 km	Minor irrigation channels	Taxila, Wah, Rawalpindi	Supplies irrigation and drinking water; supports barani farming.
Rawal Dam Feeder Canal	Rawal Dam	25 km	Small distributaries	Rawalpindi City, Islamabad	Primarily used for water supply, with some irrigation benefits.
Simly Dam Canal System	Simly Dam	20 km	Connected to local streams	Murree, Rawalpindi	Supports limited irrigation in surrounding areas.
Ling River Irrigation System	Ling River	15 km	Various minor channels	Gujar Khan, Rawalpindi	Provides supplementary irrigation in rain-fed areas.
Small Distributary System	Various Sources	40 km	Multiple small distributaries	Across Rawalpindi District	Supplies irrigation to scattered agricultural areas.
Total Length of Major & Minor Canals	Multiple Sources	225 km		Entire Rawalpindi District	Combination of natural streams, canals, and distributaries.

IRRIGATION MAP



Legend

- River
- Ditch
- Drain
- Canal
- stream
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

15 MAJOR INDUSTRIES

Rawalpindi District is a major industrial and commercial hub in Punjab, Pakistan, with a diverse industrial base contributing significantly to the regional and national economy. The district hosts various industries, including manufacturing, textiles, pharmaceuticals, food processing, steel, and automobile-related industries. The industrial zones in Rawalpindi, such as the Rawat Industrial Estate and Small Industries Estate, house numerous factories and production units that cater to both local and international markets.

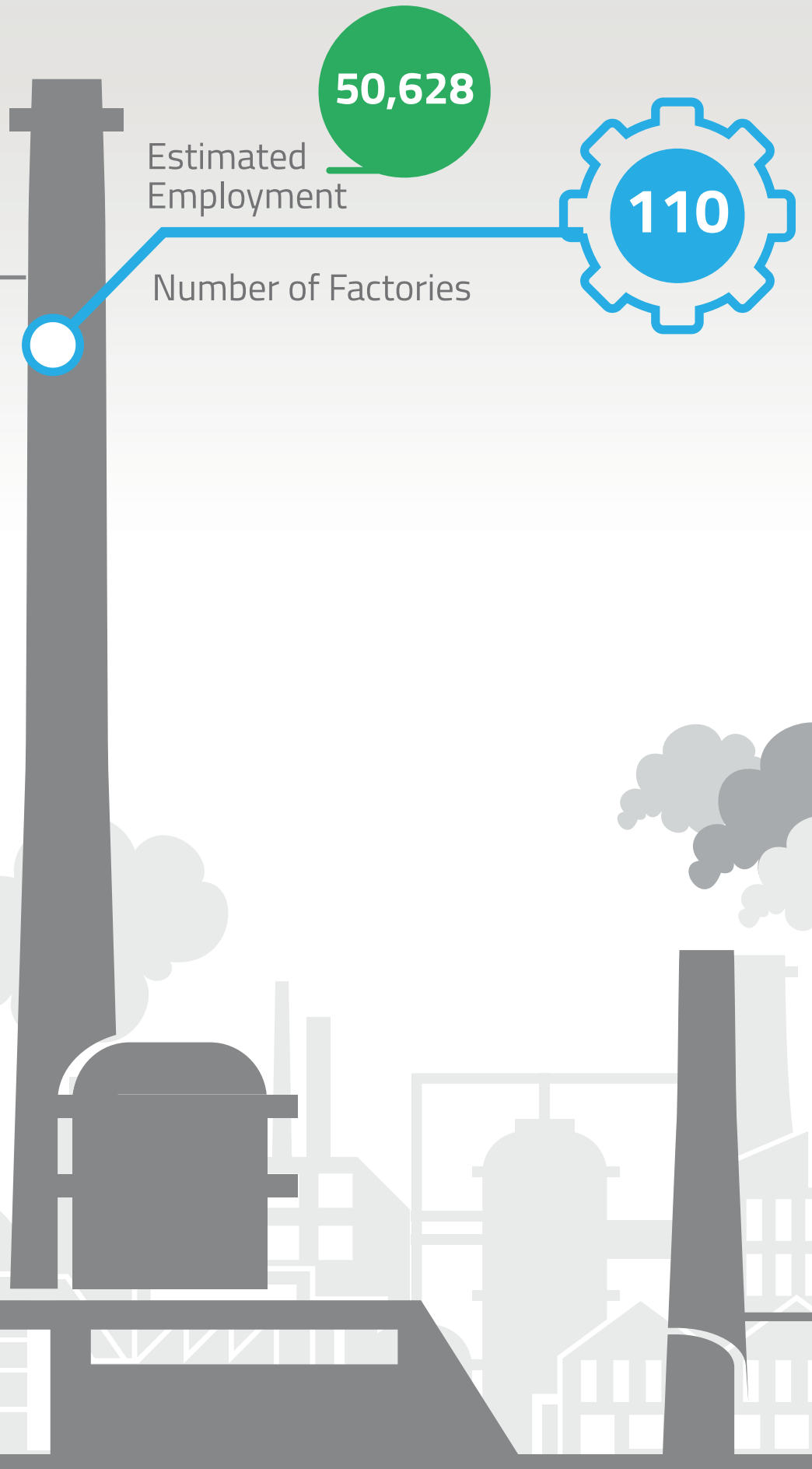
The textile sector plays a crucial role in Rawalpindi's economy, with multiple textile mills producing fabrics, garments, and hosiery products for domestic and export purposes. Similarly, the pharmaceutical industry has grown substantially, with several companies manufacturing medicines and healthcare products, supplying both national and international markets. The steel and heavy industries, particularly in areas like Rawat and Taxila, are essential for the production of machinery, construction materials, and industrial equipment.

Rawalpindi is also home to a strong food processing sector, including flour mills, dairy processing plants, and beverage companies. Additionally, the automobile industry has a presence in the district, with assembly plants and auto parts manufacturing units supporting Pakistan's growing automotive sector. The district's industrial growth is further supported by its strategic location along major highways, such as the Grand Trunk (GT) Road and the M-2 Motorway, providing efficient transportation links for raw materials and finished products.

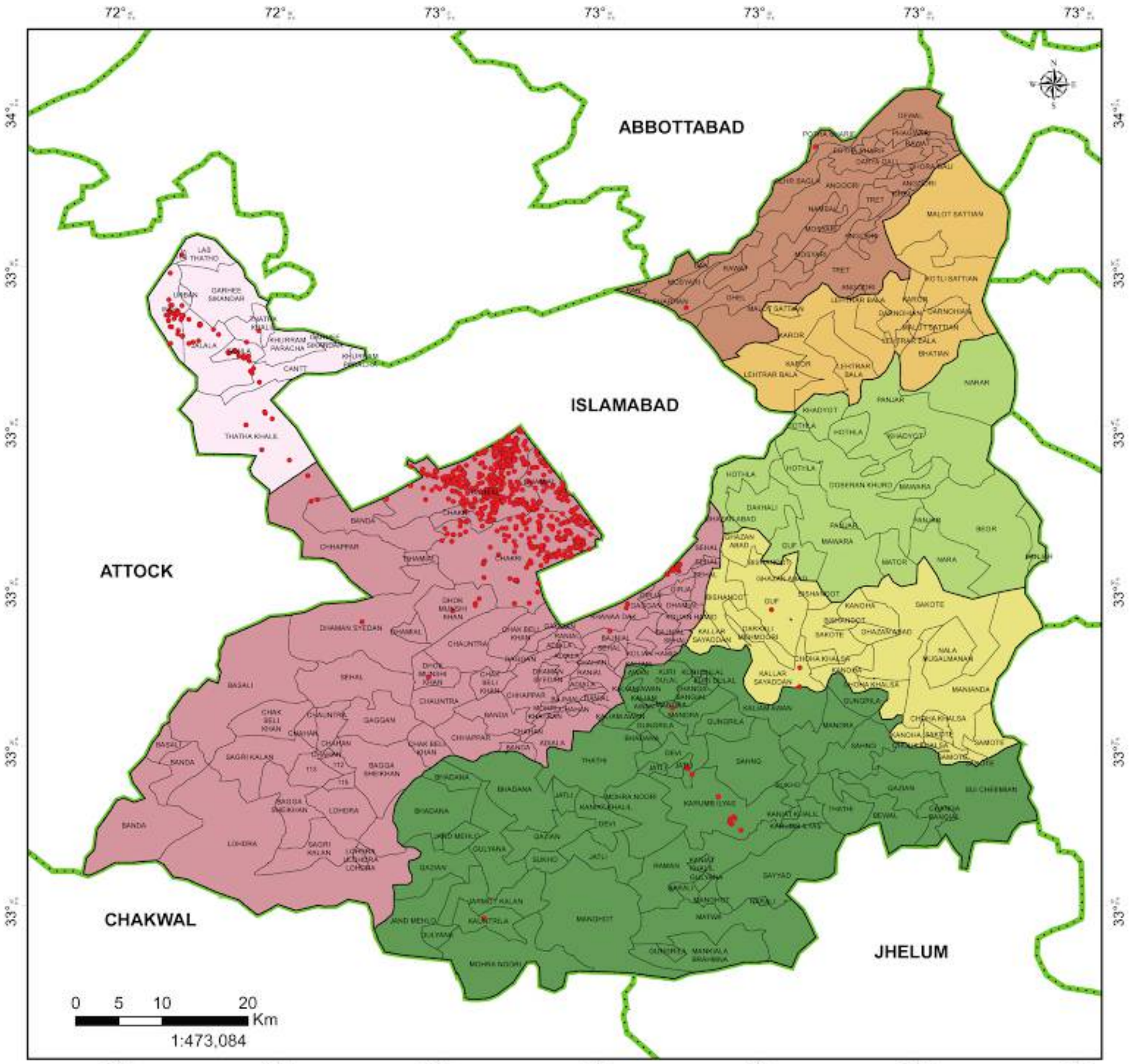
Despite its industrial progress, Rawalpindi faces challenges such as infrastructure limitations, environmental concerns, and the need for skilled labor. However, ongoing government initiatives, including industrial estate development, policy reforms, and investment incentives, aim to enhance industrial productivity and sustainability. The expansion of industrial zones and the promotion of small and medium enterprises (SMEs) further strengthen the district's economic landscape. With its growing industrial base and strategic connectivity, Rawalpindi continues to play a vital role in Pakistan's industrial and economic development.

Number of Registered Factories & Employment Level

Industry
Textile Industry
Leather and Footwear Industry
Pharmaceutical Industry
Automobile and Spare Parts Manufacturing
Food Processing and Beverages
Ceramics and Glassware Industry
Construction Material
Defense and Aerospace Industry
Printing and Publishing Industry
Handicrafts and Cottage Industry



INDUSTRIES MAP



Legend

- Industries
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

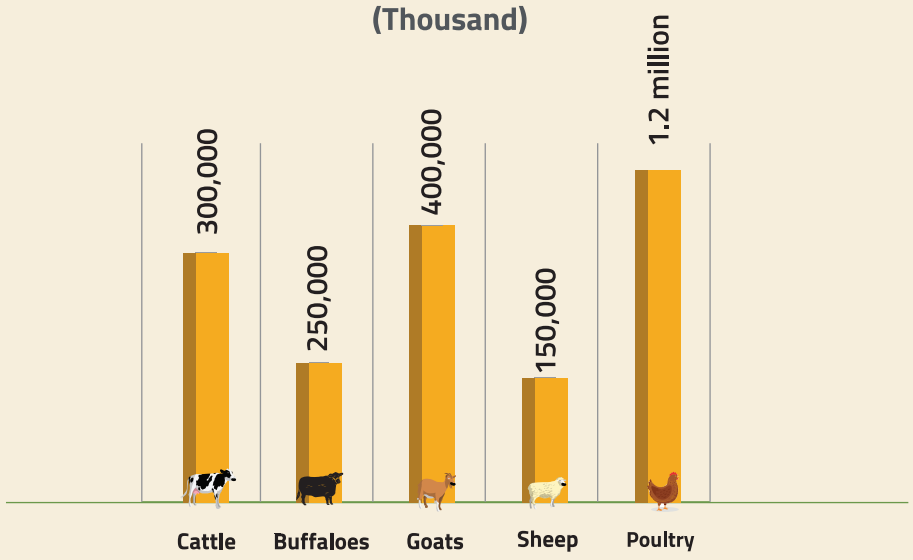
- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

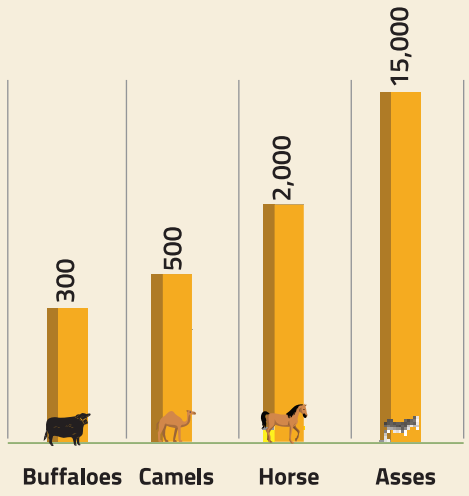
UN-HABITAT

16 LIVESTOCK

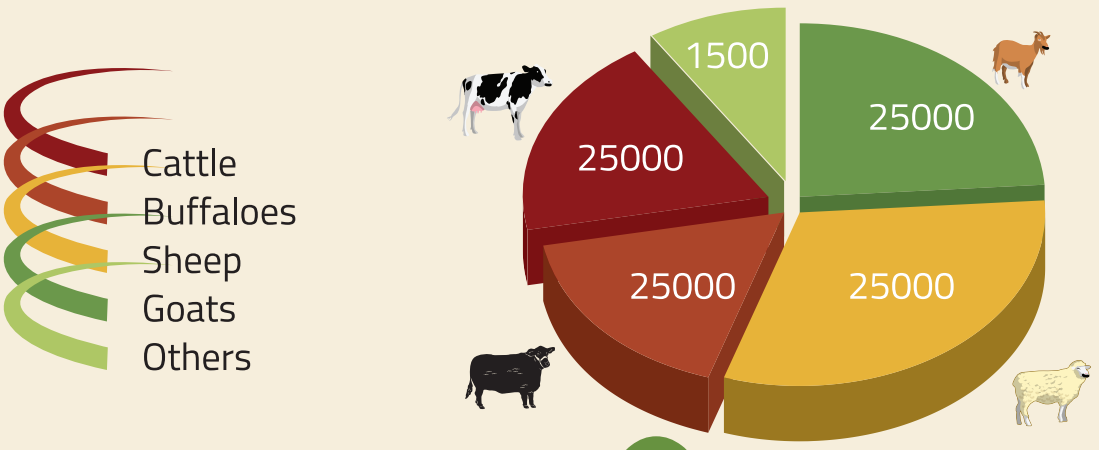
Number of Domestic Livestock
(Thousand)



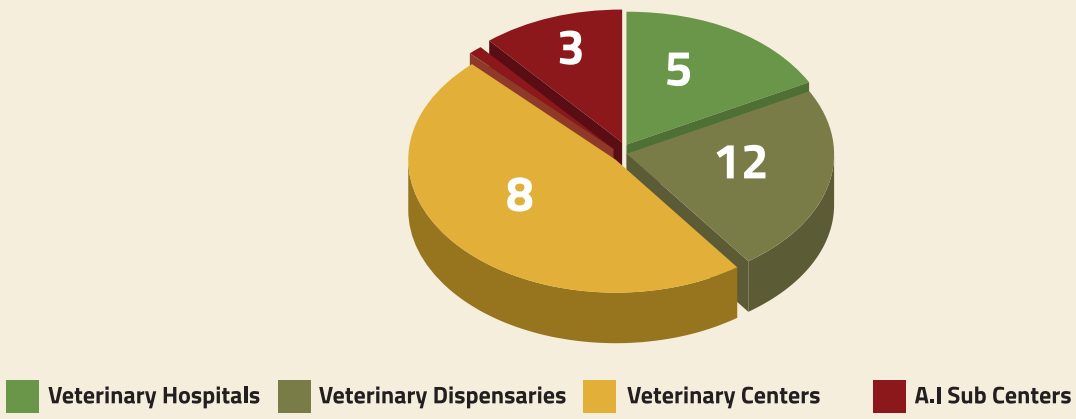
Number of Work Animals by Type (2006)
(Number)



Animals Slaughtered in Recognized & Unrecognized Slaughterhouses:
(In Hundred)



Veterinary Healthcare Facilities (2013-14)



Established Private Poultry Farms (2013-14)

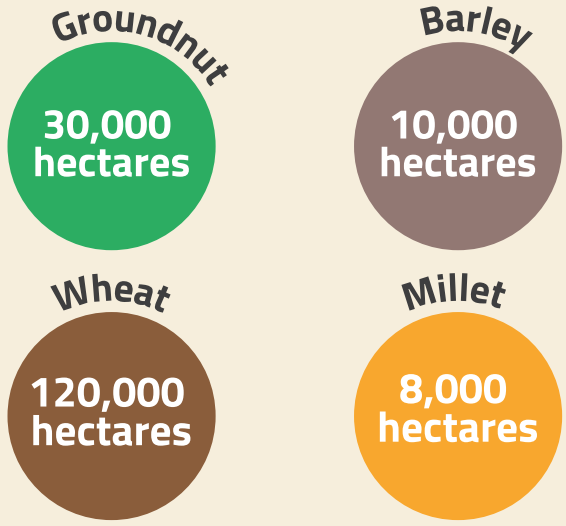
	Broiler Farms	Layer Farms	Breeding Farms
Number	150	50	10
Capacity to Rear Birds per Annum (Thousand)	1.5 million	500,000	100,000

17 AGRICULTURE

Rawalpindi District, located in the Punjab province of Pakistan, has a diverse agricultural landscape that significantly contributes to the local economy. The district features a mix of rainfed (barani) and irrigated farming systems, benefiting from seasonal rainfall, small dams, and tube wells. The climate is semi-arid to subtropical, supporting a variety of crops, fruits, and livestock farming. The Soan River and its tributaries, along with water reservoirs such as Rawal Dam and Simly Dam, serve as key water sources for irrigation, while groundwater extraction through tube wells supplements irrigation needs in drier areas.

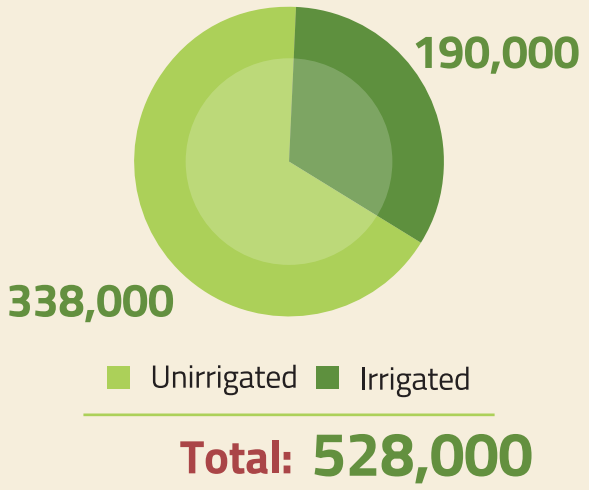
The district follows a two-season cropping pattern, with major crops cultivated in both Rabi (winter) and Kharif (summer) seasons. In the Rabi season, wheat, barley, mustard, gram, and seasonal vegetables are widely grown. The Kharif season supports the cultivation of maize, millet, sorghum, pulses, and fodder crops. Given its proximity to urban markets, Rawalpindi has a thriving horticulture sector, producing fruits such as citrus (oranges, kinnow), guava, pomegranate, loquat, and peaches. Vegetables like potatoes, onions, tomatoes, carrots, and spinach are grown extensively, supporting both local consumption and commercial trade.

Major Crop Production

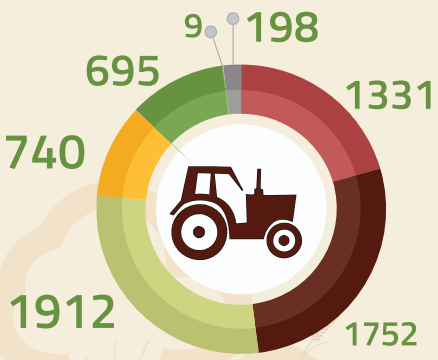


Total Area Sown

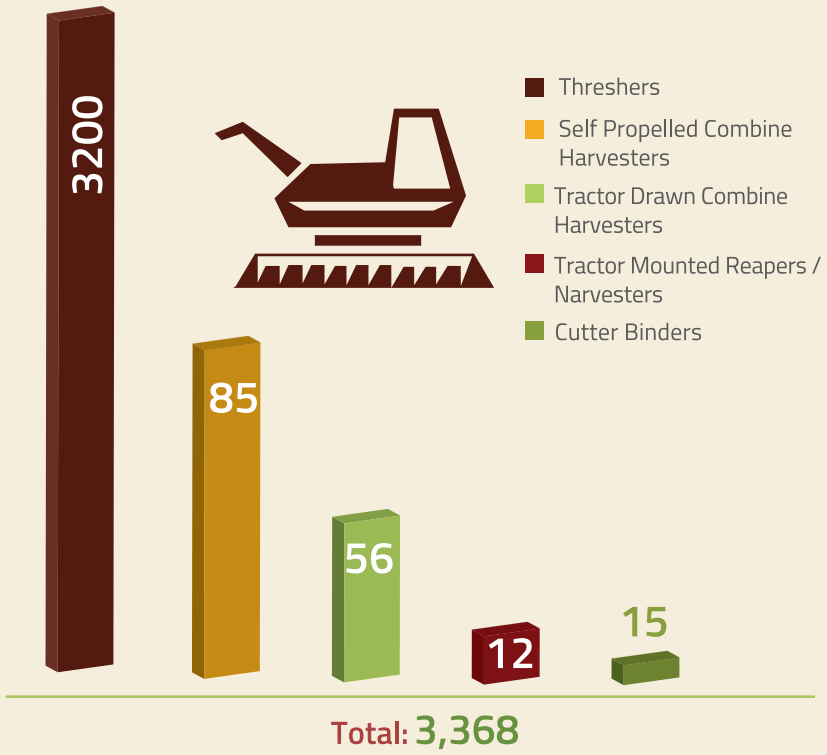
(Thousand Hectares)



Tractors by Make



Threshers & Harvesters



Emergency Calls

Road Accidents	16,3220	Drowning	416	Fire	16717	Blast	1	Buildings Collapse	52
Medical	25,7706	Crime Incidents	14,543	Patients Rescued	50,2691	Fake Calls	158		

Total Calls Received

955,504

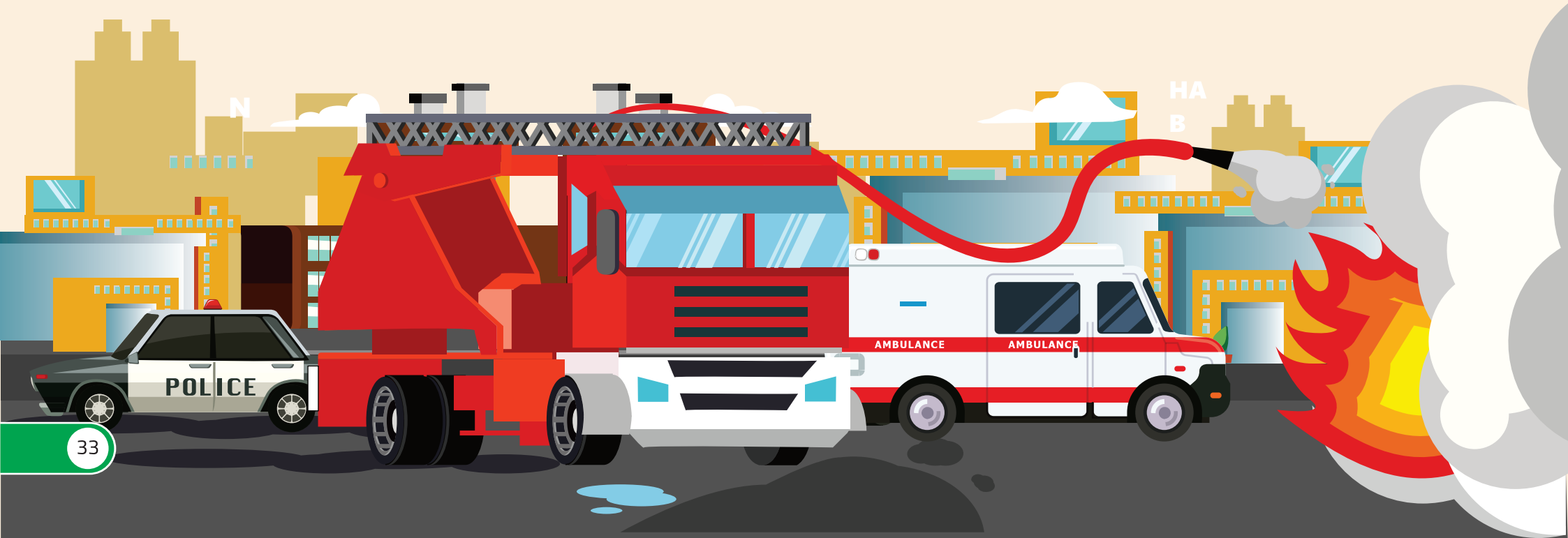
Rescue Equipment

Life Jackets	205	Fire Vehicles	19
Water R.Van	1	Emergency Responders	718
Boats	16	Volunteers	953

Address

Link Rawal Road, Near Benazir Bhutto Hospital, Murree Raod, Rawalpindi, Rawalpindi, Pakistan

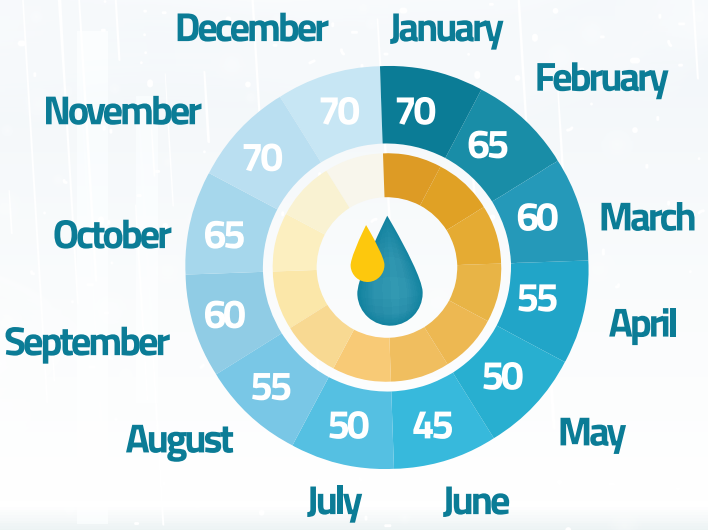
Longitude : 73.07 **Latitude :** 36.63



19 CLIMATOLOGY

Rawalpindi, located in Punjab, Pakistan, experiences a semi-arid to subtropical climate characterized by hot summers, mild winters, and moderate to high rainfall. The summer season, from May to September, sees high temperatures often exceeding 40°C, with June being the hottest month. The monsoon period, occurring from July to September, contributes a significant portion of the annual precipitation, sometimes leading to urban flooding due to poor drainage and the presence of Nullah Lai. Winters, spanning from December to February, are relatively cool, with temperatures occasionally dropping below 5°C. Spring and autumn are short transitional seasons with moderate temperatures. The region is also prone to climate-related hazards such as heatwaves, heavy rainfall events, and occasional windstorms.

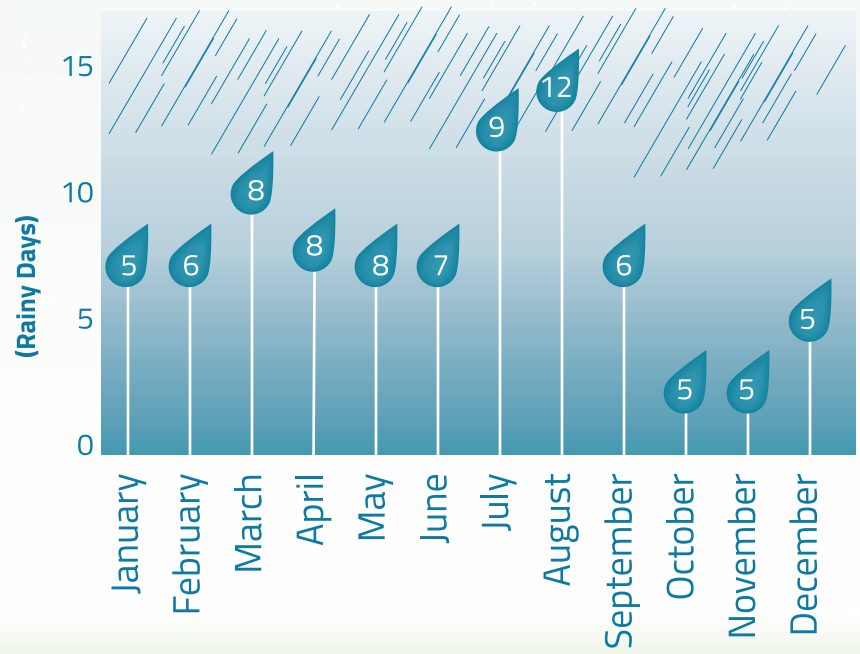
Relative Humidity (%)



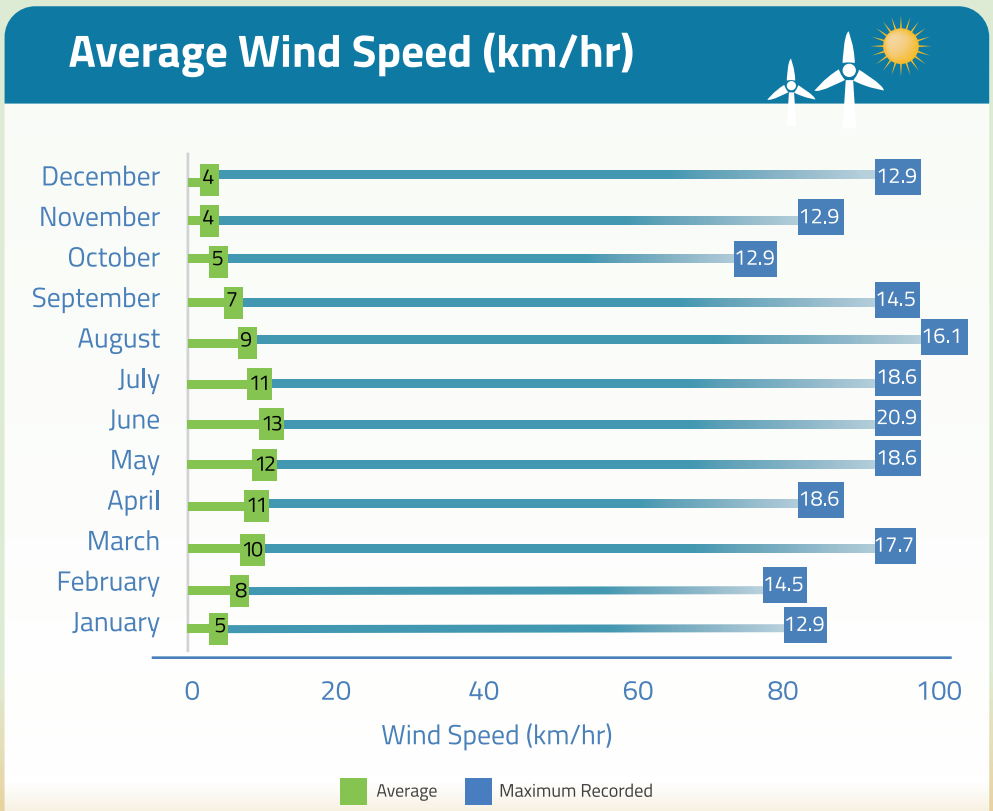
Average Precipitation (mm)

January	67.1	February	84.1	March	92.4
April	63.2	May	34.1	June	75.3
July	305.3	August	340.3	September	110.7
October	31.7	November	14.4	December	36.2

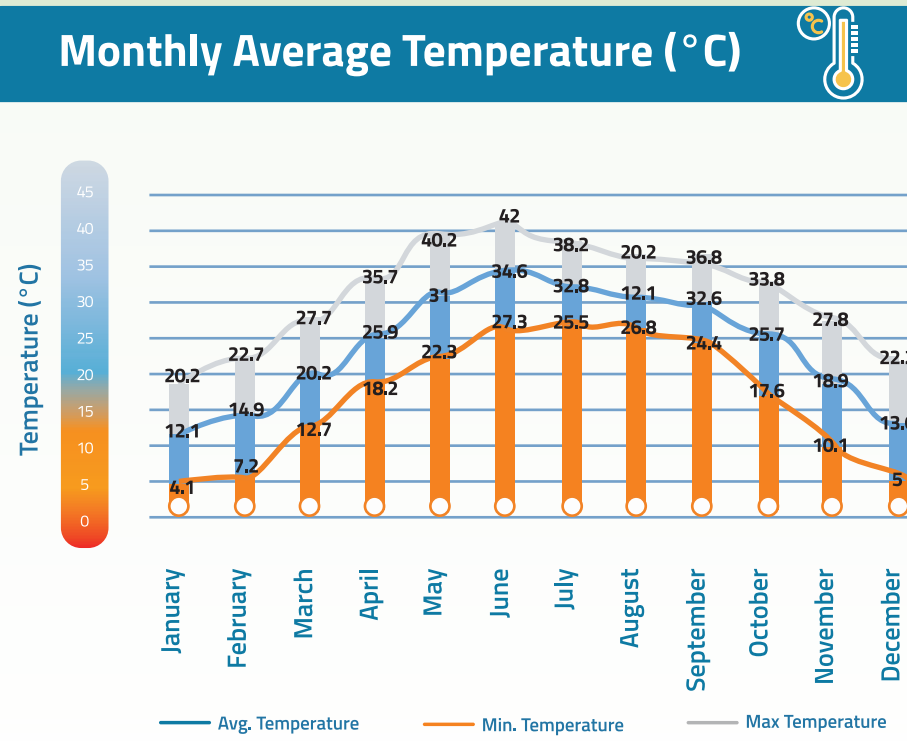
Average Rain Day (per month)



Average Wind Speed (km/hr)



Monthly Average Temperature (°C)



B | HAZARD ASSESSMENT

- DROUGHT
- EARTHQUAKE
- FLOOD

2 DROUGHT HAZARD ASSESSMENT

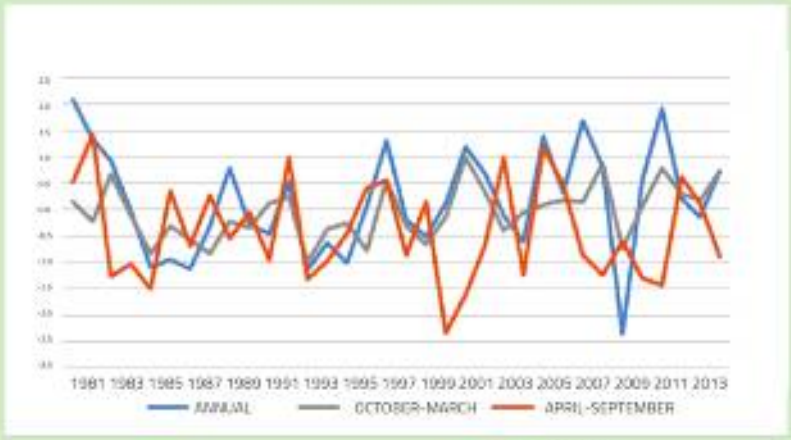
A large part of Pakistan faces severe effects of drought for most part of the year. Long-drawn-out precence of drought is signiciant challenge to agriculture, human lives, livestock, forests, water resource management, urban planing and food security. Due to changing climatic patterns, the drought phenomenon is likery to increase in terms of recurrence, extent, and intensity. In this study follwing indices are used for assessment for drought hazard

a. Standard Precipitation Index (SPI)
b. Normalized Difference Vegetation Index(NDVI)
c. Temperature condition index (TCI)
d. Vegetation Condition Index (VCI)
e. Vegetation Health Index (VHI)

Drought return period

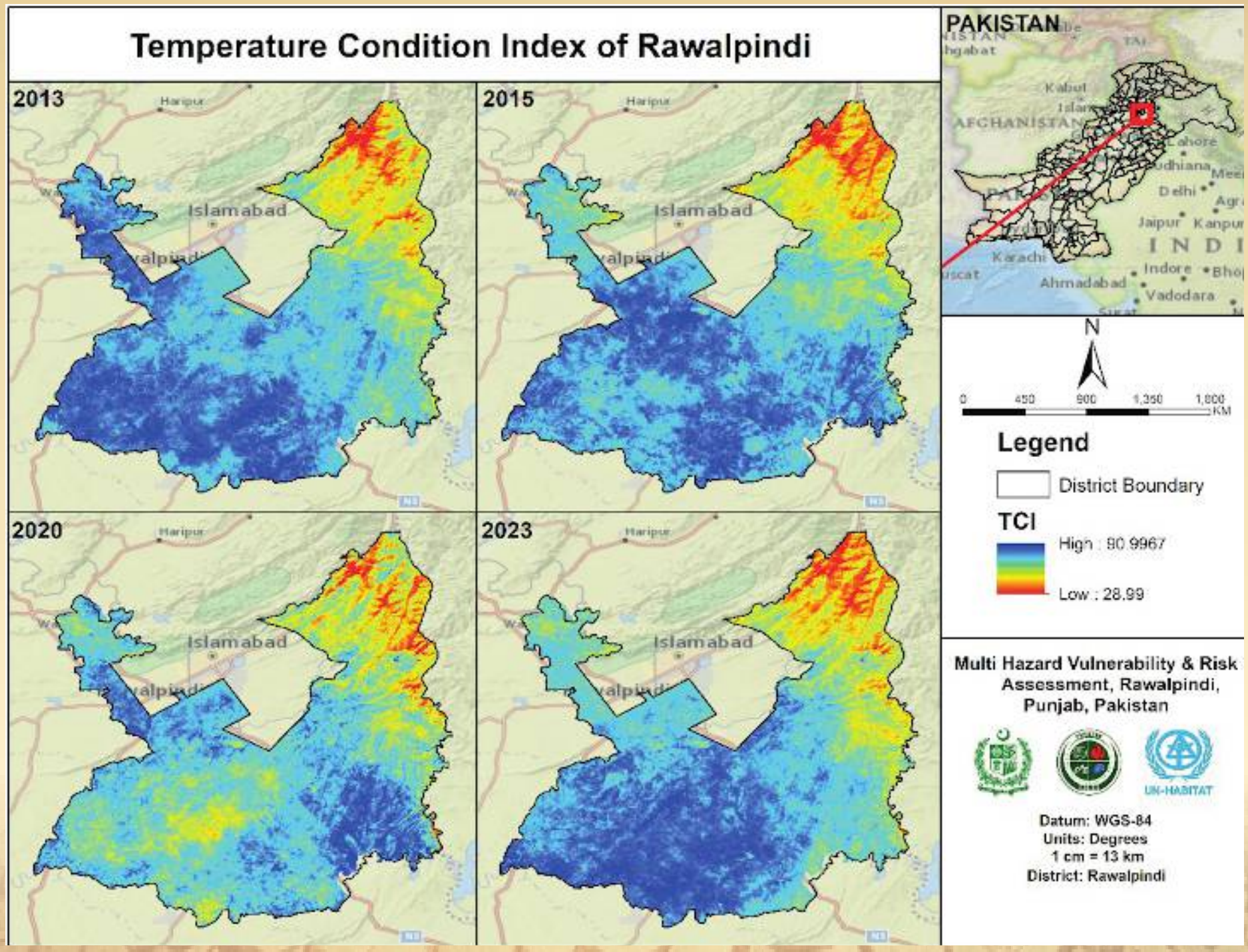
A return period is the recurrence interval of a drought. Its is a statistical measurement, particulary based on previous data. Strategic planning and management of water resources under climate change and drought conditions ofetn require the assessment of return periods of drought events catergorized by high severities.

Standard Precipitation Index (SPI) 1981-2024

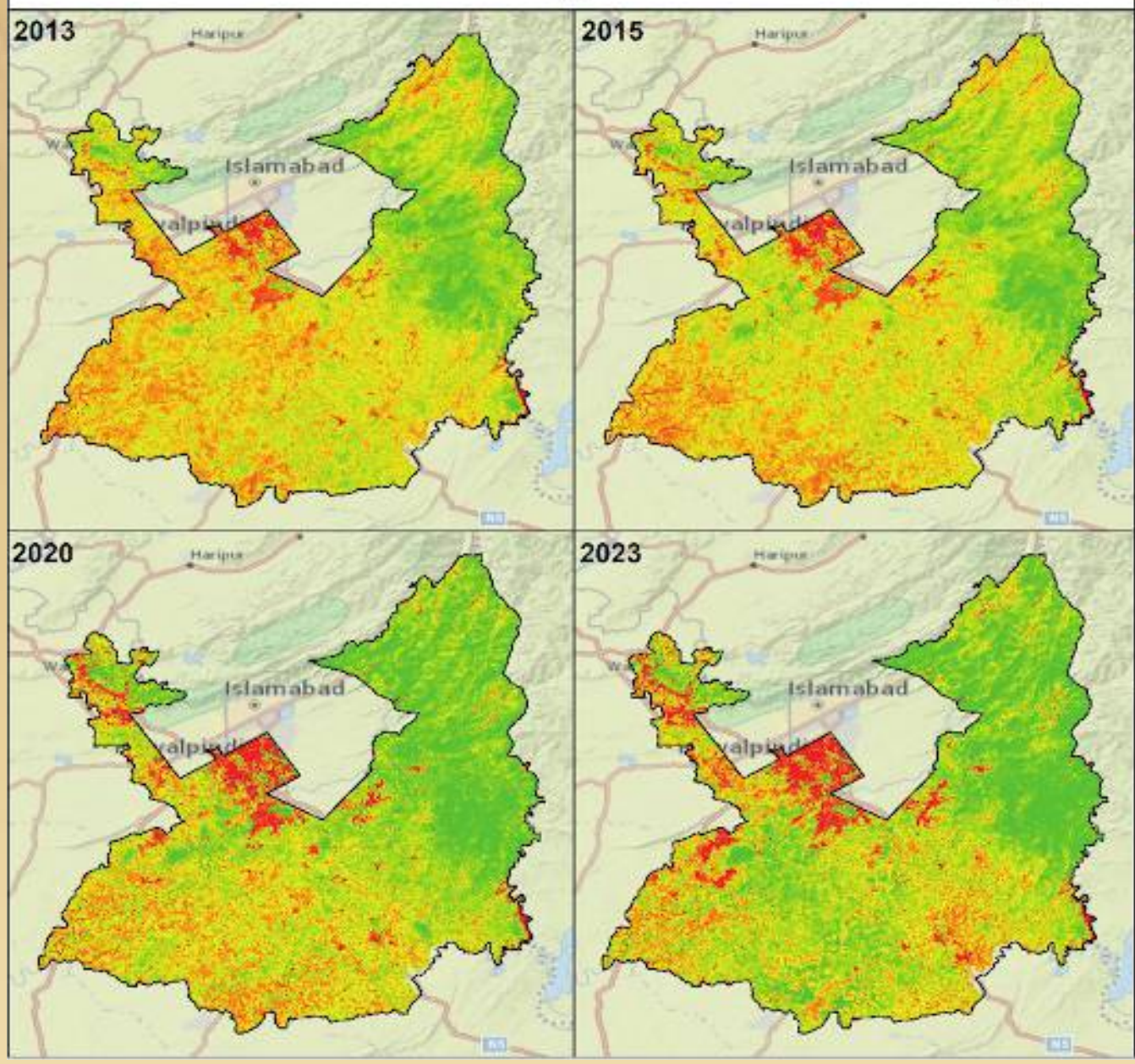


SPI Value	Conditions
2.0+	Extremely Wet
1.5 to 1.99	Very Wet
1.0 to 1.49	Moderately Wet
-0.99 to 0.99	Near Normal
-1.0 to -1.49	Moderately Dry
-1.5 to -1.99	Severely Dry
-2.0 and less	Extremely Dry

Description:
SPI is a tool to determine the severity of a drought at a given time scale of interest for any rainfall station with historic data. Mathematically, SPI is based on the cumulative probability of a given rainfall event occurring at a station.



Normalized Difference Vegetation Index of Rawalpindi



N

0 450 900 1,350 1,800 KM

Legend

District Boundary

NDVI

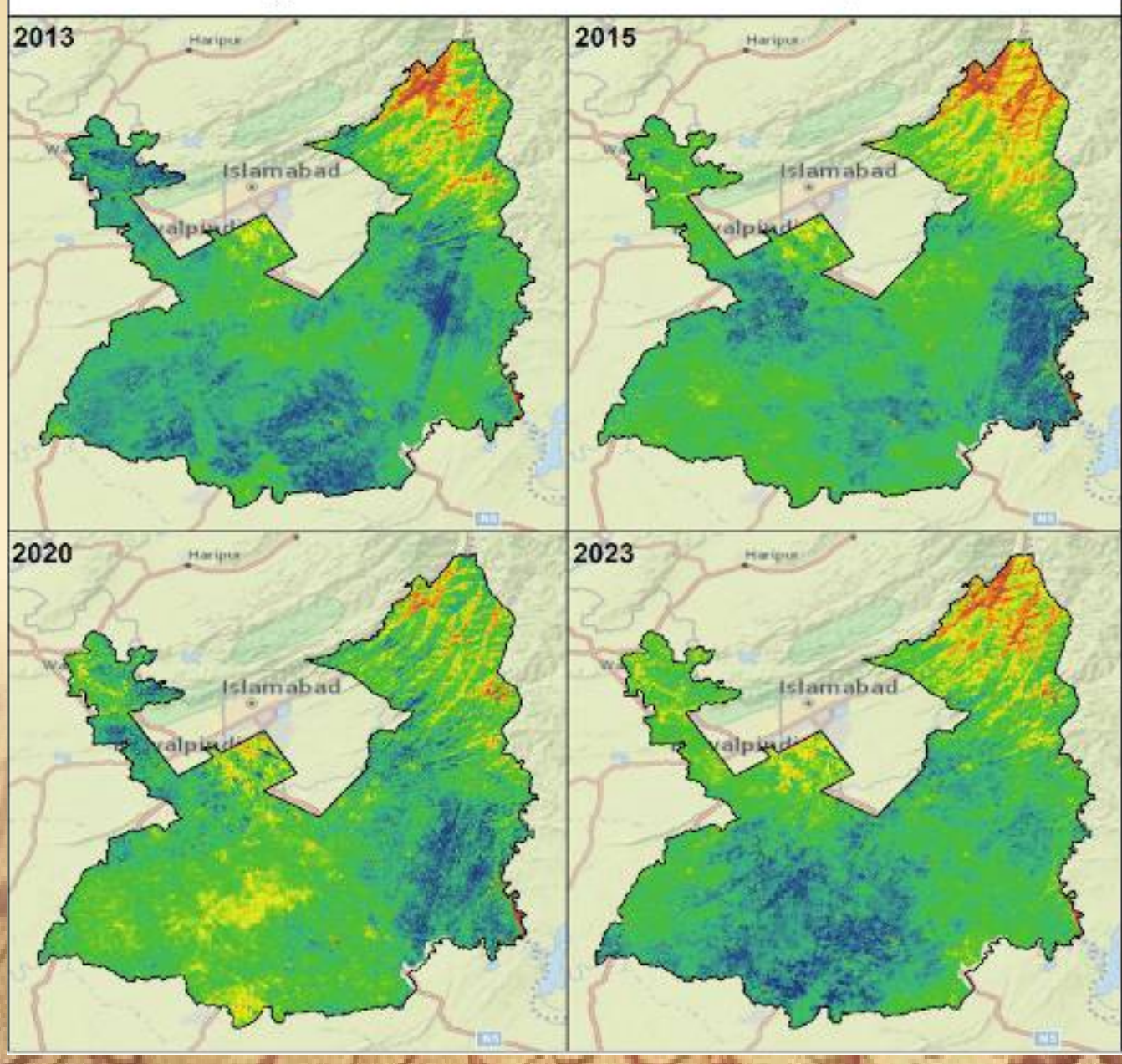
High

Low

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

Datum: WGS-84
Units: Degrees
1 cm = 13 km
District: Rawalpindi

Vegetation Health Index of Rawalpindi



N

0 450 900 1,350 1,800 KM

Legend

District Boundary

VHI

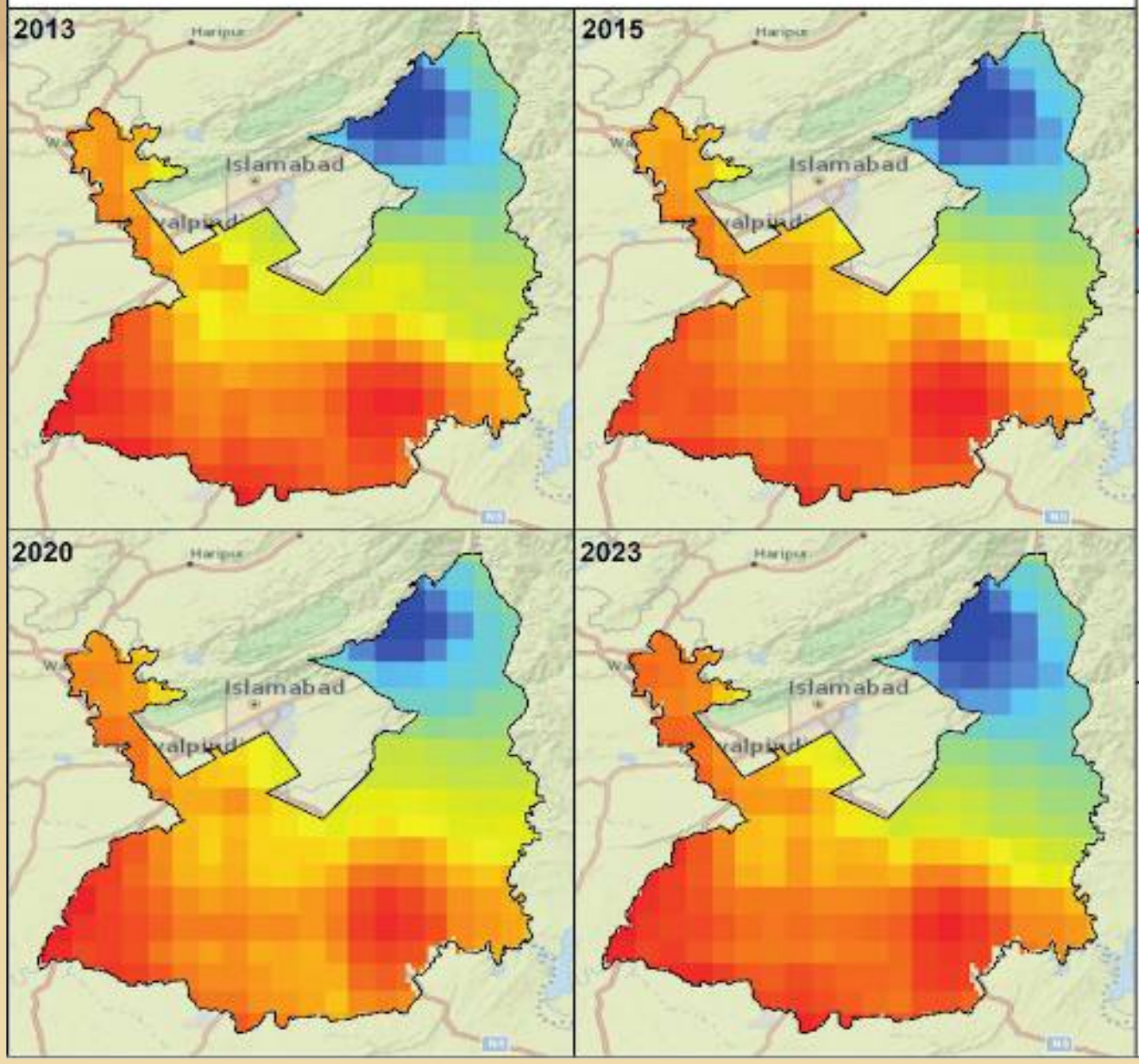
High

Low

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

Datum: WGS-84
Units: Degrees
1 cm = 13 km
District: Rawalpindi

Standardized Precipitation Index of Rawalpindi



N

0 450 900 1,350 1,800 KM

Legend

District Boundary

SPI

High

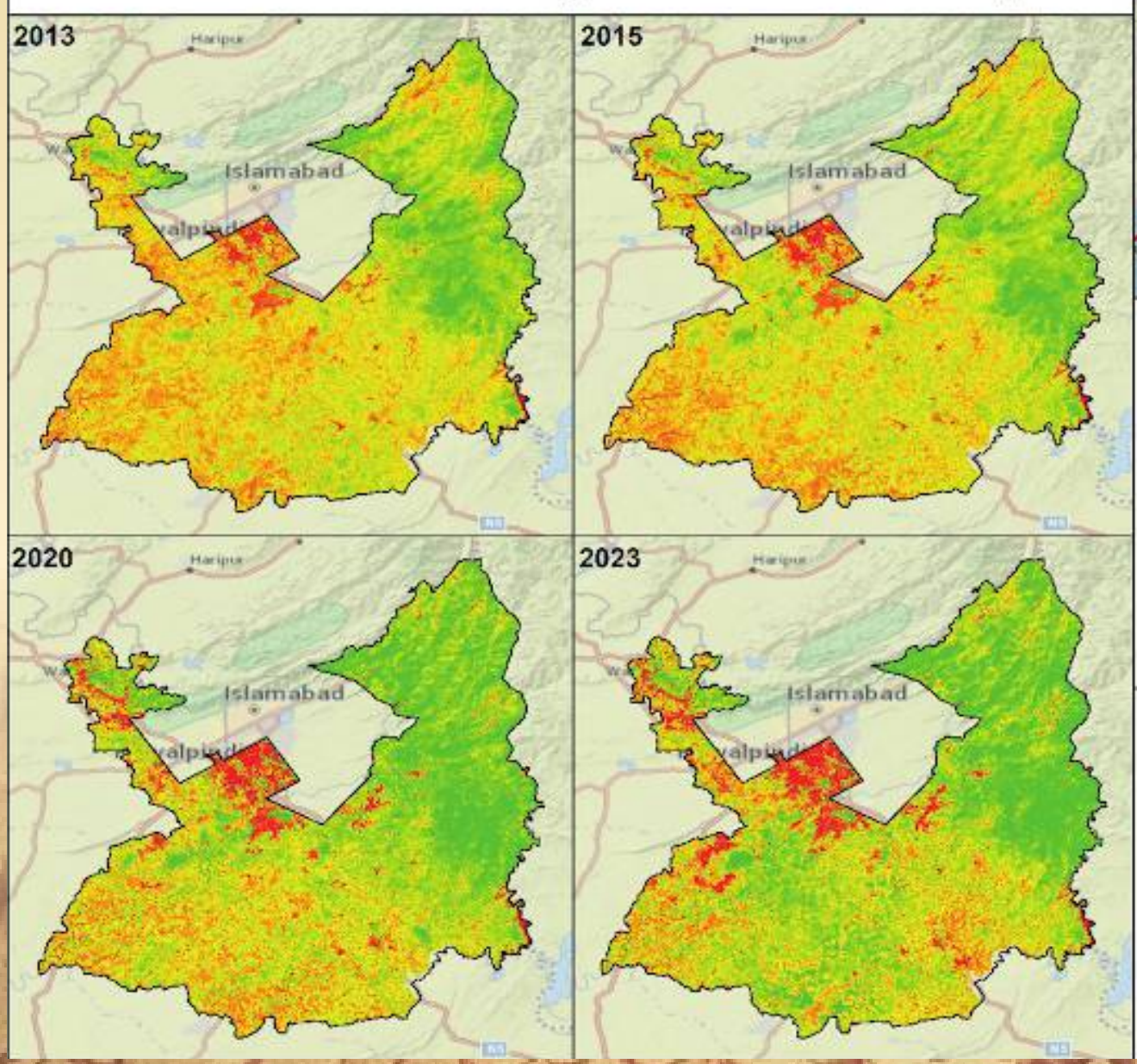
Low

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

Datum: WGS-84
Units: Degrees
1 cm = 13 km
District: Rawalpindi

Normalized Difference Vegetation Index of Rawalpindi



N

0 450 900 1,350 1,800 KM

Legend

District Boundary

NDVI

High

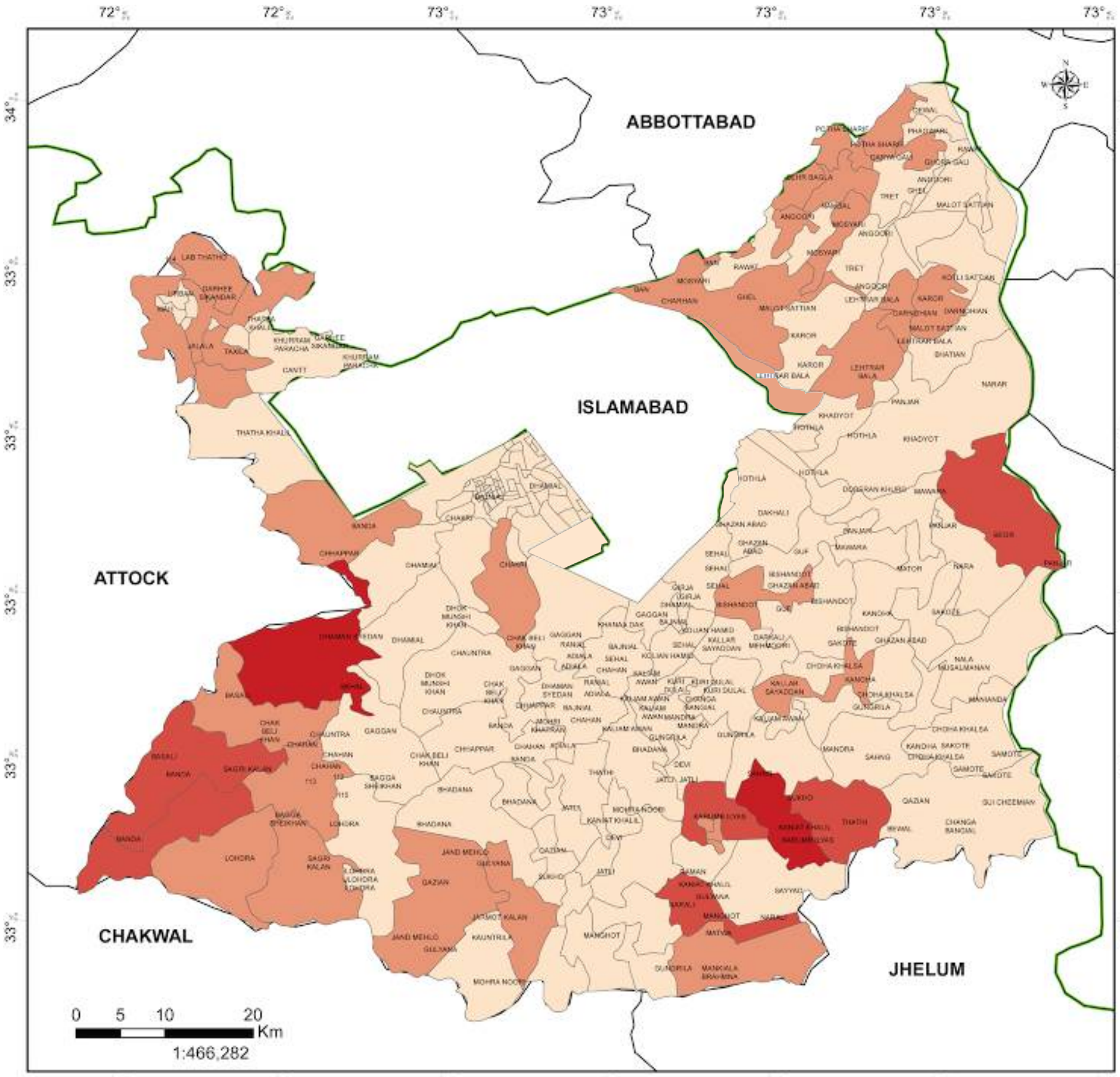
Low

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

Datum: WGS-84
Units: Degrees
1 cm = 13 km
District: Rawalpindi

DROUGHT HAZARD MAP



Legend

Drought Hazard

- No Drought
- Mild Drought
- Moderate Drought
- Severe Drought
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

21 EARTHQUAKE HAZARD ASSESSMENT

Earthquake is defined as the shaking and vibration at the surface of the earth resulting from underground movement along a fault plane due to volcanic activity, cryoseismic activity, the sudden cracking of frozen soil or rock, or the movement of plate boundaries of the Earth. Earthquake hazard at a site is characterized by either probabilistic or deterministic seismic hazard analyses. Probabilistic seismic hazard analysis involves the quantification of the rate of probability of exceeding certain motion intensities at all possible earthquake sources.

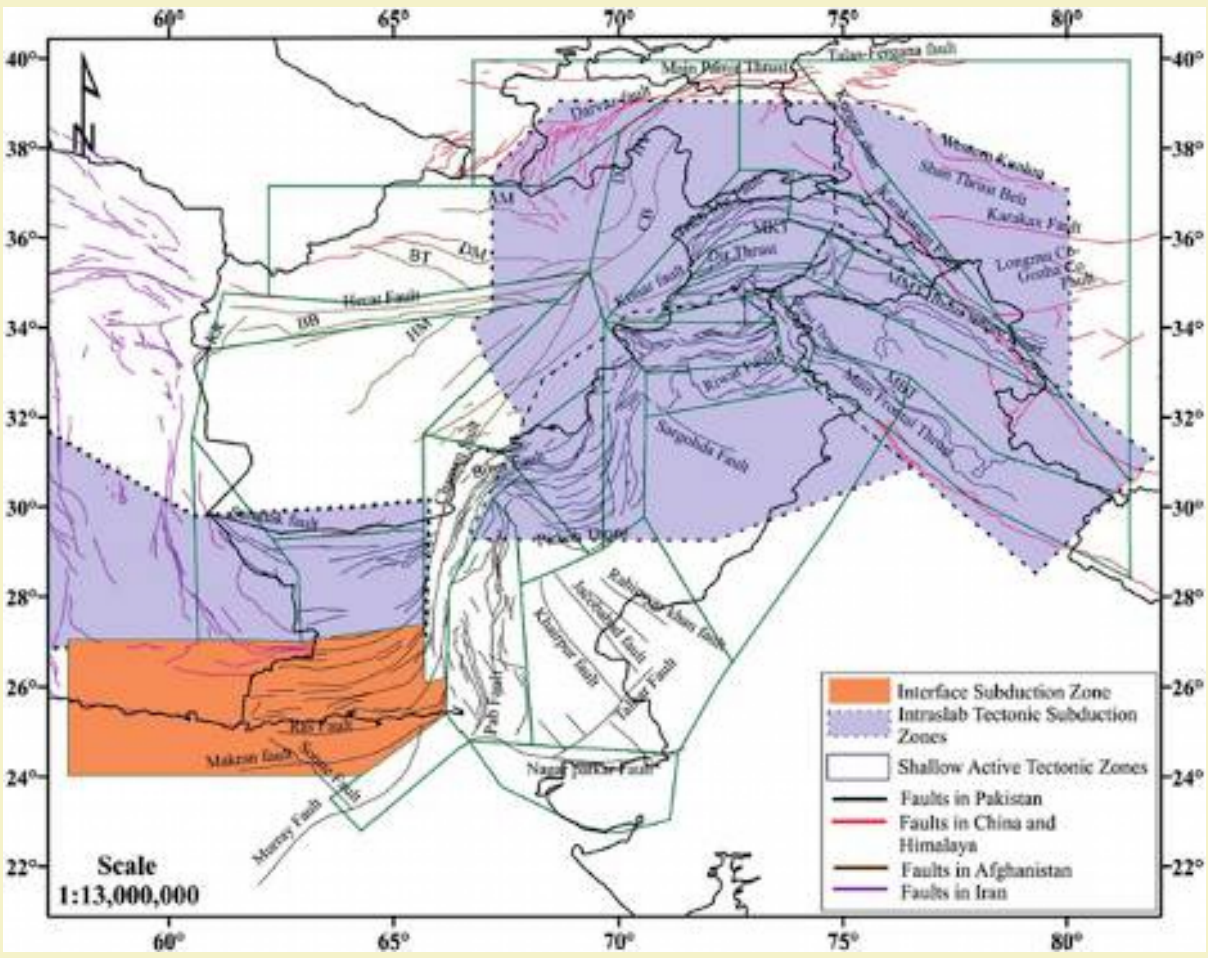
Deterministic analysis evaluates the site-specific seismic hazard, which is influenced by maximum hazard from controlling sources. The general probabilistic seismic hazard analysis procedure quantifies the annualized rate of exceedance of specified ground motion levels of various intensities, which is then transformed to obtain the probability of exceedance of ground motions within the lifetime of the structure and infrastructure of interest. District Rawalpindi is located in a seismically active region and has experienced earthquakes of varying magnitudes. The region is influenced by the active fault systems of the Himalayan tectonic belt. Historical earthquake catalogues and recent seismic studies suggest that Rawalpindi has moderate to high seismicity, with past earthquake magnitudes ranging between 4.5 and 6.5 on the Richter scale.

The main findings of the probabilistic seismic hazard assessment reveal that ground motion in District Rawalpindi exhibits spatial variability, with higher intensities near fault lines and diminishing levels in areas further from active faults. The study categorizes the seismic hazard levels into five zones based on Peak Ground Acceleration (PGA), aligned with Pakistan's Building Code guidelines. These zones range from very low to very high hazard levels, as presented in the accompanying hazard maps.

The first step for the Earthquake Hazard Assessment involved defining the area of interest by compiling earthquake catalogues from various national and international sources. The catalogues were homogenized, declustered, and checked for completeness. Ground Motion Prediction Equations (GMPEs) were selected, and the data was processed in hazard computation software (CRISIS). The probabilistic seismic hazard mapping was conducted for return periods of 50, 100, and 475 years. Sensitivity analysis was performed to refine the estimates, followed by Site-Specific Seismic Response Analysis incorporating soil conditions using the Deepsoil software.

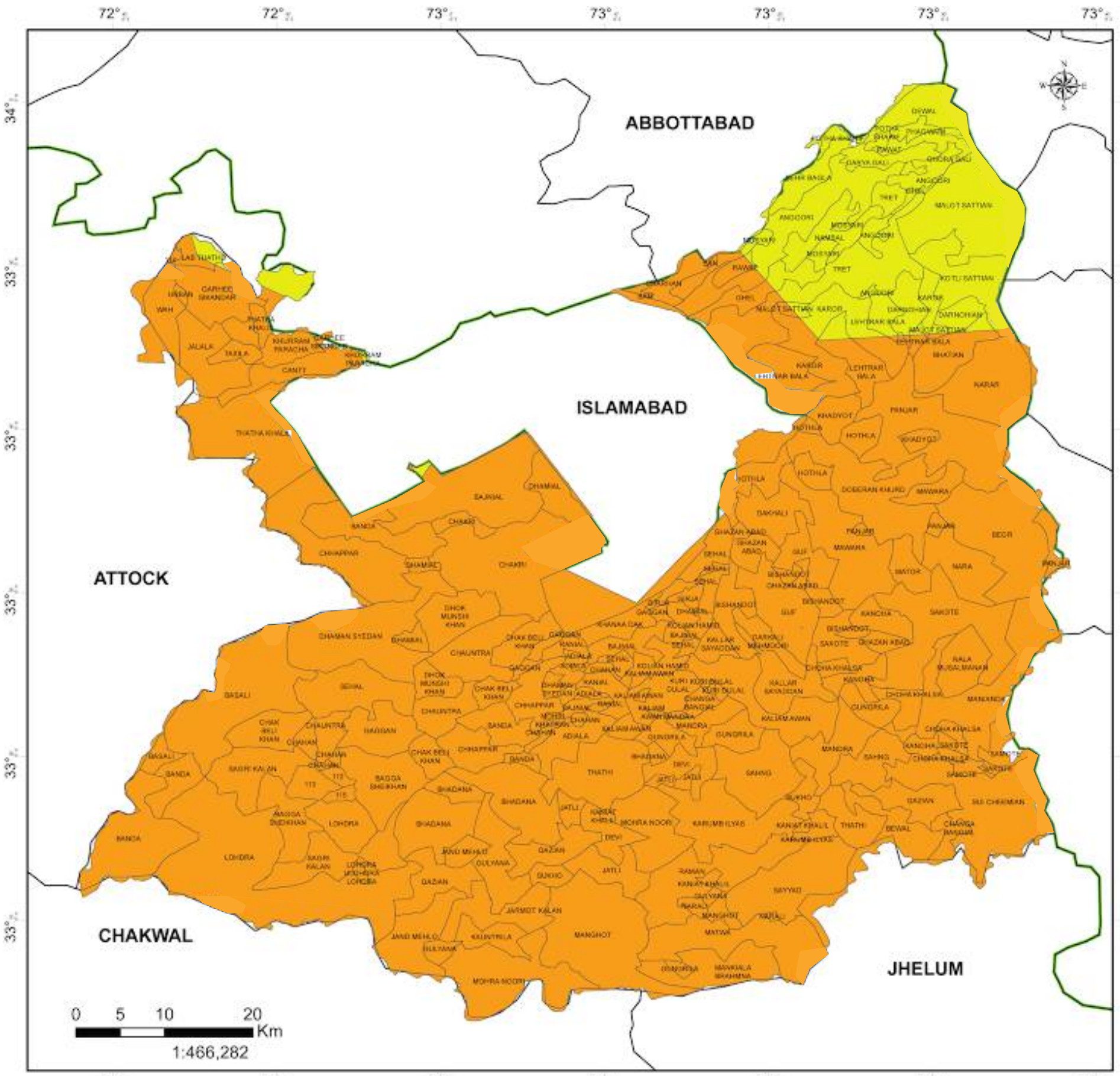
Hazard Zones Classification The seismic hazard zones are classified into five categories based on Peak Ground Acceleration (PGA):

- Zone 1: Very Low Hazard (0.01 - 0.08g)
- Zone 2A: Low Hazard (0.08 - 0.16g)
- Zone 2B: Moderate Hazard (0.16 - 0.24g)
- Zone 3: High Hazard (0.24 - 0.32g)
- Zone 4: Very High Hazard (>0.32g)



Seismotectonic Model of Pakistan

EARTHQUAKE HAZARD 50 YEARS RETURN PERIOD



Legend

Hazard Zone

- 2B (0.16-0.24g) Medium
- 3 (0.24-0.32g) High
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

UN-HABITAT

EARTHQUAKE HAZARD 100 YEARS RETURN PERIOD

Legend

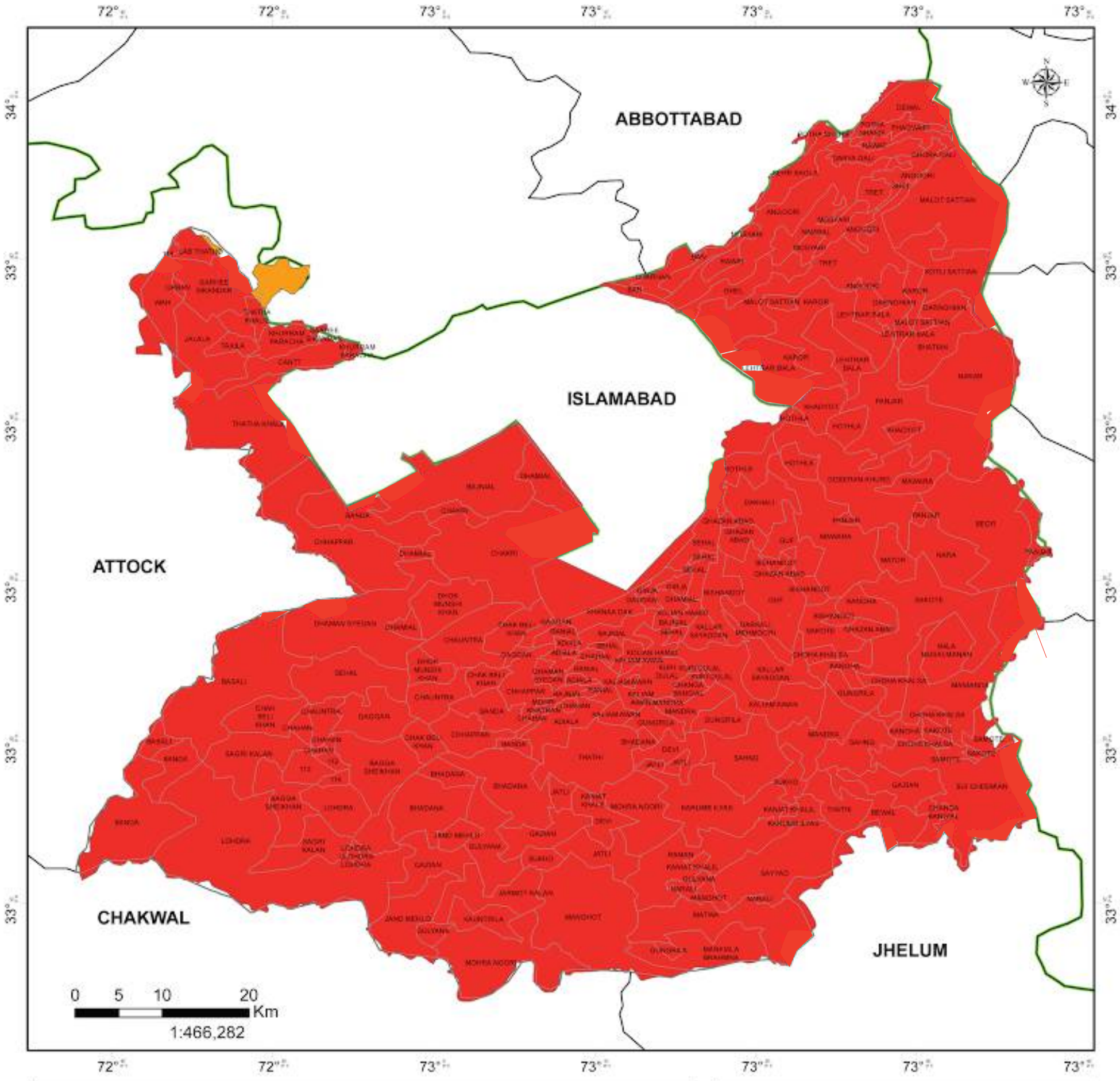
Hazard Zone

- 3 (0.24-0.32) High
- 4 (>0.32) Very High
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

EARTHQUAKE HAZARD 475 YEARS RETURN PERIOD



Legend

Hazard Zone

- 3 (0.24-0.32g) High
- 4 (>0.32) Very High
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

22 FLOOD HAZARD ASSESSMENT

Rawalpindi District, located in Punjab, is highly vulnerable to flood hazards due to its proximity to the Leh Nullah and other tributaries. The district has experienced significant flooding in past years, including the devastating floods of 2001 and subsequent years. Floodwaters affect major urban centers, residential areas, and critical infrastructure, necessitating the development of flood protection structures and mitigation strategies.

Flood Protection Structures Drains:

- Leh Nullah Drain
- Sawan River Drain
- Dhok Ratta Drain
- Arya Mohalla Drain ▪ Ratta Amral Drain

Embankments & Flood Protection Bunds:

- Leh Nullah Flood Protection Bund
- Saddar Protection Wall
- Gawalmandi Flood Bund
- Soan River Embankment
- Dhoke Hassu Protection Bund

Assessment Methodology The flood hazard assessment for Rawalpindi is based on hydrodynamic modeling using the HEC-RAS and HEC-GeoRAS models. These models utilize:

- Digital Elevation Model (DEM) for terrain analysis.
- Observed peak flow data from Nullah Leh and Soan River stations.
- GIS-based flood extent mapping to assess the impact zones.
- Assessment of drainage infrastructure and embankments to determine their effectiveness.

Major Flood Events & Historic Peaks Rawalpindi has recorded peak discharges from the Leh Nullah at various times. The 2001 flood was among the most devastating, with peak flows exceeding 40,000 cusecs, causing widespread damage.

Damages & Losses (2001 Floods)

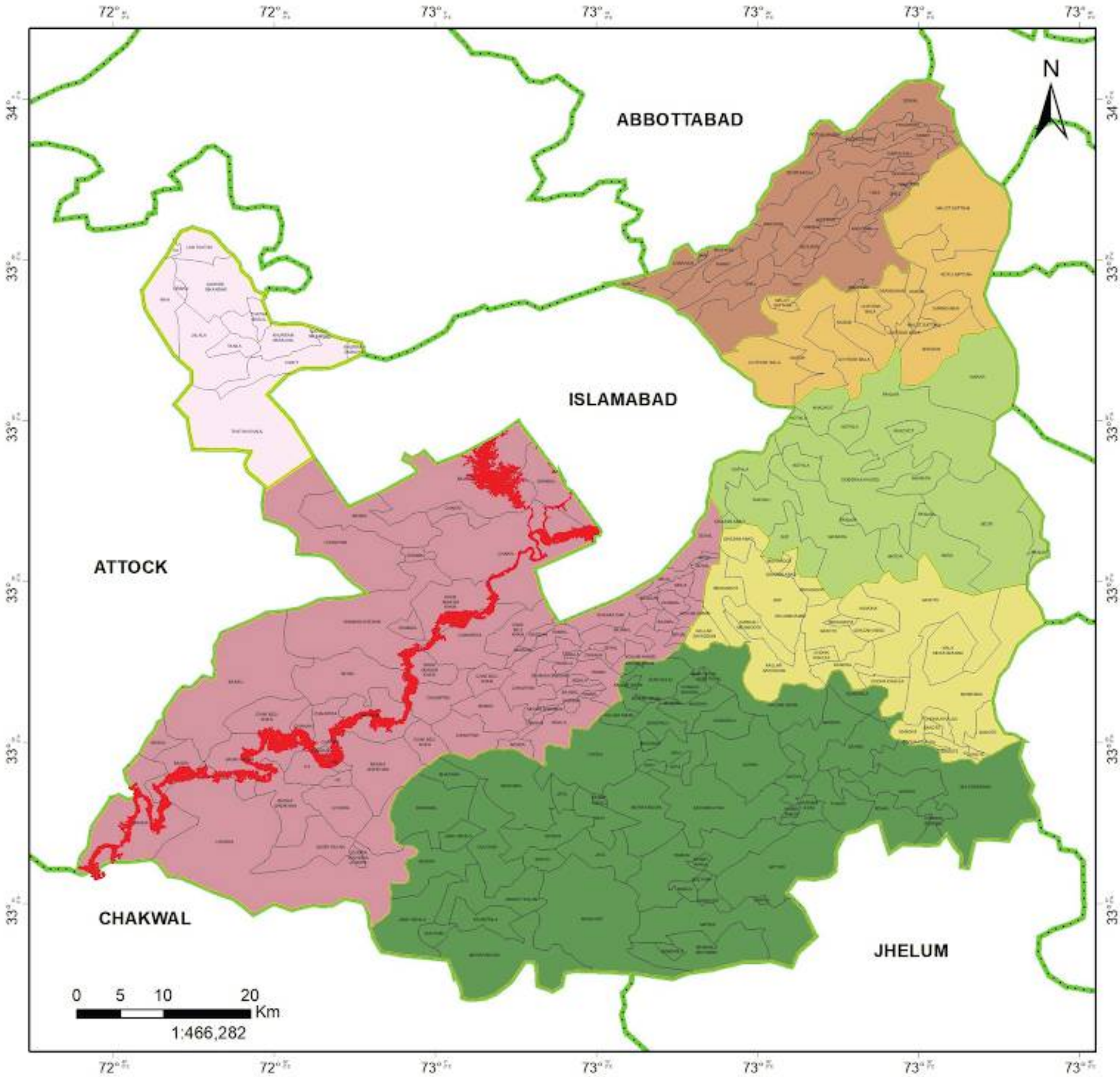
Housing Impact by Building Type and Damage Extent

Union Councils	Kacha	Pacca	Partially Damaged	Completely Damaged	Urban	Rural	Total
Gawalmandi	120	300	220	200	300	320	620
Arya Mohalla	90	250	180	160	240	260	500
Dhoke Hassu	110	280	210	180	290	300	590

Agricultural Losses

Union Councils	Crop Damage (Acres
Chaklala	2,800
Kotha Kalan	3,500
Morgah	4,200
Total	**10,500**

FLOOD HAZARD 10 YEARS RETURN PERIOD



Legend

- Flood Hazard 10 Year Return Period
- Union Council Boundary
- District Boundary
- Provincial Boundary

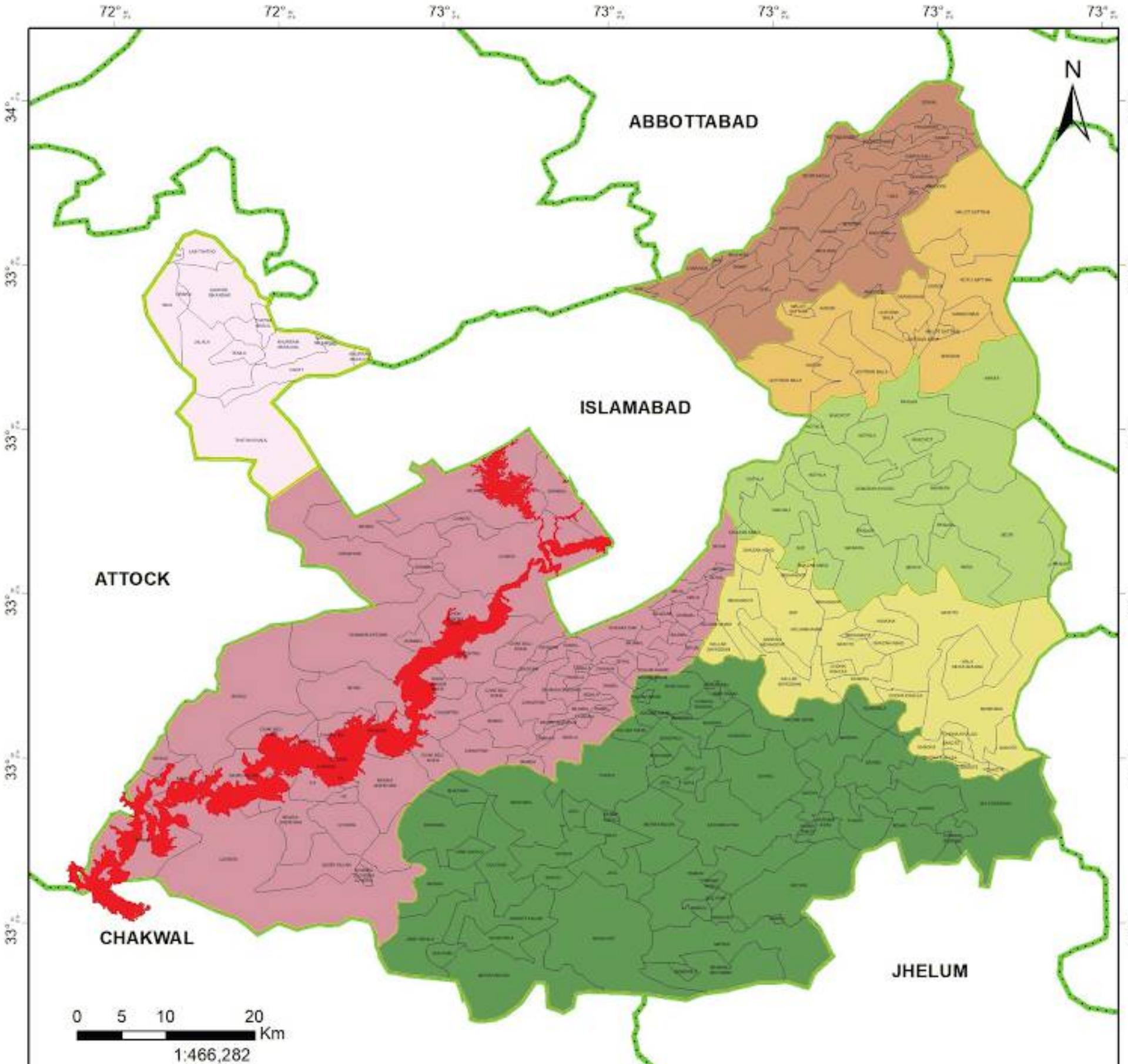
Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

FLOOD HAZARD 50 YEARS RETURN PERIOD



Legend

- Flood Hazard 50 Year Return Period
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

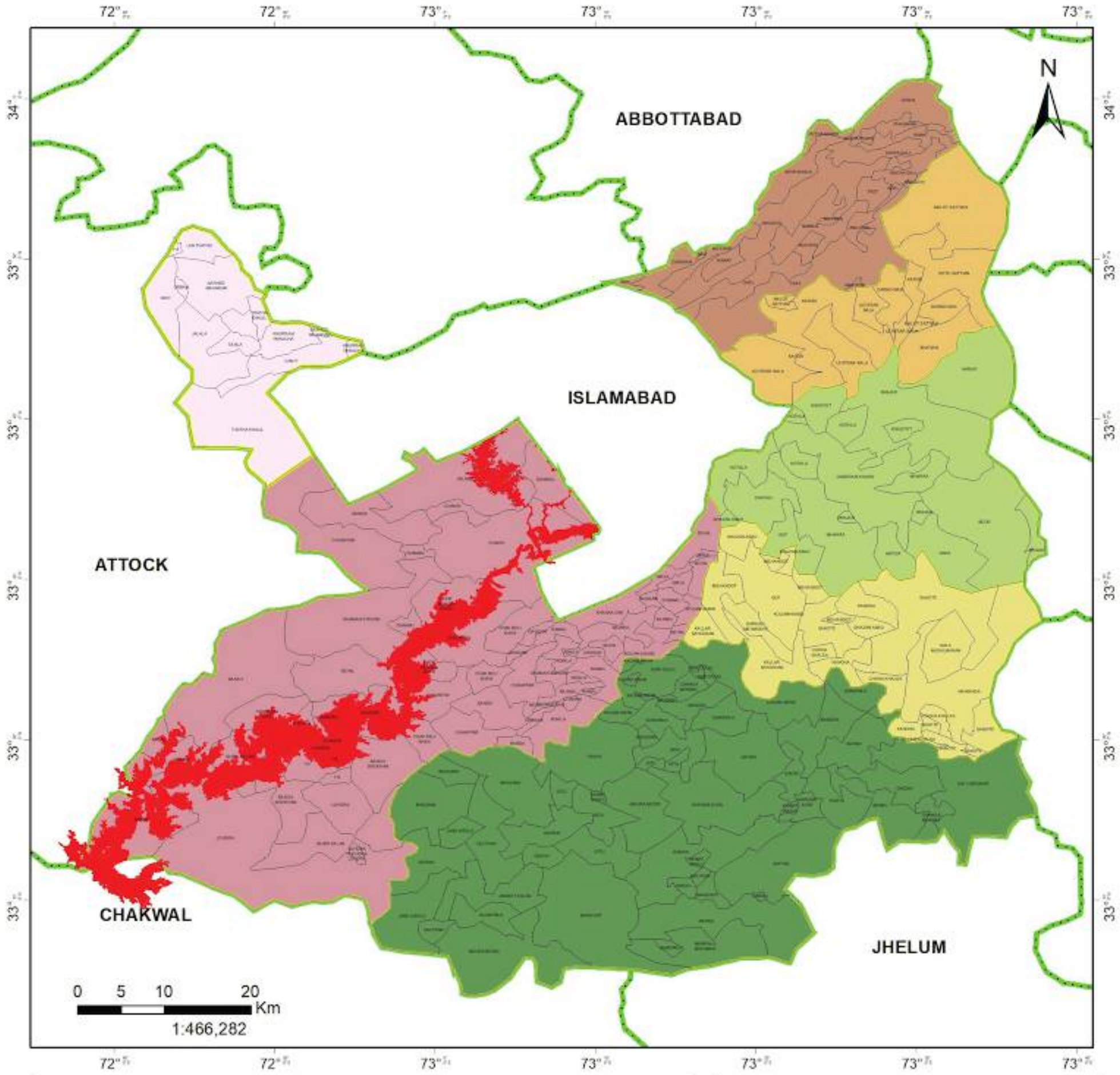
- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

UN-HABITAT

FLOOD HAZARD 100 YEARS RETURN PERIOD



Legend

- Flood Hazard 100 Year Return Period
- Union Council Boundary
- District Boundary
- Provincial Boundary

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

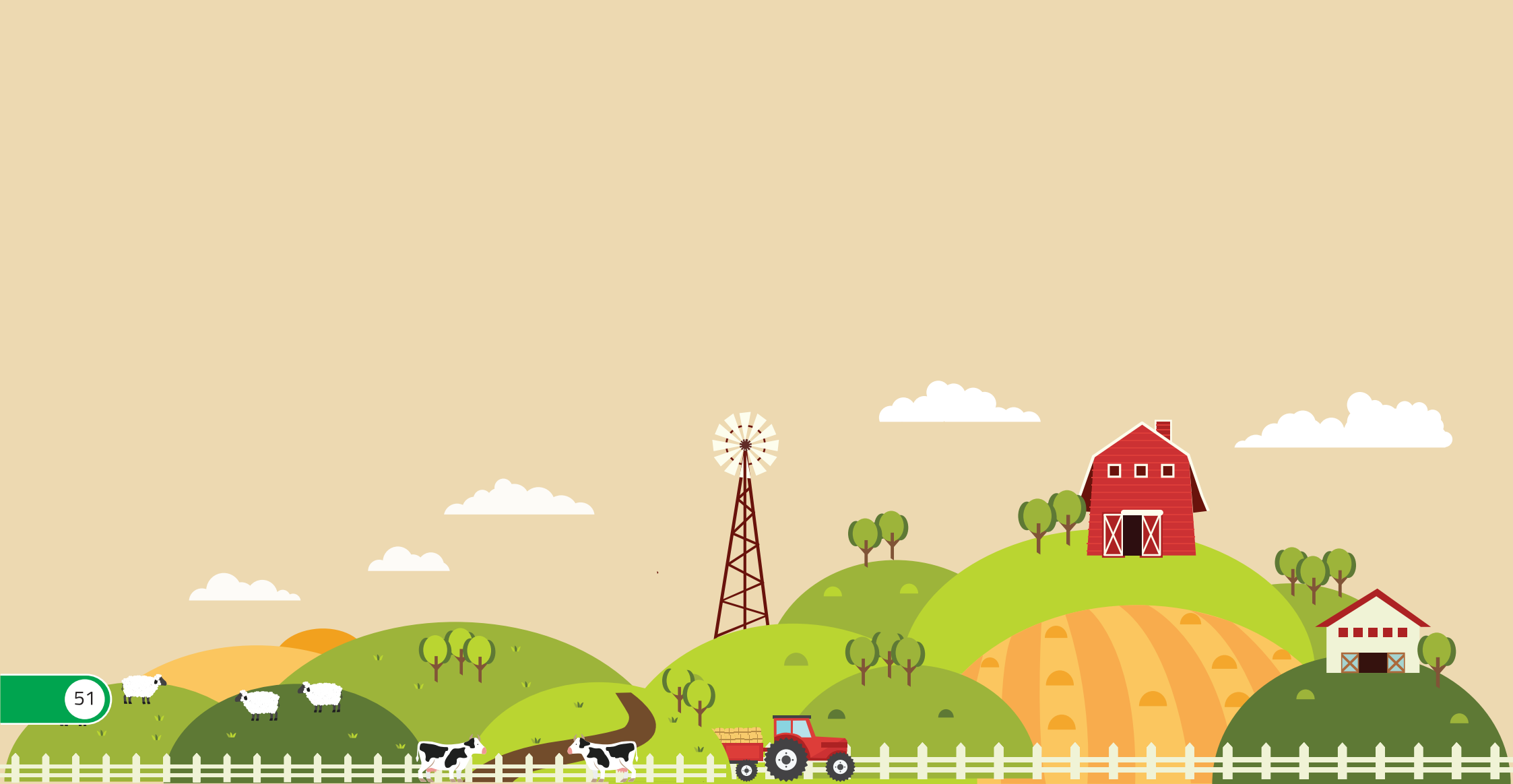
UN-HABITAT

C | EXPOSURE ASSESSMENT

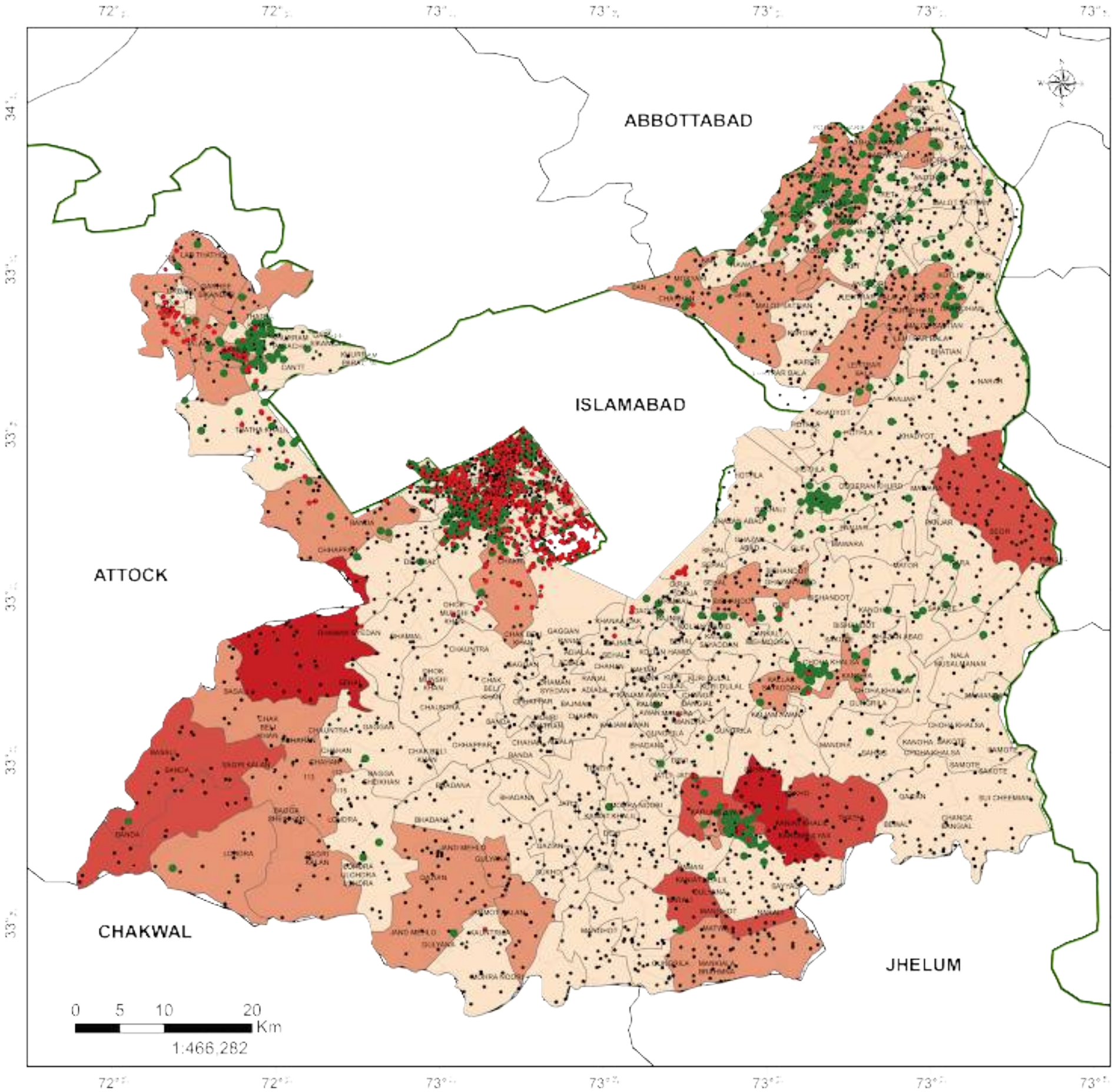
- DROUGHT
- EARTHQUAKE
- FLOOD

23 ELEMENTS EXPOSED TO DROUGHT HAZARD

Elements	Exposed	Resilient (Safe)	Vulnerable				
			Very Low	Low	Medium	High	Very High
Population	6.1mln	2mln	5,885,761	0	0	166,302	13,089
Settlements	2,451	735	2,330	0	0	94	27
Railways	10	3	8	0	0	2	0
Airports	2	1	2	0	0	0	0
Schools	837	251	796	0	0	39	2
Highways	9,430	2,829	57,471	0	0	1,487	12
Dams	7	2	7	0	0	0	0
Communication Towers	2,103	631	2,045	0	0	55	3



COMMUNICATION TOWERS, INDUSTRIES, EDUCATION FACILITIES & SETTELMENTS EXPOSED TO DROUGHT HAZARD



Legend

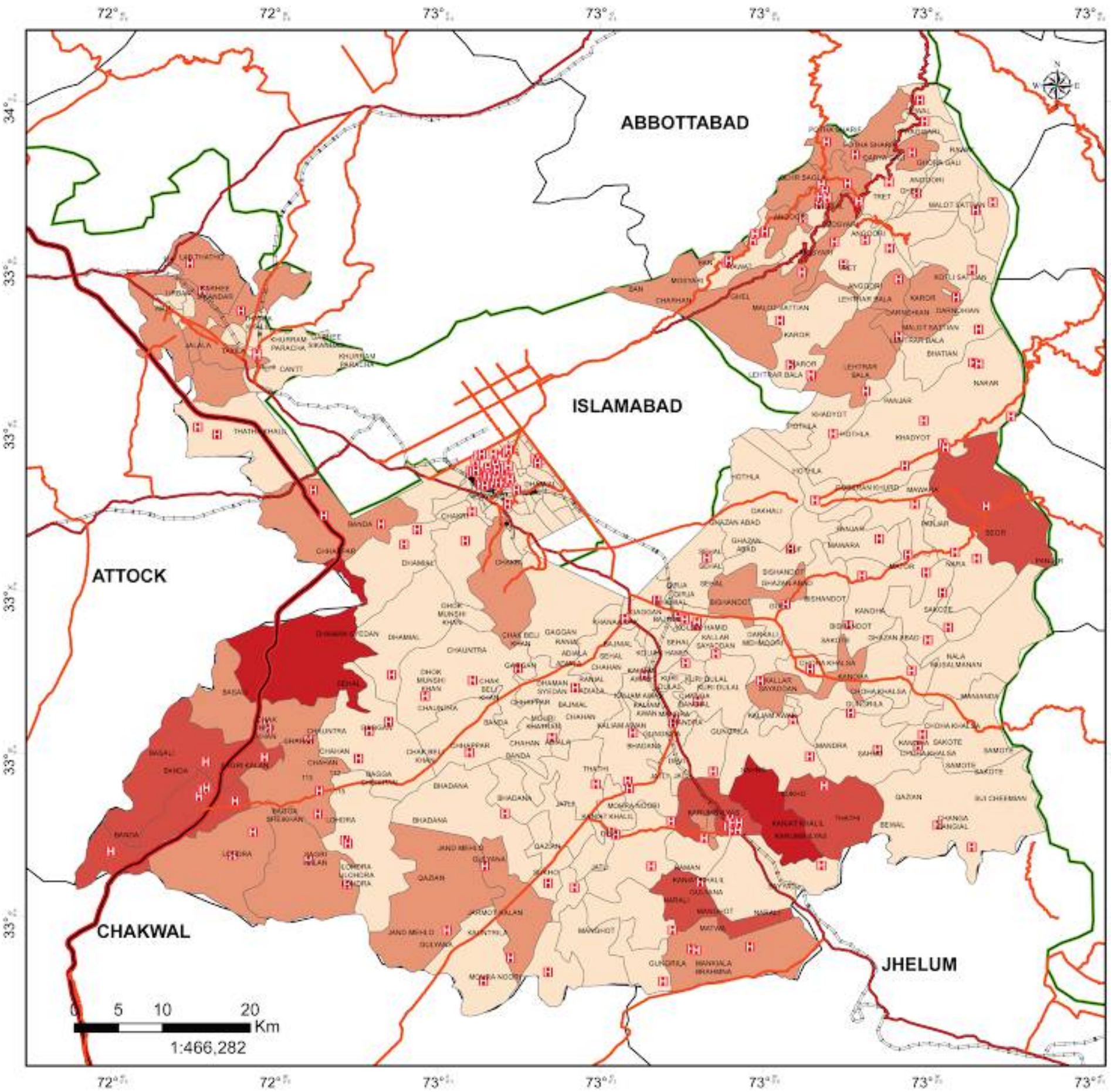
Drought Hazard

- No Drought
- Mild Drought
- Moderate Drought
- Severe Drought
- Communication Tower
- Industries
- Education Facilities
- Settelments
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

HEALTH FACILITIES & TRANSPORTATION NETWORK EXPOSED TO DROUGHT HAZARD



Legend

Drought Hazard

- No Drought
- Mild Drought
- Moderate Drought
- Severe Drought
- Health Facilities
- Major Roads
- Motorways
- National Highway
- Strategic Road
- Railway Tracks
- Union Council Boundary
- District Boundary
- Provincial Boundary

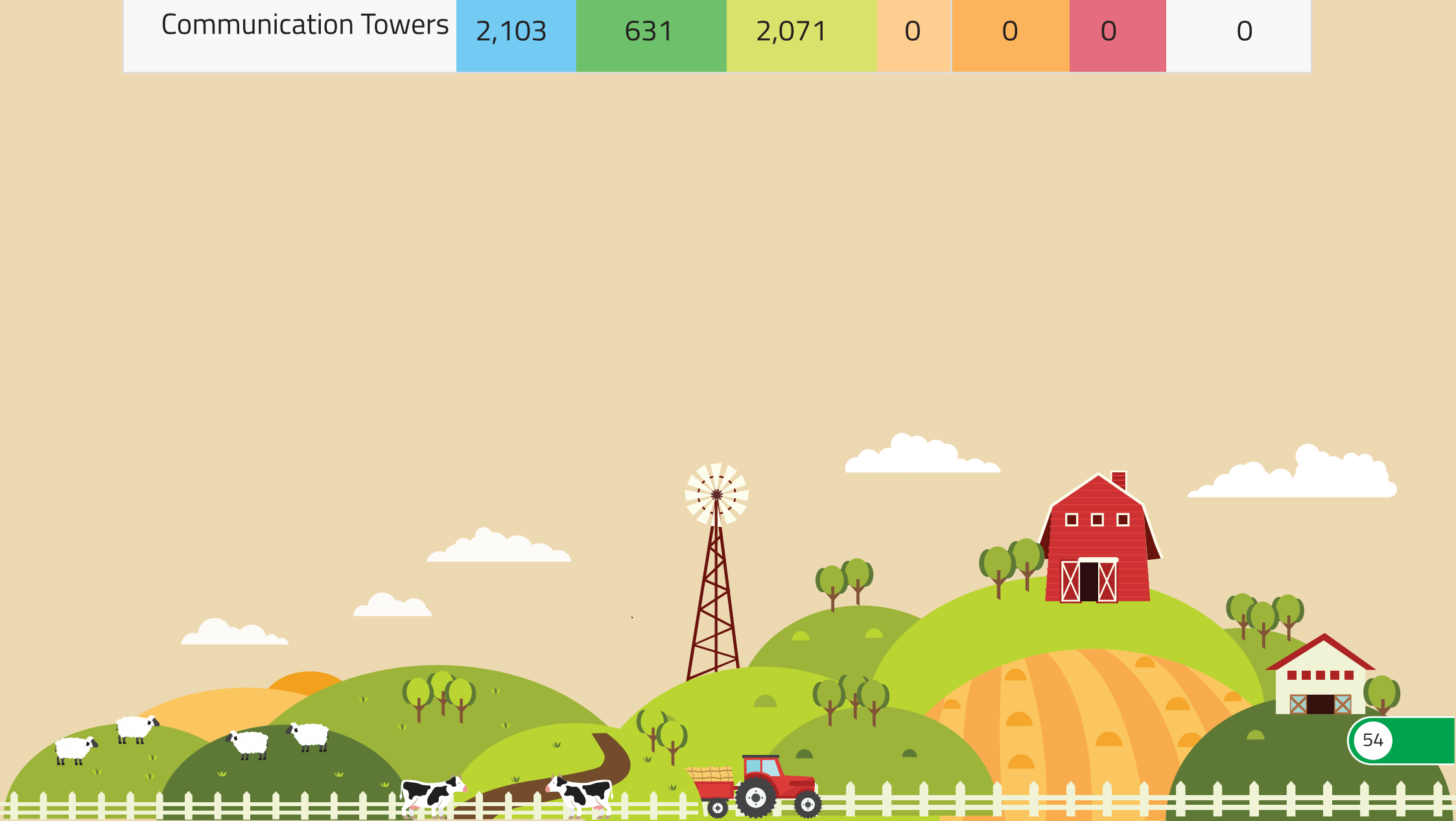
Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

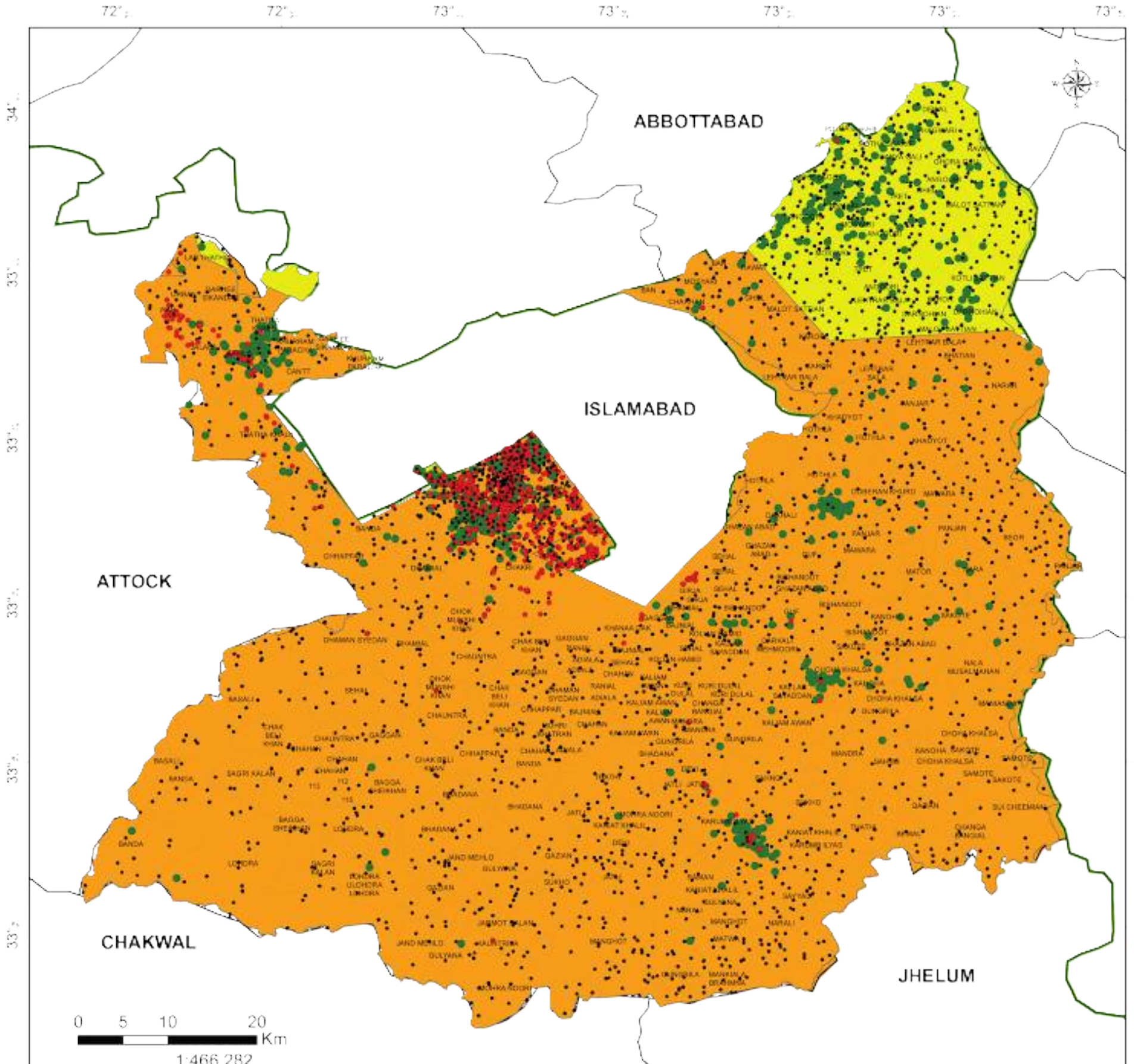
UN-HABITAT

24 ELEMENTS EXPOSED TO EARTHQUAKE HAZARD

Elements	Exposed	Resilient (Safe)	Vulnerable				
			Very Low	Low	Medium	High	Very High
Population	6.1mln	2mln	6,016,314	0	0	0	0
Settlements	2,451	735	2,429	0	0	0	0
Railways	10	3	10	0	0	0	0
Airports	2	1	2	0	0	0	0
Schools	837	251	832	0	0	0	0
Highways	9,430	2,829	58,542	0	0	0	0
Dams	7	2	7	0	0	0	0
Communication Towers	2,103	631	2,071	0	0	0	0



COMMUNICATION TOWERS, INDUSTRIES, EDUCATION FACILITIES & SETTELMENTS EXPOSED TO EARTHQUAKE 50 YEARS RETURN PERIOD



Legend

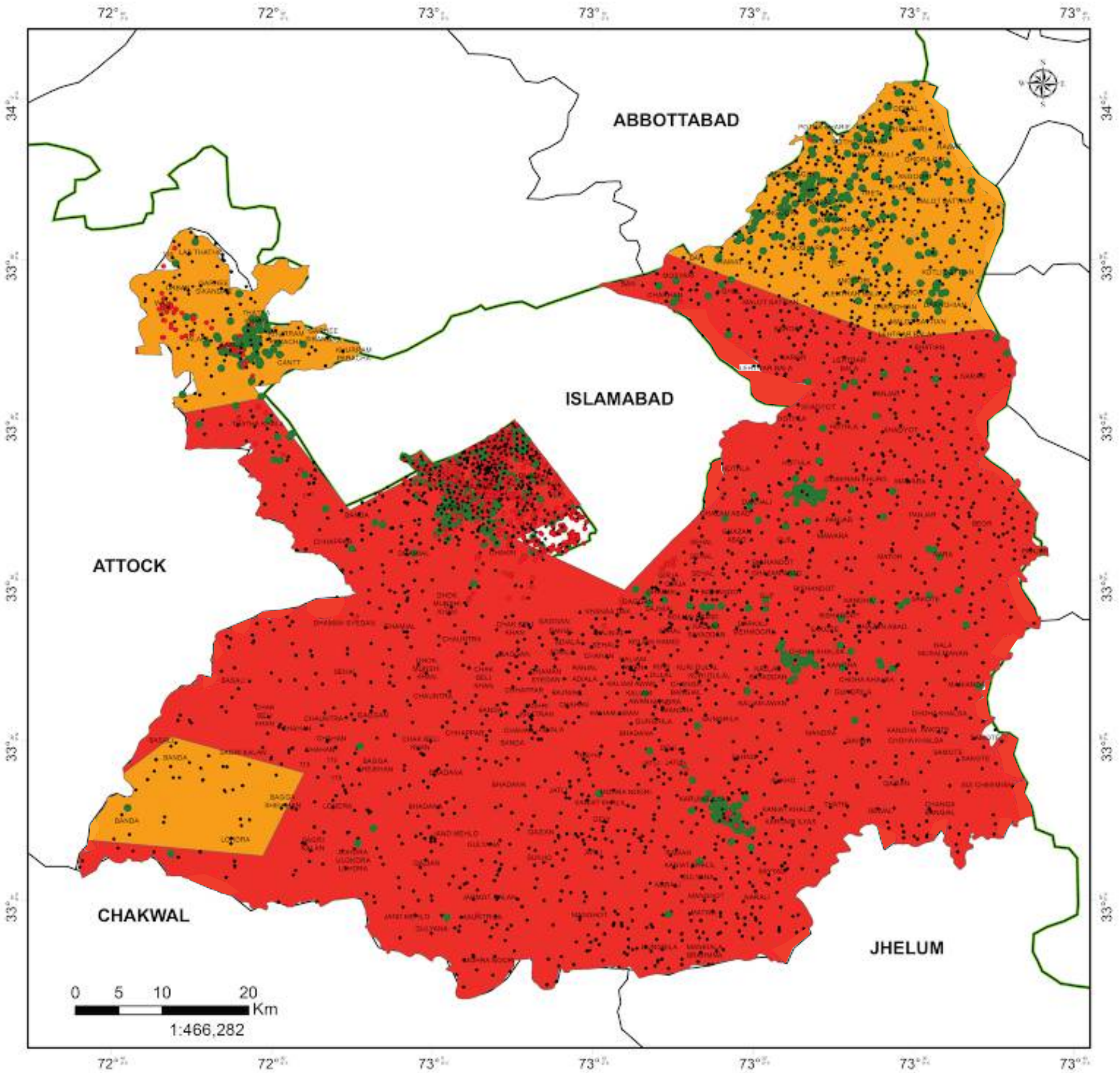
Earthquake Hazard 50 Year Return Period

- Medium
- High
- Communication Tower
- Industries
- Education Facilities
- Settelments
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

COMMUNICATION TOWERS, INDUSTRIES, EDUCATION FACILITIES & SETTELMENTS EXPOSED TO EARTHQUAKE 100 YEARS RETURN PERIOD



Legend

Earthquake Hazard 100 Year Return Period

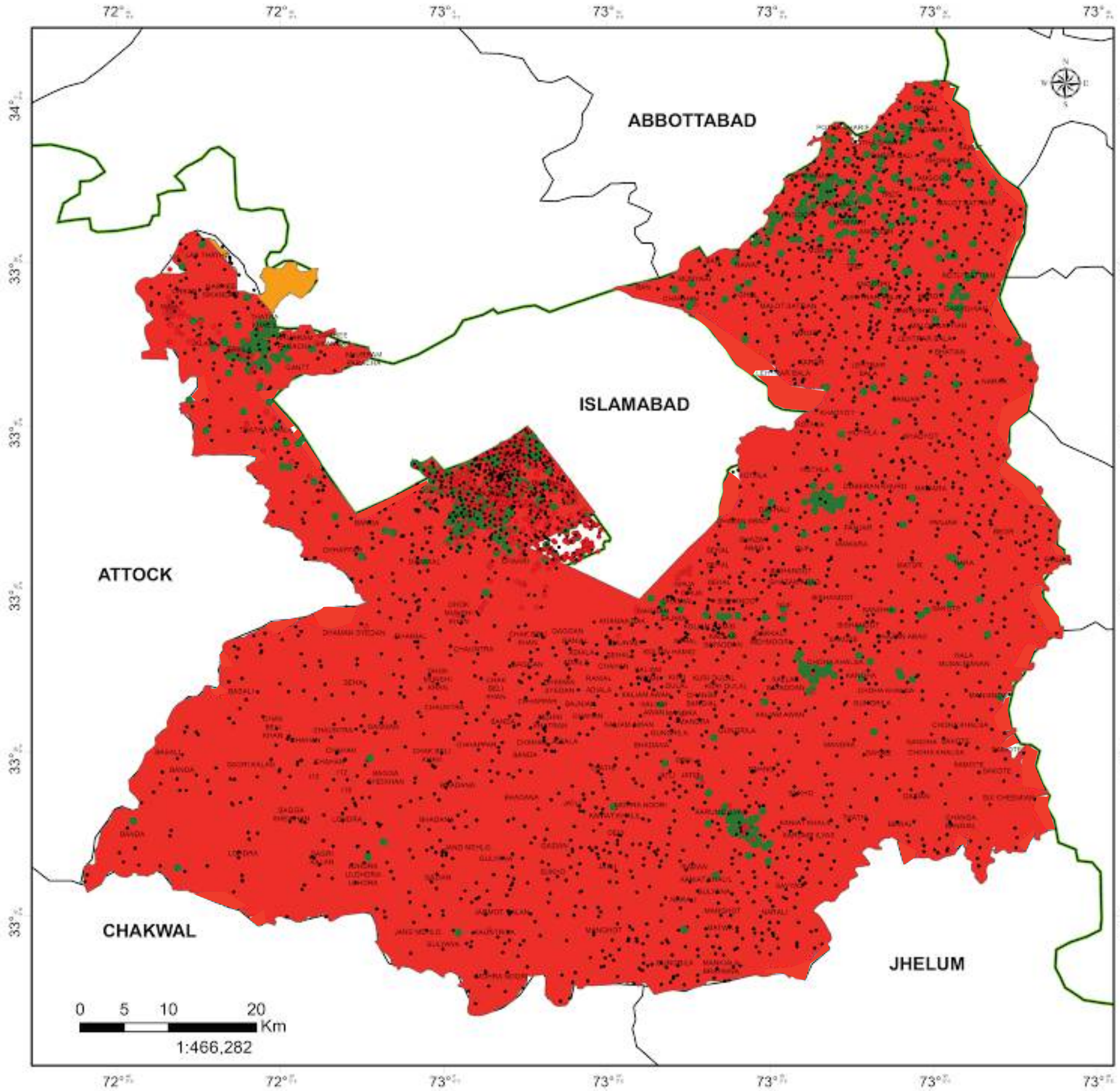
- High
- Very High
- Communication Tower
- Industries
- Education Facilities
- Settelments
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

UN-HABITAT

COMMUNICATION TOWERS, INDUSTRIES, EDUCATION FACILITIES & SETTELMENTS EXPOSED TO EARTHQUAKE 475 YEARS RETURN PERIOD



Legend

Earthquake Hazard 475 Year Return Period

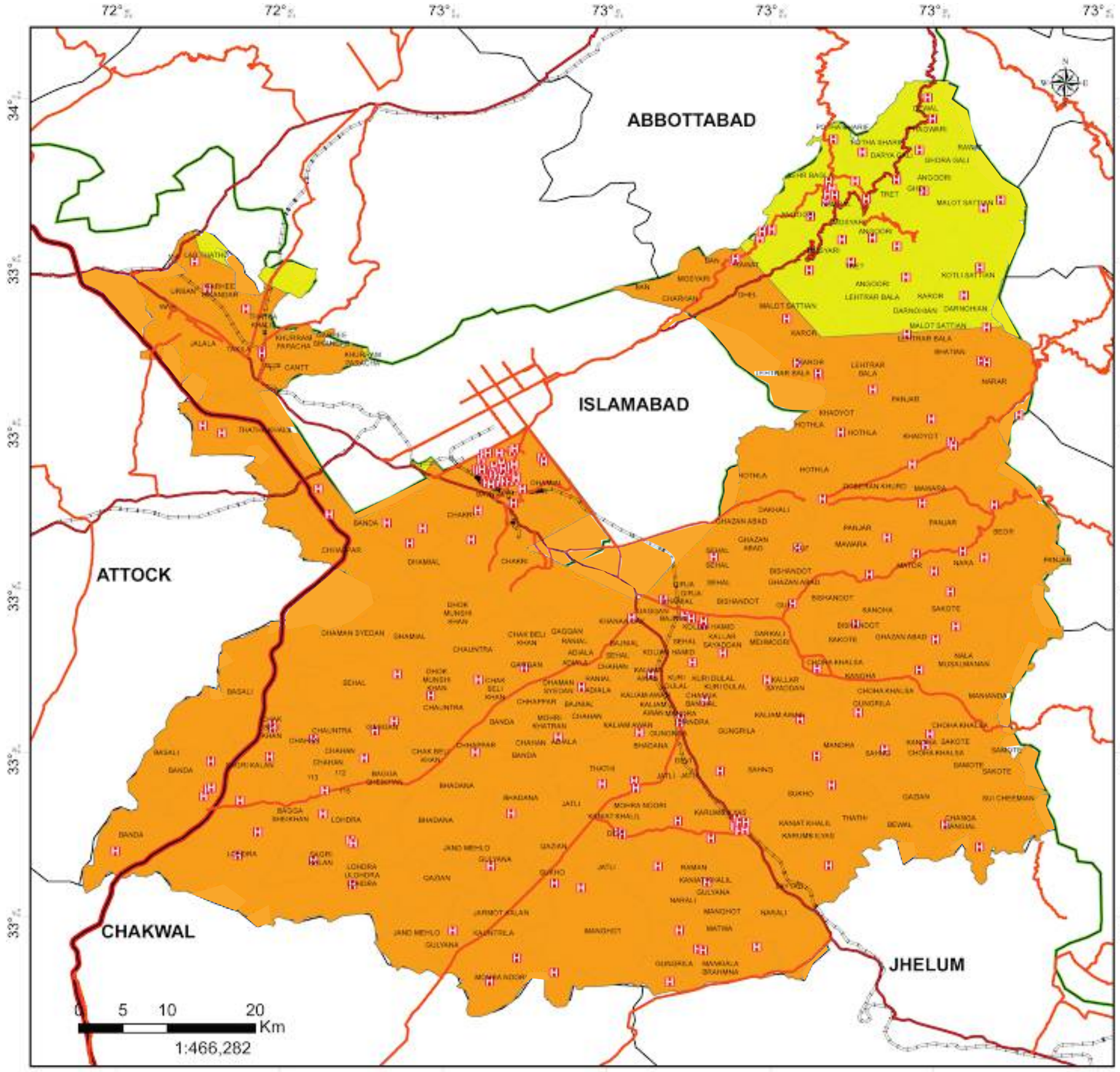
- High
- Very High
- Communication Tower
- Industries
- Education Facilities
- Settelments
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

UN-HABITAT

HEALTH FACILITIES & TRANSPORTATION NETWORK EXPOSED TO EARTHQUAKE 50 YEARS RETURN PERIOD



Legend

Earthquake Hazard 50 Year Return Period

- Medium
- High
- Health Facilities
- National Highway
- Strategic Road
- Major Roads
- Motorways
- Railway Tracks

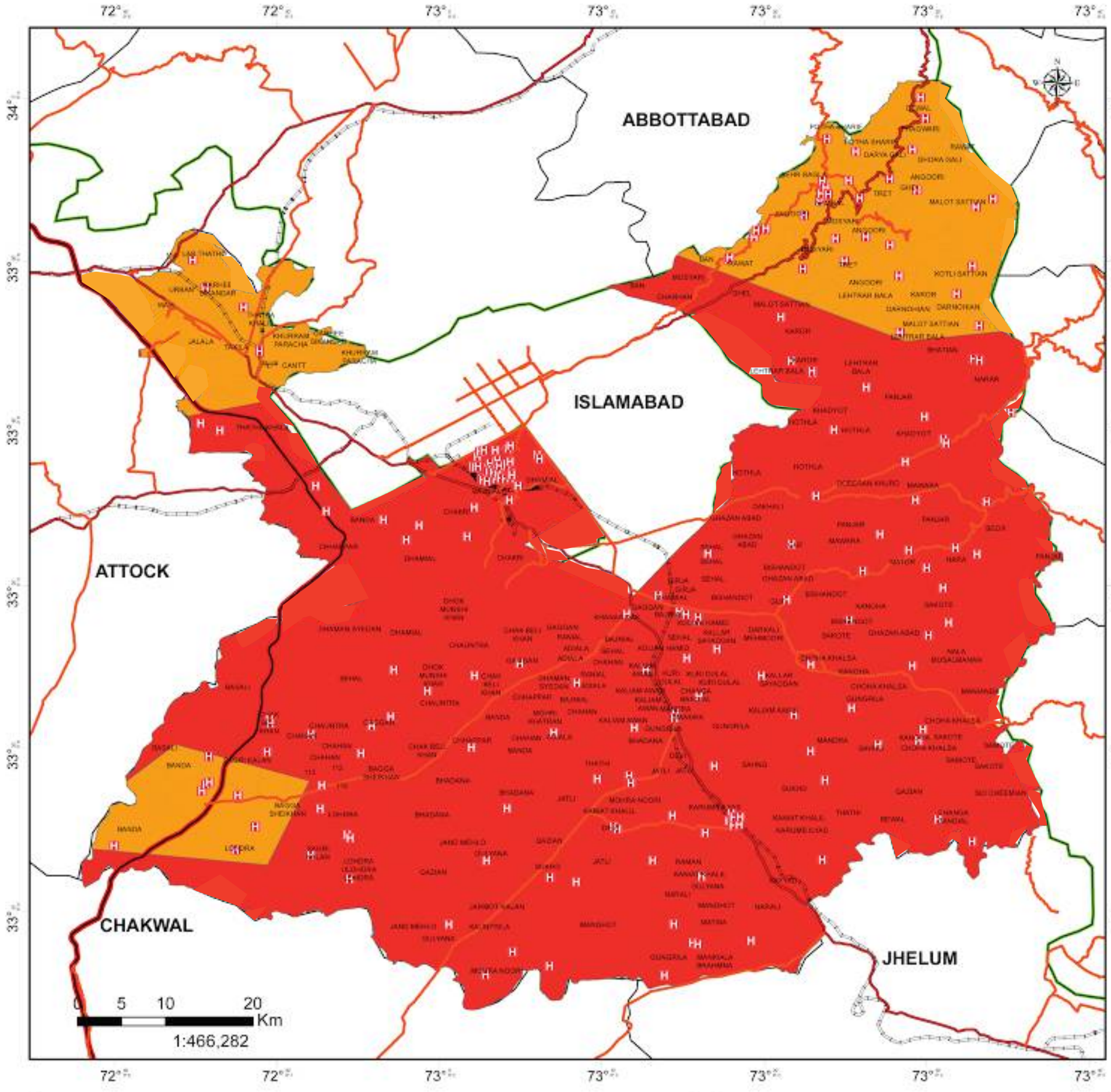
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

UN-HABITAT

HEALTH FACILITIES & TRANSPORTATION NETWORK EXPOSED TO EARTHQUAKE 100 YEARS RETURN PERIOD



Legend

Earthquake Hazard 100 Year Return Period

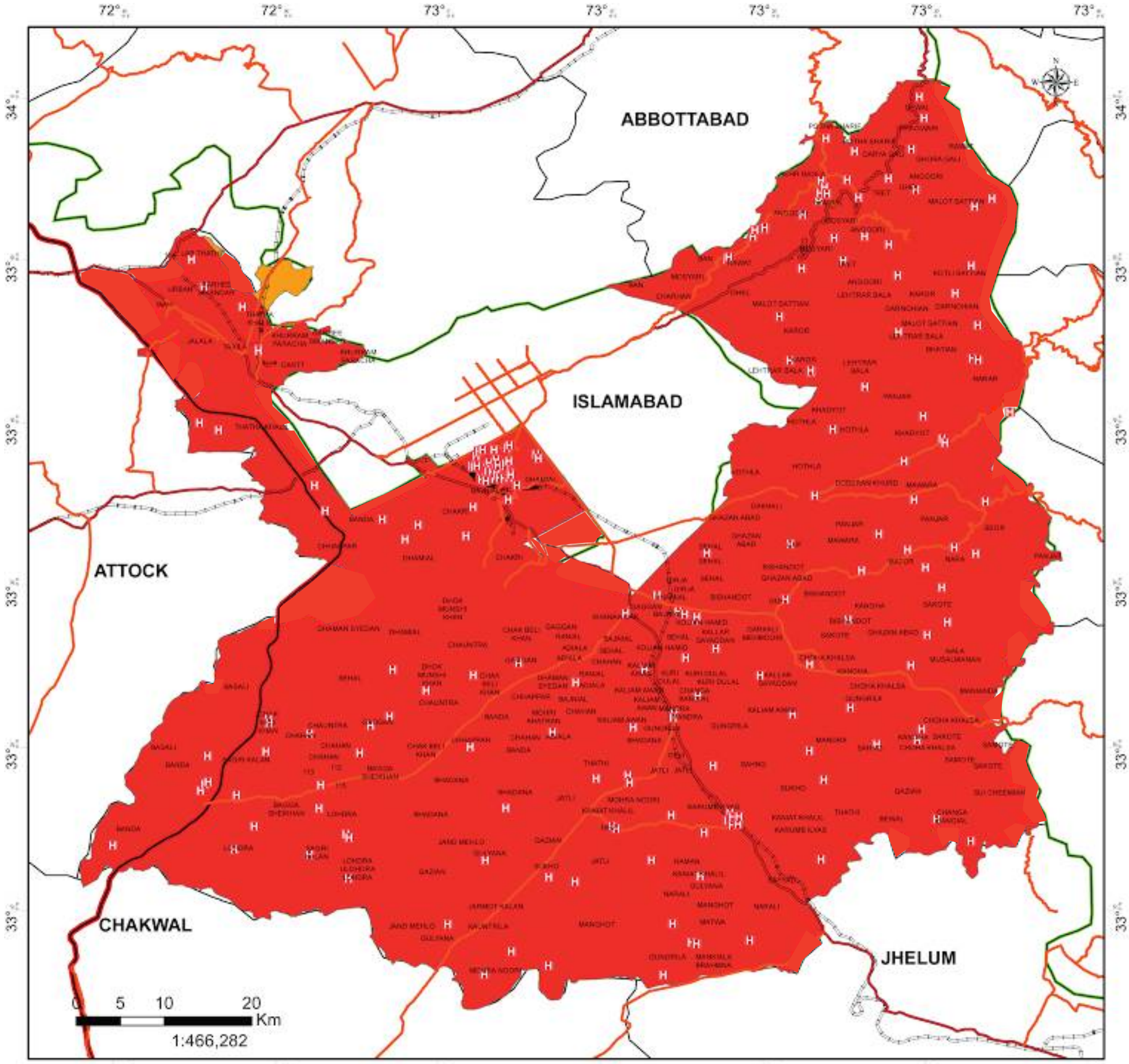
- High
- Very High
- Health Facilities
- National Highway
- Strategic Road
- Major Roads
- Motorways
- Railway Tracks
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

UN-HABITAT

HEALTH FACILITIES & TRANSPORTATION NETWORK EXPOSED TO EARTHQUAKE 475 YEARS RETURN PERIOD



Legend

Earthquake Hazard 475 Year Return Period

- High
- Very High
- Health Facilities
- National Highway
- Strategic Road
- Major Roads
- Motorways
- Railway Tracks

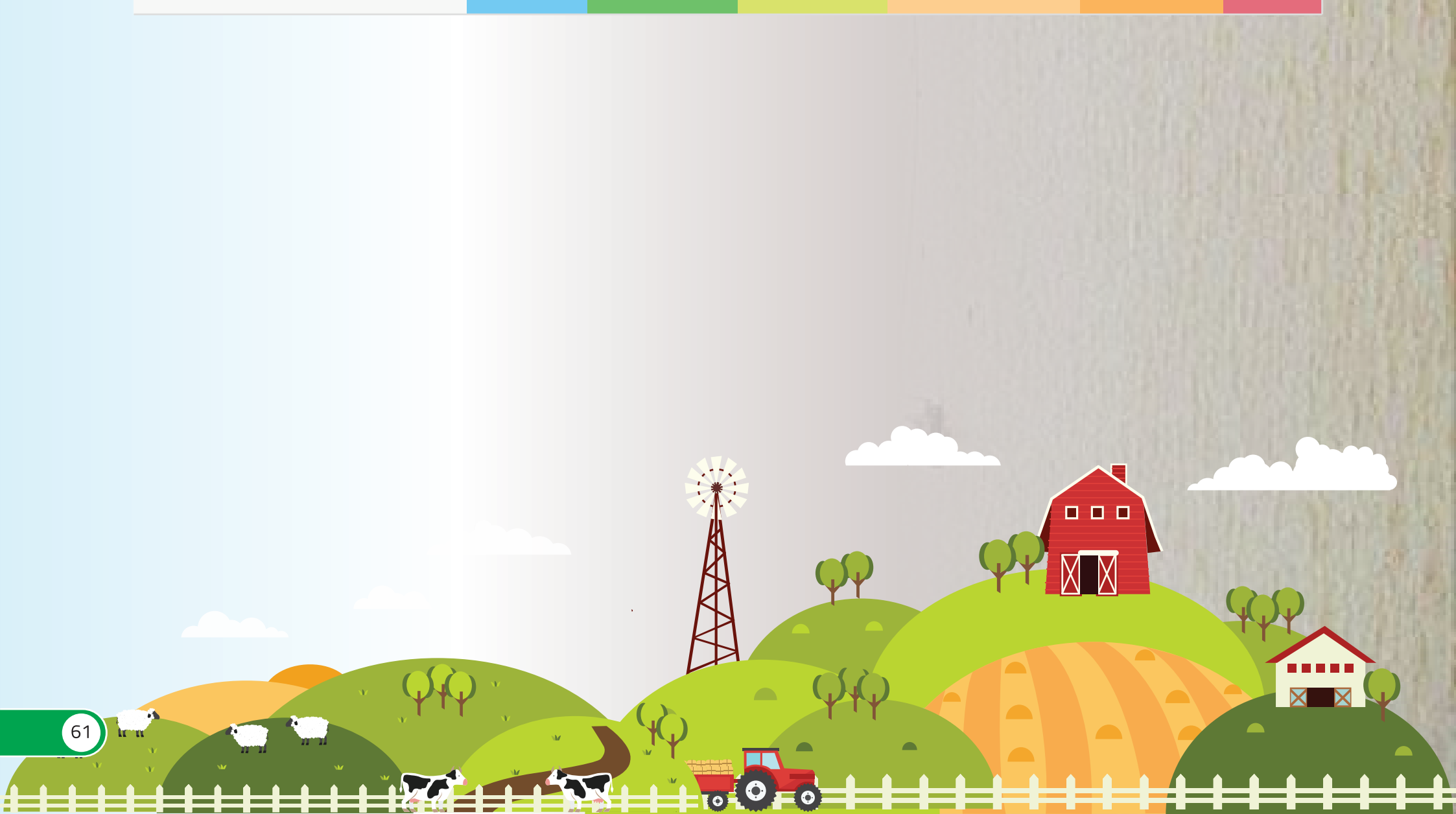
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

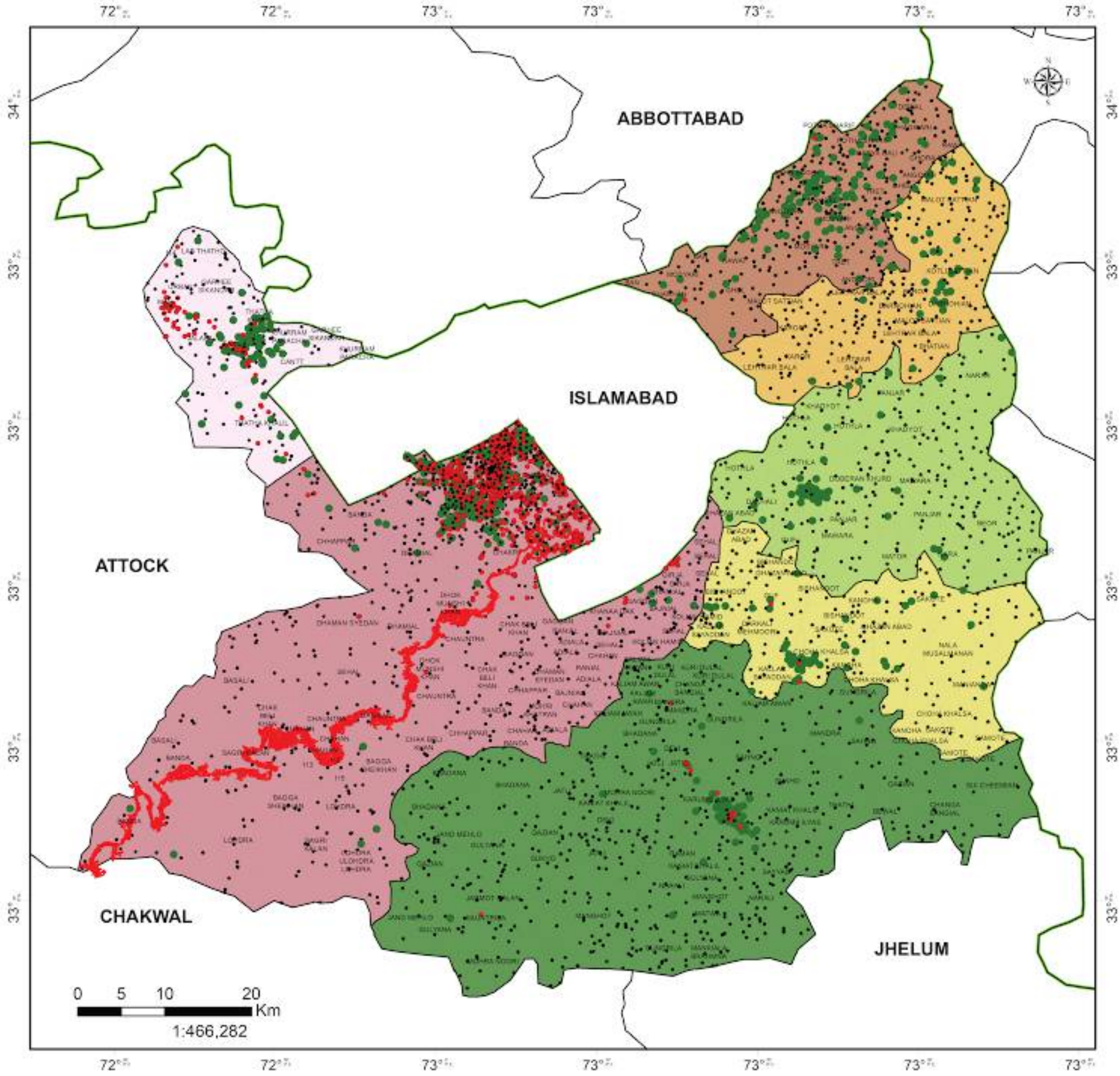
UN-HABITAT

25 ELEMENTS EXPOSED TO FLOOD HAZARD

Elements	Exposed	Resilient (Safe)	Vulnerable			
			Very Low	Low	Medium	High
Population	6.1mln	2mln	4,501,314	1,563,838	0	0
Settlements	2,451	735	1,717	734	0	0
Railways	10	3	10	0	0	0
Airports	2	1	2	0	0	0
Schools	837	251	772	65	0	0
Highways	9,430	2,829	48,5172	10,798	0	0
Dams	7	2	3	4	0	0
Communication Towers	2,103	631	1,842	261	0	0



COMMUNICATION TOWERS, INDUSTRIES, EDUCATION FACILITIES & SETTELMENTS EXPOSED TO FLOOD 10 YEARS RETURN PERIOD



Legend

- Flood Hazard 10 Year Return Period
- Communication Tower
- Industries
- Education Facilities
- Settelments

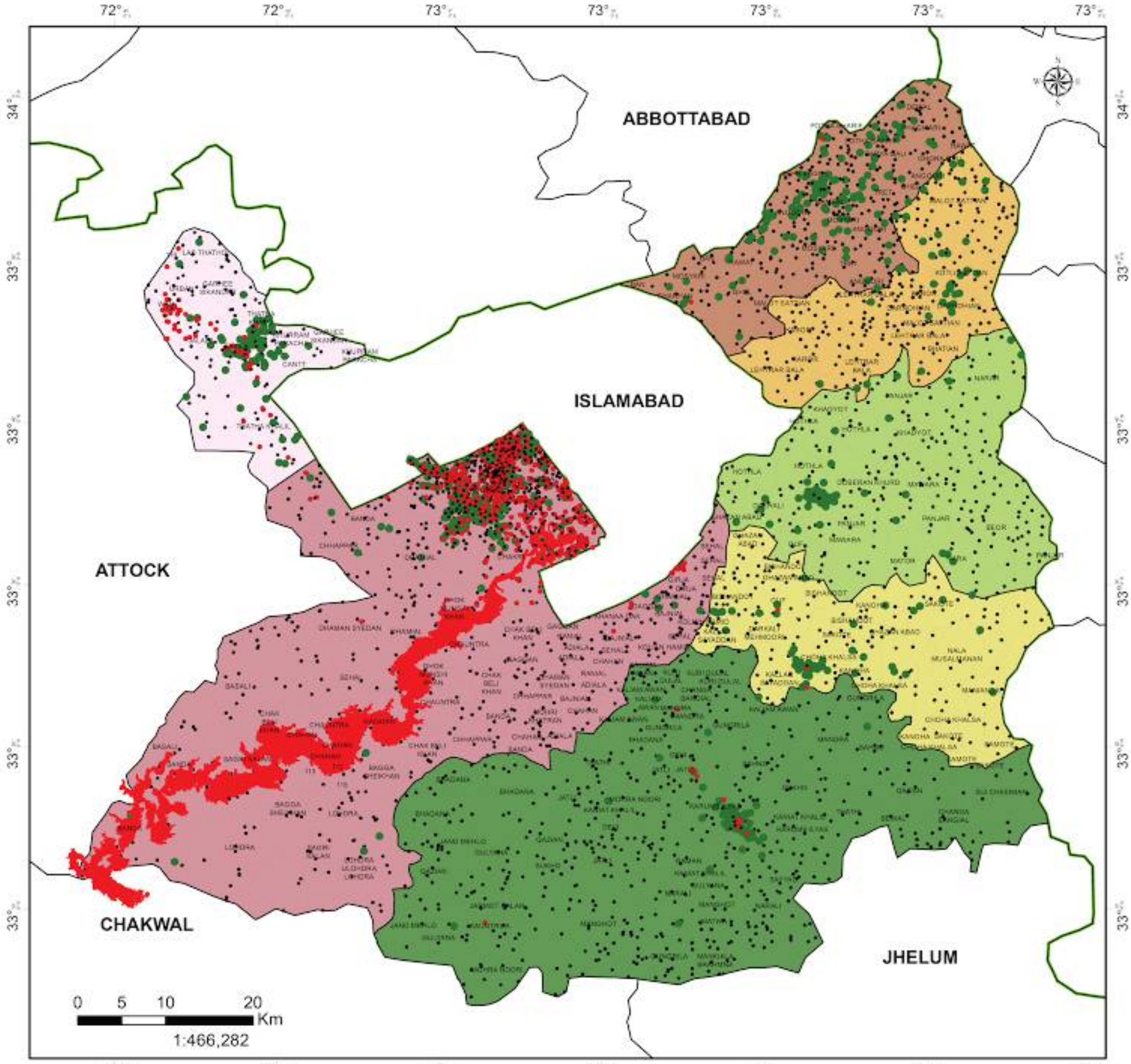
Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

COMMUNICATION TOWERS, INDUSTRIES, EDUCATION FACILITIES & SETTELMENTS EXPOSED TO FLOOD 50 YEARS RETURN PERIOD



Legend

- Flood Hazard 50 Year Return Period
- Communication Tower
- Industries
- Education Facilities
- Settelments

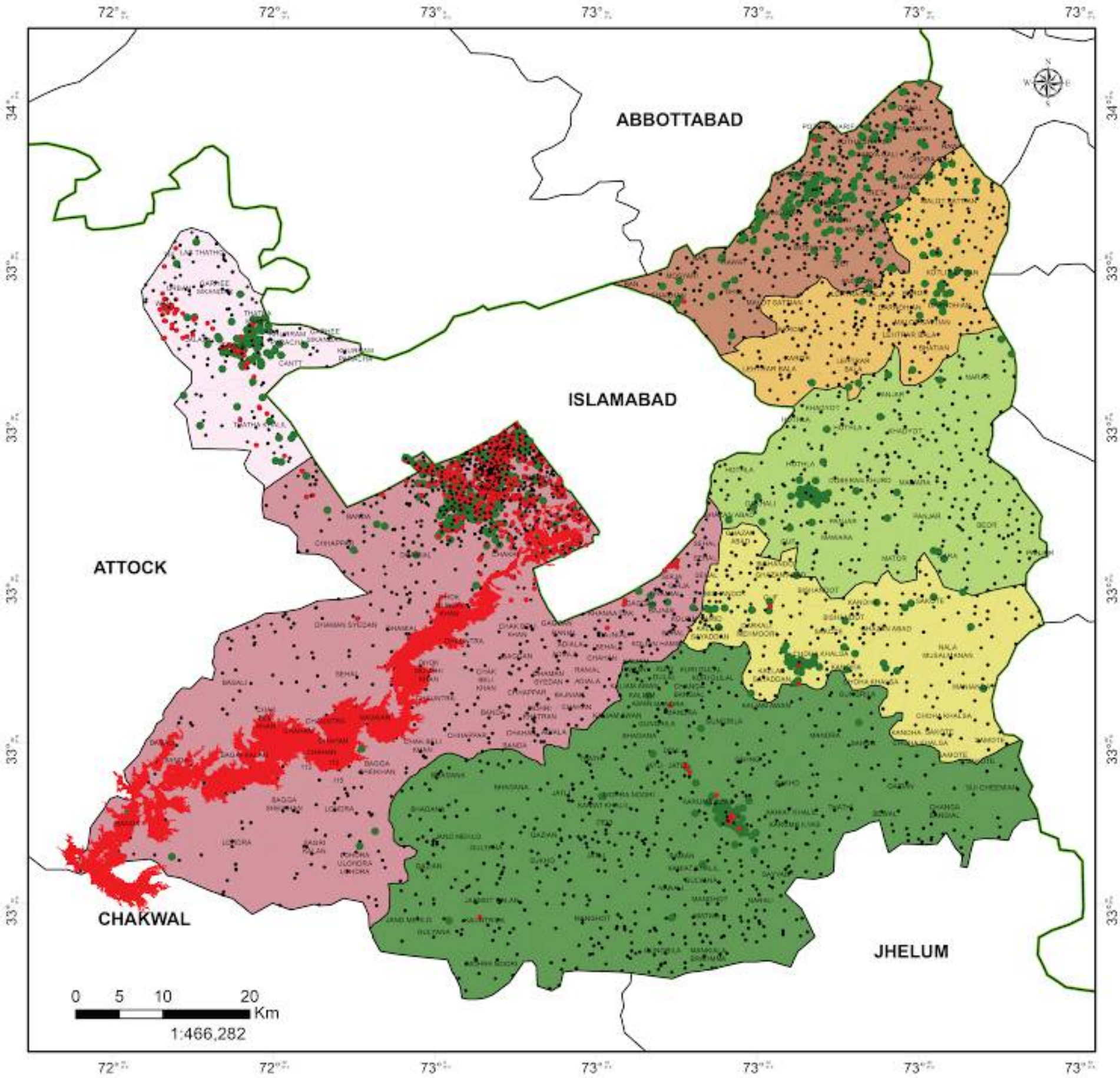
Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

COMMUNICATION TOWERS, INDUSTRIES, EDUCATION FACILITIES & SETTELMENTS EXPOSED TO FLOOD 100 YEARS RETURN PERIOD



Legend

- Flood Hazard 100 Year Return Period
- Communication Tower
- Industries
- Education Facilities
- Settelments

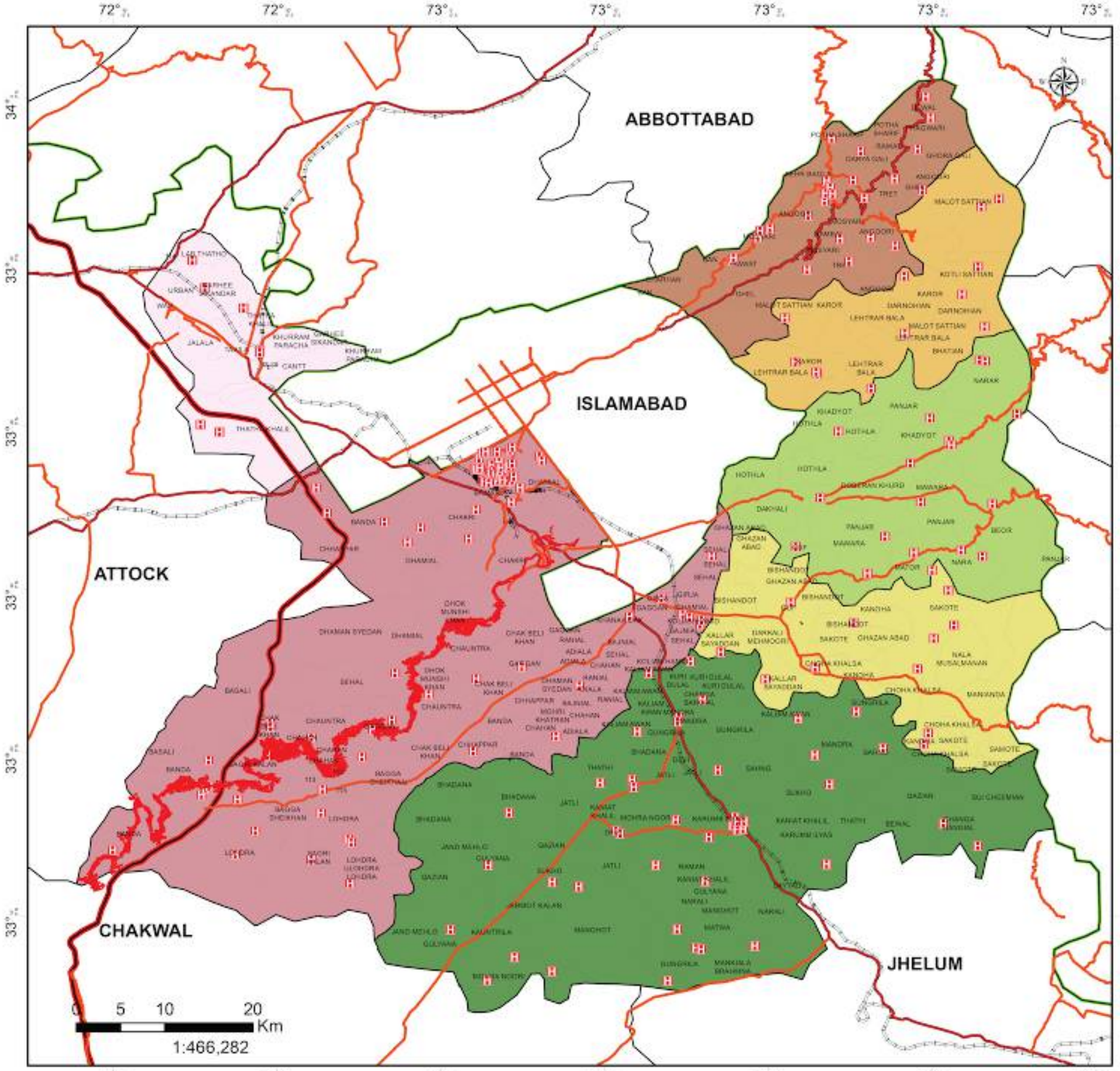
Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila
- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

HEALTH FACILITIES & TRANSPORTATION NETWORK EXPOSED TO FLOOD 10 YEARS RETURN PERIOD



Legend

- Flood Hazard 10 Year Return Period
- Health Facilities
- Major Roads
- Motorways
- National Highway
- Strategic Road
- Railway Tracks

Tehsil Boundary

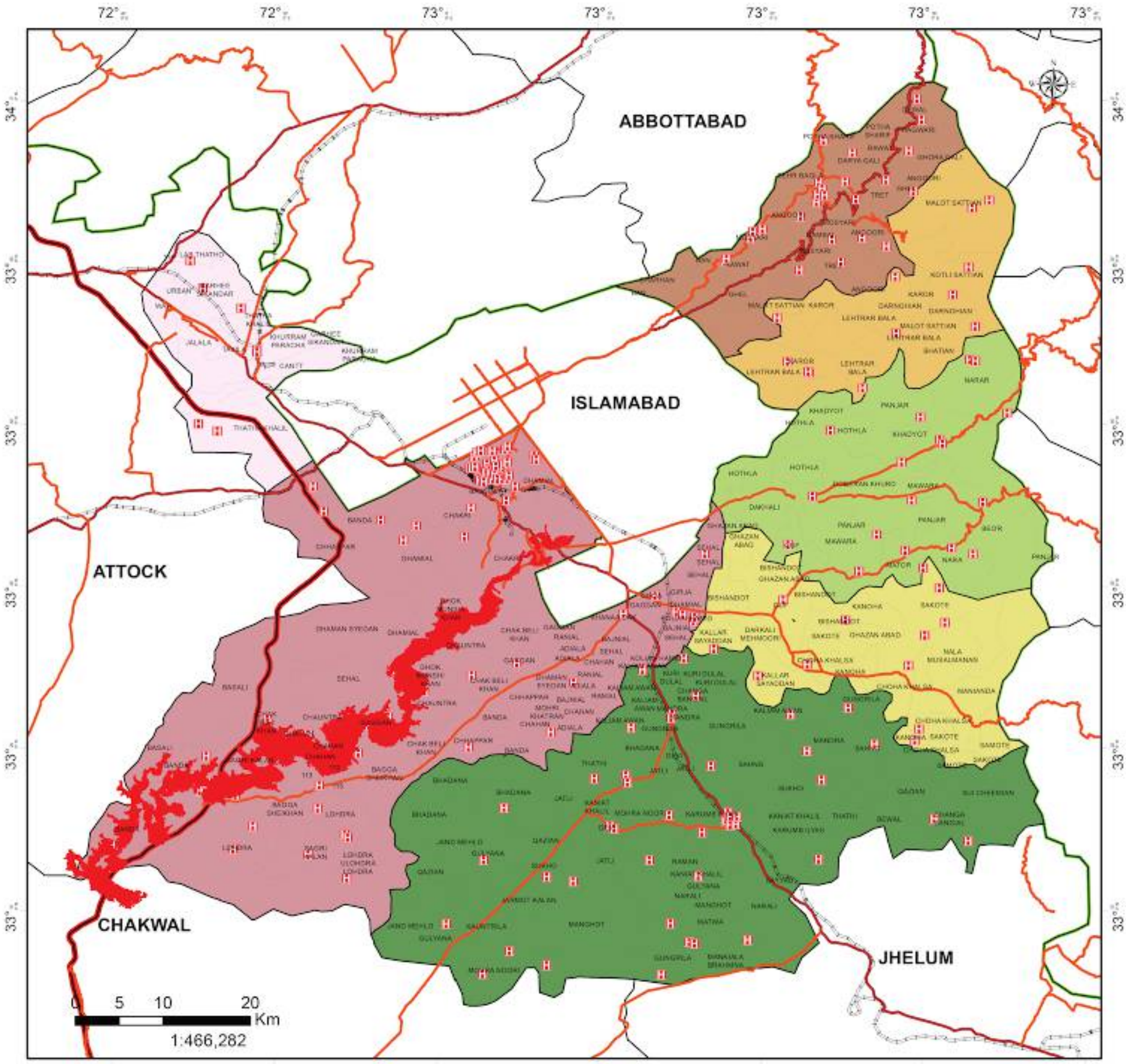
- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

HEALTH FACILITIES & TRANSPORTATION NETWORK EXPOSED TO FLOOD 50 YEARS RETURN PERIOD



Legend

- Flood Hazard 50 Year Return Period
- Health Facilities
- Major Roads
- Motorways
- National Highway
- Strategic Road
- Railway Tracks

Tehsil Boundary

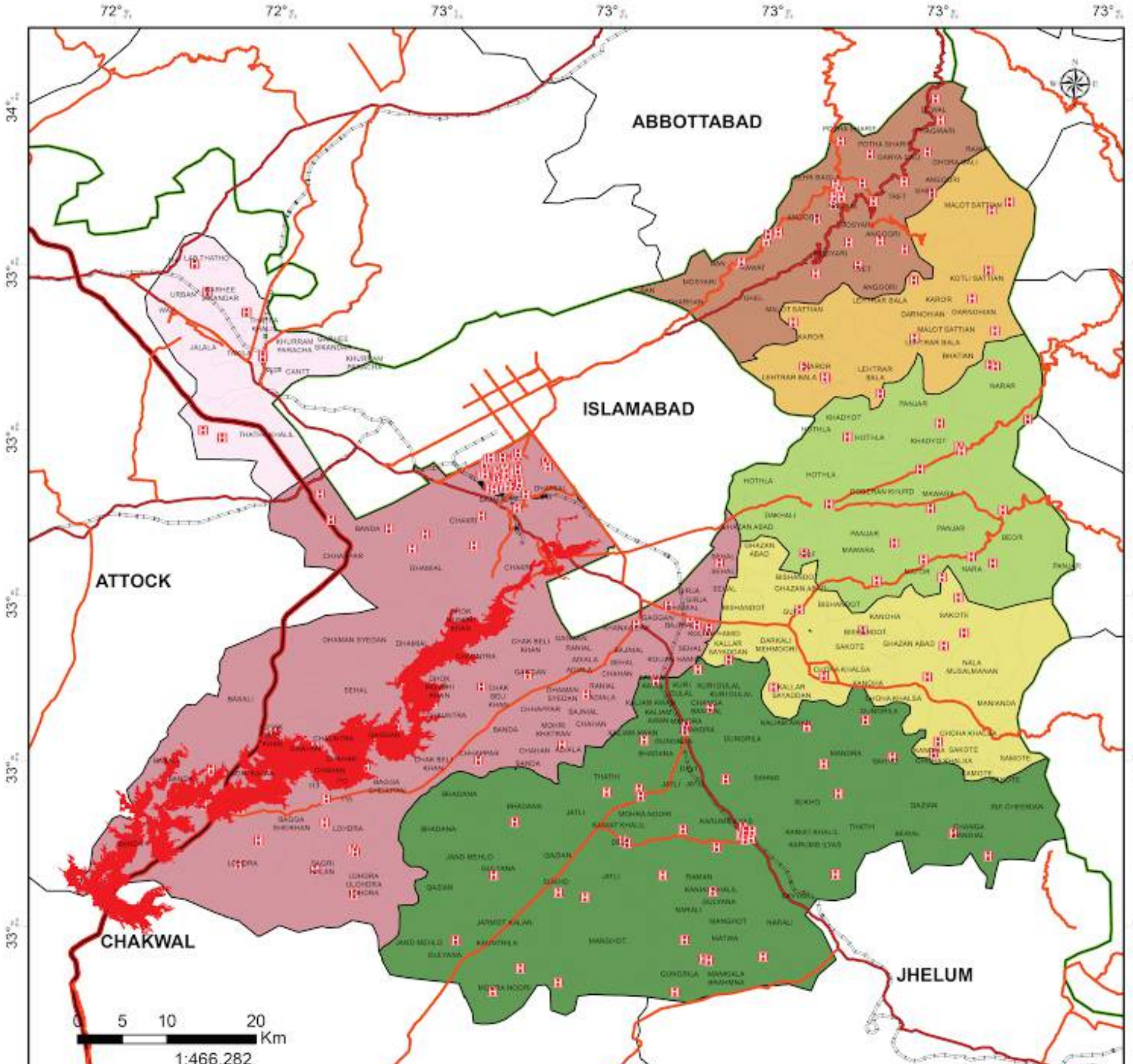
- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

HEALTH FACILITIES & TRANSPORTATION NETWORK EXPOSED TO FLOOD 100 YEARS RETURN PERIOD



Legend

- Flood Hazard 100 Year Return Period
- Health Facilities
- Major Roads
- Motorways
- National Highway
- Strategic Road
- Railway Tracks

Tehsil Boundary

- Gujar Khan
- Kahuta
- Kallar Sayyedan
- Kotli Sattian
- Murree
- Rawalpindi
- Taxila

- Union Council Boundary
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

D | VULNERABILITY ASSESSMENT

- PHYSICAL VULNERABILITY
- SOCIAL VULNERABILITY
- FOOD SECURITY

26 SOCIAL VULNERABILITY ASSESSMENT

Vulnerability Assessment has been undertaken in terms of:

(a) Physical Dimension (b) Social Aspects (c) Agro based Food Security

Exposure is defined as the interaction of element at risk and hazard. The hazard severity, extent or magnitude of various return periods indicates the degree to which the elements at risk are exposed to a particular hazard. Primary and secondary sources were used for exposure analysis and it was performed by overlaying hazard information with elements at risk. Elements at risks were considered in the dimensions of population, building, essential & critical infrastructures and livelihood.

Physical Vulnerability Analysis (PVA)

For fragility analysis of buildings the structures are classified into engineered and non-engineered constructions. The engineered structured are analyzed by conducting laboratory experiments on building constituent materials such as brick units, mortar, brick assemblages, brick panels and brick walls for masonry structures and concrete cylinders, reinforcing steel bars, structural beam-column members for reinforced concrete structures. However, the complexity of non-engineered buildings, that depend solely on material properties are not reliable owing to the complexity of structure for modeling On National scale the construction typologies in Pakistan are primarily based on the type of material used in the construction of walls, floors and roof, and the overall construction quality of a structure typology.

Based on the type used according to EMS-98 the building vulnerability scoring for earthquake and flood hazard are given below where fragility against earthquake is calculated using shake table test and numerical analysis approach, while flood vulnerabilty scoring is based on historical damage statistics.

Building Vulnerability Scoring

Building Types	EMS-98	Vulnerability Score	
		Floods	Earthquakes
Reinforced Concrete	RC1	2.5	3.09
Stone Masonry	M1	5.4	5.56
Mud/Adobe Masonry	M2	7.14	7.14
Brick Masonry	M5	3.66	3.79
Wood/Bamboo Traditional	M7	4.82	2.50
Block Masonry	M8	4.24	5.00
Others Undefined	00	5	6.25

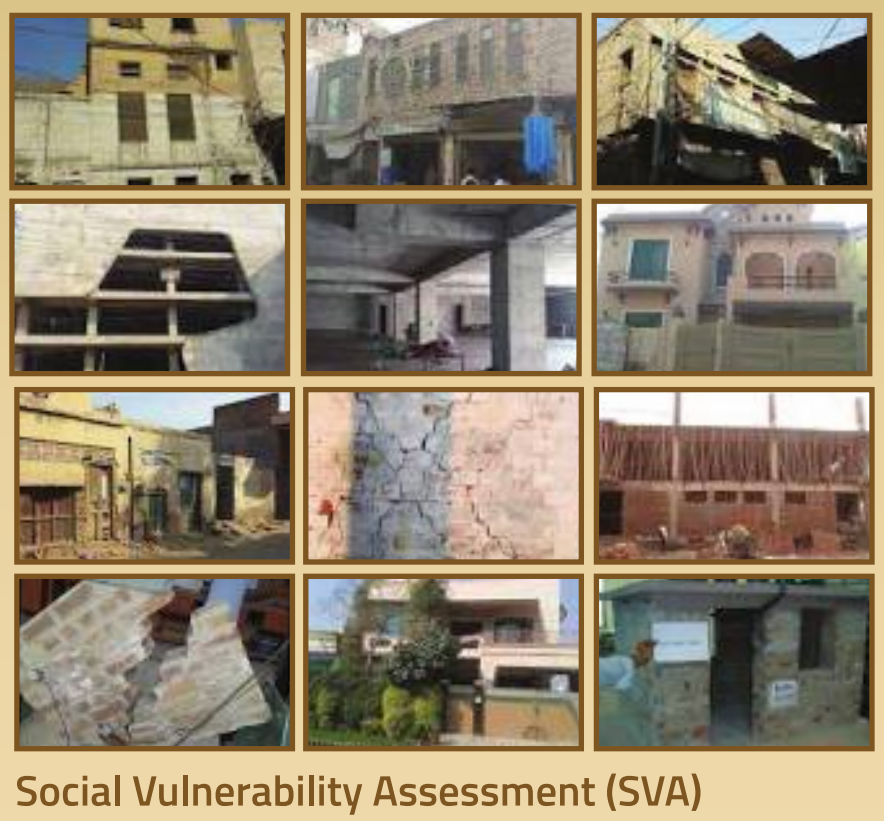
Building Vulnerability Scoring as per PBS Classification

Building Types	Floods	Earthquakes
Kaccha	6.5	7
Semi-Pacca	5.0	6
Pacca	2.5	3

The damage state of building material based on the repair cost ratio i.e. the ratio of the cost of repair to the total building cost is given below.

Damage State	Repair Cost Ratio
Slight	0 - 5%
Moderate	5 - 20%
Heavy	20 - 50%
Severe	50 - 100%

Buildings Surveyed for Physical Vulnerability Assessment



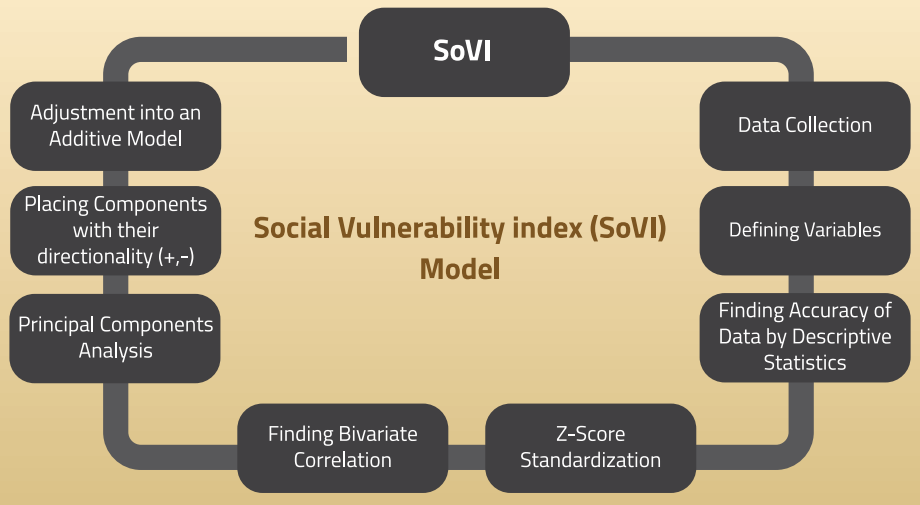
Social Vulnerability Assessment (SVA)

The Social Vulnerability Assessment focuses on the vulnerability characterization of communities, considering both the vulnerabilities of physical systems and the social conditions that can increase or decrease the impact of disasters in the considered area. The assessment is based on susceptibility of populations to loss, which is quantified using the methodology known as Social Vulnerability Index (SoVI). The SoVI for District Khushab is given in the table below.

Factors	Component	Directionality	Variance Observed(%)
1	Age, Education, Health Outcome, Socioeconomic Status	Positive	29.76%
2	Rural Farm Populations	Positive	12.5%
3	Information Access	Negative	6.9%
4	Children with Disabilities	Positive	5.99%
5	Social Benefits	Negative	5.66%
6	Infant safety	Negative	5.61%
7	Low income laborers	Positive	5.31%
8	Poverty/Need for External Income Source	Positive	5.22%
9	Preventative Health Measures	Negative	5%

To obtain a final composite score of social vulnerability, the factors were added to obtain the aggregated factor i.e. the Social Vulnerability Index for each of the District:

SoVI Score = Factor 1 + Factor 2 + Factor 3 + Factor 4 + Factor 5 + Factor 6 + Factor 7 + Factor 8 + Factor 9



27 FOOD SECURITY

Distrcit	Tehsil	UC	Food Insecurity Ranking
Rawalpindi	Gujar Khan Tehsil	BEWAL	2
Rawalpindi	Gujar Khan Tehsil	BHADANA	2
Rawalpindi	Gujar Khan Tehsil	CHANGA BANGIAL	2
Rawalpindi	Gujar Khan Tehsil	Daultala	2
Rawalpindi	Gujar Khan Tehsil	DEVI	2
Rawalpindi	Gujar Khan Tehsil	GHUNGRILA	2
Rawalpindi	Gujar Khan Tehsil	GULIANA	2
Rawalpindi	Gujar Khan Tehsil	JAND MEHLO	2
Rawalpindi	Gujar Khan Tehsil	JARMOT KALAN	2
Rawalpindi	Gujar Khan Tehsil	JATLI	2
Rawalpindi	Gujar Khan Tehsil	JHUNGAL	2
Rawalpindi	Gujar Khan Tehsil	KALYAM AWAN	2
Rawalpindi	Gujar Khan Tehsil	KANIAT KHALIL	2
Rawalpindi	Gujar Khan Tehsil	KARUMB ILYAS	2
Rawalpindi	Gujar Khan Tehsil	KAUNTRILA	2
Rawalpindi	Gujar Khan Tehsil	KURI DULAL	2
Rawalpindi	Gujar Khan Tehsil	MANDRA	2
Rawalpindi	Gujar Khan Tehsil	MANGOT	2
Rawalpindi	Gujar Khan Tehsil	MANKIALA BRAHMNA	2
Rawalpindi	Gujar Khan Tehsil	MATWA	2
Rawalpindi	Gujar Khan Tehsil	MOHRA NOORI	2
Rawalpindi	Gujar Khan Tehsil	NARALI	2
Rawalpindi	Gujar Khan Tehsil	PANJGRAN KALAN	2
Rawalpindi	Gujar Khan Tehsil	QAZIAN	2
Rawalpindi	Gujar Khan Tehsil	RAMAN	2
Rawalpindi	Gujar Khan Tehsil	SAHANG	2
Rawalpindi	Gujar Khan Tehsil	SAYYAD	2
Rawalpindi	Gujar Khan Tehsil	SUI CHEEMIAN	2
Rawalpindi	Gujar Khan Tehsil	THATHI	2
Rawalpindi	Gujar Khan Tehsil	BEOR	2
Rawalpindi	Kahuta Tehsil	BISHANDOT	2
Rawalpindi	Kahuta Tehsil	CHOHA KHALSA	2
Rawalpindi	Kahuta Tehsil	DAKHALI	2
Rawalpindi	Kahuta Tehsil	DARKLI MAMOORI	2
Rawalpindi	Kahuta Tehsil	DOBERAN KHURD	2
Rawalpindi	Kahuta Tehsil	GHAZAN ABAD	2
Rawalpindi	Kahuta Tehsil	GUF	2
Rawalpindi	Kahuta Tehsil	HOTHLA	2
Rawalpindi	Kahuta Tehsil	KALLAR SAYADDAN	2
Rawalpindi	Kahuta Tehsil	KANOHA	2
Rawalpindi	Kahuta Tehsil	KHADYOT	2
Rawalpindi	Kahuta Tehsil	MANYANDAH	2
Rawalpindi	Kahuta Tehsil	MATOR	2

Distrcit	Tehsil	UC	Food Insecurity Ranking
Rawalpindi	Kahuta Tehsil	SAKOT	2
Rawalpindi	Kahuta Tehsil	SMOTE	2
Rawalpindi	Kahuta Tehsil	BHATIAN	2
Rawalpindi	Kotli Sattian	DARNOHIAN	2
Rawalpindi	Tehsil	DHIR KOT SATIAN	2
Rawalpindi	Kotli Sattian	KAROR	2
Rawalpindi	Tehsil	KOTLI SATTIAN	2
Rawalpindi	Kotli Sattian	LEHTRAR BALA	2
Rawalpindi	Tehsil	MALOT SATIAN	2
Rawalpindi	Kotli Sattian	SANTHA SAROOLA	2
Rawalpindi	Tehsil	WAHGAL	2
Rawalpindi	Kotli Sattian	KAHUTA-I	2
Rawalpindi	Tehsil	KAHUTA-II	2
Rawalpindi	Kotli Sattian	GUJAR KHAN-II	2
Rawalpindi	Tehsil	GUJAR KHAN-III	2
Rawalpindi	Kotli Sattian	GUJAR KHAN-I	2
Rawalpindi	Tehsil	SUKHO	2
Rawalpindi	Kotli Sattian	DEWAL	2
Rawalpindi	TehsilAR	PHAGWARI	2
Rawalpindi	Kahuta Tehsil	POTHA	2
Rawalpindi	Kahuta Tehsil	GHEL	2
Rawalpindi	Gujar Khan Tehsil	RAWAT	2
Rawalpindi	Gujar Khan Tehsil	SEHR BAGLA	2
Rawalpindi	Gujar Khan Tehsil	DARYA GALI	2
Rawalpindi	Murree Tehsil	GHORA GALI	2
Rawalpindi	Murree Tehsil	NAMBAL	2
Rawalpindi	Murree Tehsil	MOSYARI	2
Rawalpindi	Murree Tehsil	ANGOORI	2
Rawalpindi	Murree Tehsil	TRET	2
Rawalpindi	Murree Tehsil	CHARHAN	2
Rawalpindi	Murree Tehsil	BAN	2
Rawalpindi	Murree Tehsil	MURREE	2
Rawalpindi	Murree Tehsil	MURREE HILLS CANTT	2
Rawalpindi	Rawalpindi Tehsil	SHAKRIAL(S&N)	2
Rawalpindi	Rawalpindi Tehsil	KHANA DAK	2
Rawalpindi	Rawalpindi Tehsil	CHAK LALA	2
Rawalpindi	Rawalpindi Tehsil	DHOK MUNSHI KHAN	2
Rawalpindi	Rawalpindi Tehsil	KOTHA KALAN	2
Rawalpindi	Rawalpindi Tehsil	MORGAH	2
Rawalpindi	Rawalpindi Tehsil	ADIALA	2
Rawalpindi	Rawalpindi Tehsil	DHAMAN SYEDAN	2
Rawalpindi	Rawalpindi Tehsil	DHAMIAL	2
Rawalpind	Rawalpindi Tehsil	LAKKHAN	2

E | RISK ASSESSMENT

Population Density

Building Density

Health Facilities

Communication Towers

Major Industries

Roads

Education Facilities

Railway

Critical Infrastructure

28 INTEGRATED RISK ASSESSMENT

The given study has employed Integrated Risk Assessment Model, as shown in the figure below, for the cumulative risk assessment of study district. The Model takes into account both quantitative and qualitative risk assessment approaches. The methodology is based on multi criteria evaluation as well as analytical hierarchy process. For this purpose, set of indicators for each risk factors have been carefully taken based on the availability as well as the specific context of the study district. In the given methodology four separate dimensions of risk are considered as "factor Components" i.e. hazard, exposure, vulnerability and capacity. To analyze the value of factor components, a combination of quantitative, qualitative and contextual indicators have be assigned to each factor component. Each factor consists of a sets of indicators which cover several aspects of risk. The Risk Index considered a total of 52 indicators to cover physical, economic, demographic, social, environmental and economic dimensions of risk. Specific weights have been assigned to each indicator in order to acutely calculate its impact on risk. The maximum sum of all the elements of weights and indicators can have minimize value of 100, whereas the minimum sum is 0. The risk formula used in the Study is given below:

Risk= (Hazard x Vulnerability x Exposure / Capacity)

Five classes have been devised to categorize risk between "No to Very Low" Risk to "Very High Risk".

Risk Score	Risk State
>4.1	Extremely High
3.1-4.0	High to very High
2.1-3.0	Moderate to High
1.1-2.0	Low to moderate
0-1.0	No to very Low

Earthquake Hazard Severity Score		
3.0 - 3.9 Richter Scale	1	Very Low
4.0 - 4.9 Richter Scale	2	Low
5.0 - 5.9 Richter Scale	3	Moderate
6.0 - 6.9 Richter Scale	4	High
7 more Richter Scale	5	Very High
0 represents **No Hazard**		

Flood Hazard Severity Score		
0.3	1	Very Low
3.1 - 6	2	Low
6.1 - 9	3	Moderate
9.1 - 12t	4	High
> 12	5	Very High
0 represents **No Hazard**		

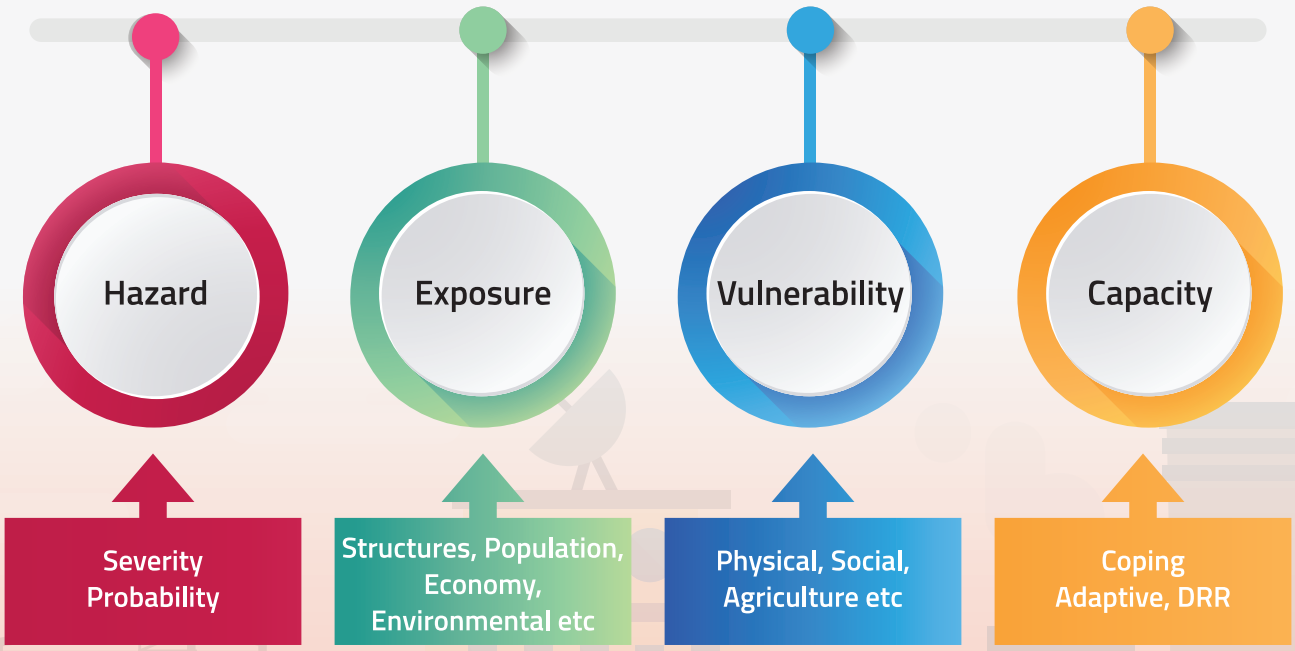
Drought Hazard Severity Score		
No Drought	1	Very Low
Mild	2	Low
Moderate	3	Medium
Severe	4	High
Extreme	5	Very High
0 represents **No Hazard**		

Exposure Scoring Scale	
1	No to Negligible
2	Low
3	Medium
4	High
5	Extremely High

Vulnerabilty Scoring Scale	
1	No to Negligible
2	Low
3	Medium
4	High
5	Extremely High

Capacity Scoring Scale	
1	No to Negligible
2	Low
3	Medium
4	High
5	Extremely High

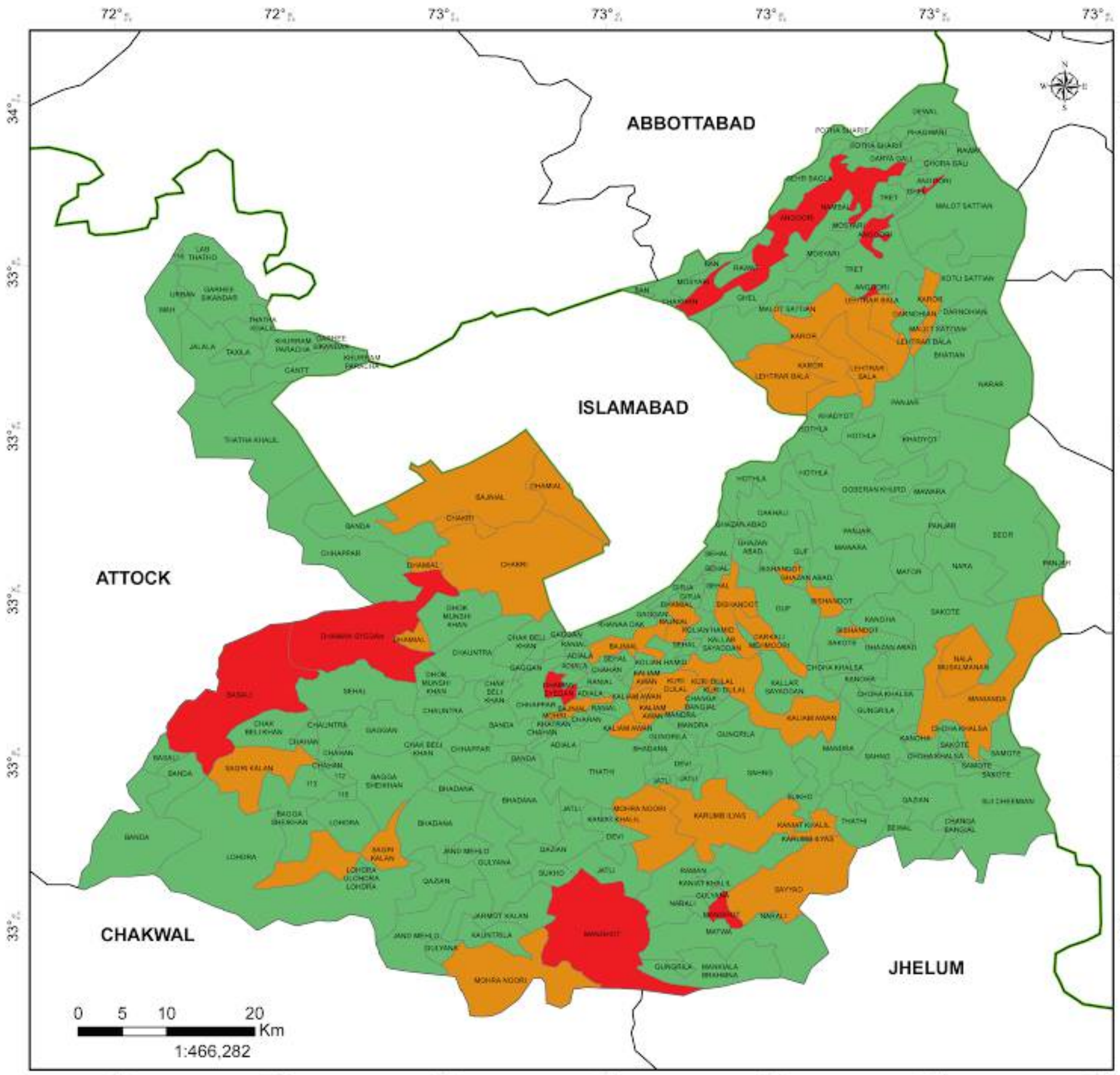
Disaster Risk Impact Factor



29 RISK ASSESSMENT BY HAZARD TYPE

Union Council	Hazard	Exposure	Vulnerability	Capacity	Risk			Overall
					Earthquake	Flood	Drought	
Adam Zai	1	3	3	2	3	1	2	2
Ainzari	2	3	3	2	3	1	2	2
AKBAR PURA (SHINDI PAYAN)	1	3	3	2	2	2	1	1
Aman Kot	3	3	3	2	1	3	1	2
Aza Khel Bala	3	3	3	2	2	3	2	2
Aza Khel Payan	3	3	3	2	1	3	1	2
Badrashi	1	3	3	2	1	1	2	1
BALU	2	3	3	2	1	1	1	1
BANDA MOHIB	2	3	3	2	2	3	1	2
Bara Banda	1	3	3	2	1	1	1	1
Chouki Mamrez	1	3	3	2	1	1	1	1
DAG BAISUD	1	3	3	2	1	1	2	1
DAG ISMAIL KHEL CHAPRI	1	3	3	2	3	1	2	2
Dagai	2	3	3	2	1	2	1	1
Dakhli Spin Khak	1	3	3	2	3	1	2	2
Dheri Katti Khel	1	3	3	2	3	1	2	2
Ganderi	2	3	3	2	1	1	1	1
JALLO ZAI	1	3	3	2	1	1	2	1
Jehangira	2	3	3	2	1	3	2	2
Kabul River	1	3	3	2	3	1	2	2
Kahi	1	3	3	2	3	1	2	2
Khairabad	2	3	3	2	1	3	2	2
Khaishki Bala	3	3	3	2	1	3	2	2
Khaishki Payan	2	3	3	2	1	2	2	2
Kuderzai Khan Sher Garhi	2	3	3	2	2	2	1	2
KURVI	2	3	3	2	1	2	2	2
M.c. Jehangera	1	3	3	2	1	1	3	2
Manduri	1	3	3	2	3	1	2	2
Manki Sharif	2	3	3	2	1	2	2	2
Mera Akora Khattak	1	3	3	2	2	1	2	2
Misri Banda	1	3	3	2	1	1	2	1
Mughalki	1	3	3	2	3	1	1	2
Nazampur Garu	3	3	3	2	1	3	2	2
Nowshera Cantt	3	3	3	2	1	3	2	2
Nowshera Kalan	1	3	3	2	3	1	1	2
Pahari Kati Khel	2	3	3	2	1	2	2	2
Pir Piai	3	3	3	2	1	3	1	2
Pir Sabaq	1	3	3	2	1	1	1	1
Rashaki	1	3	3	2	3	1	2	2
Shah Kot	2	3	3	2	1	1	1	1
Taru	3	3	3	2	2	2	1	2
Zara Miana	1	3	3	2	3	1	2	2
Ziarat Kaka Sahib	1	3	3	2	1	1	2	1

DROUGHT RISK



Legend

Drought Risk

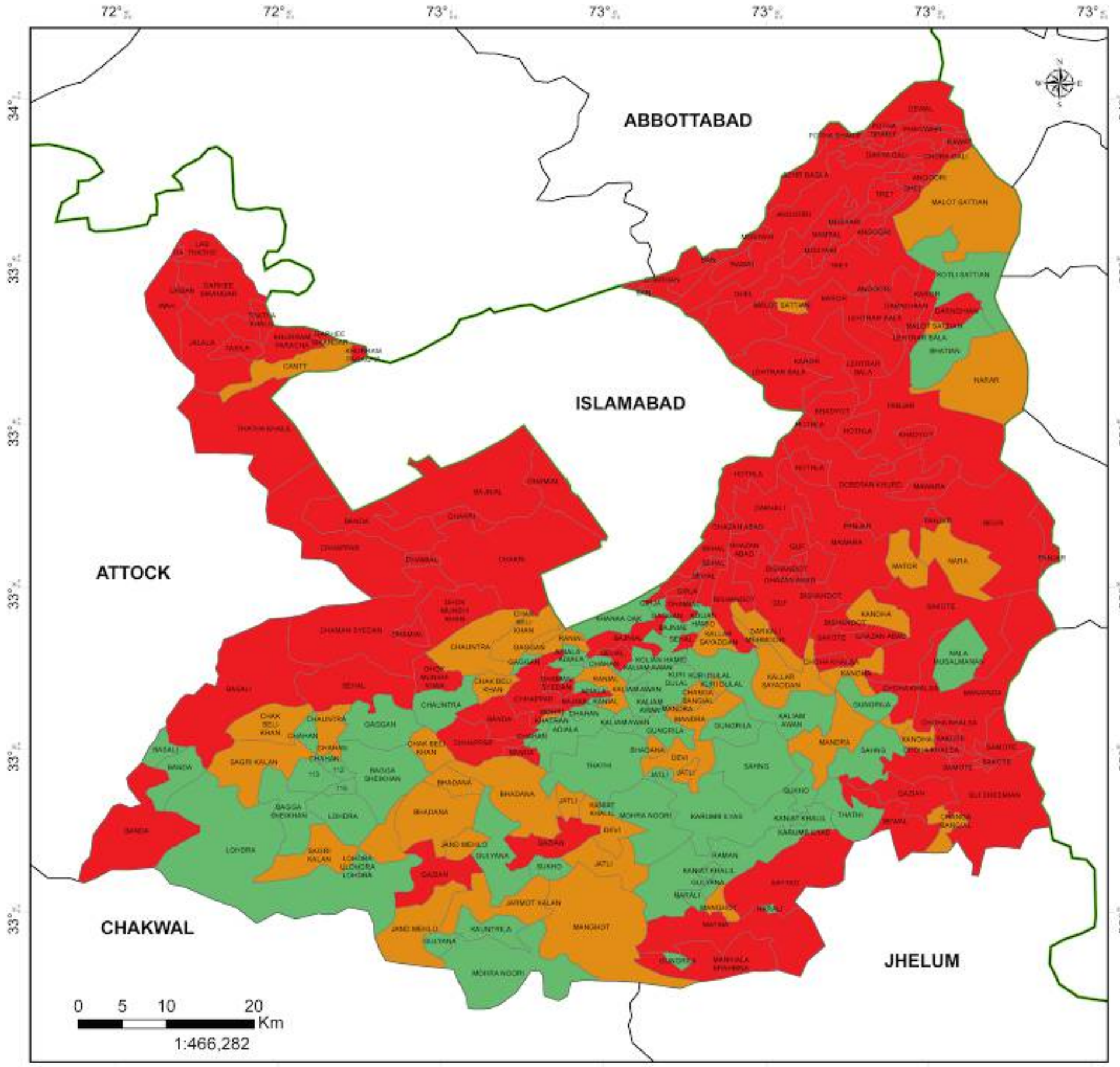
- Low
- Medium
- Very High
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

UN-HABITAT

EARTHQUAKE RISK



Legend

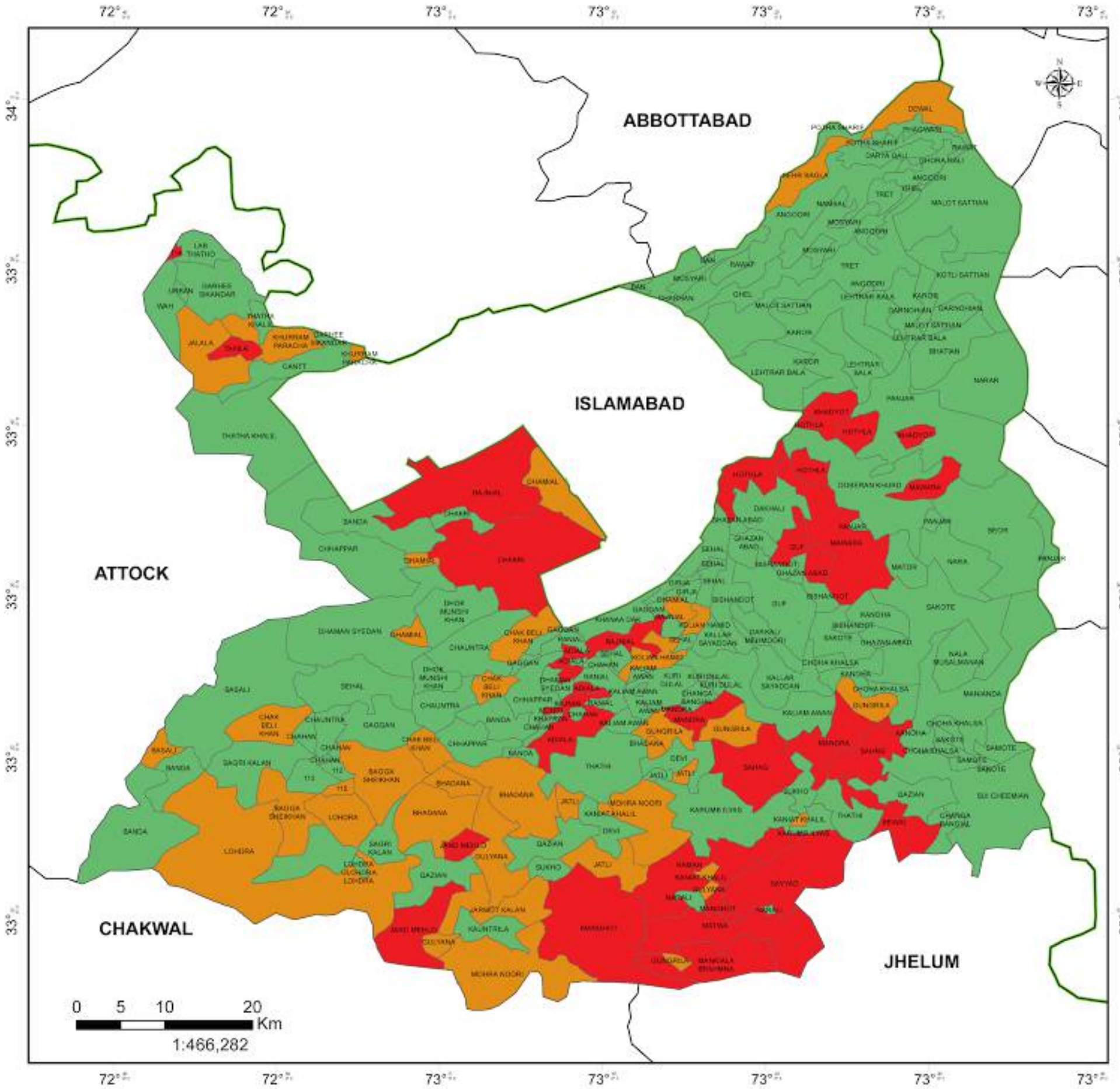
Earthquake Risk

- Low
- Medium
- Very High
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

FLOOD RISK



Legend

Flood Risk

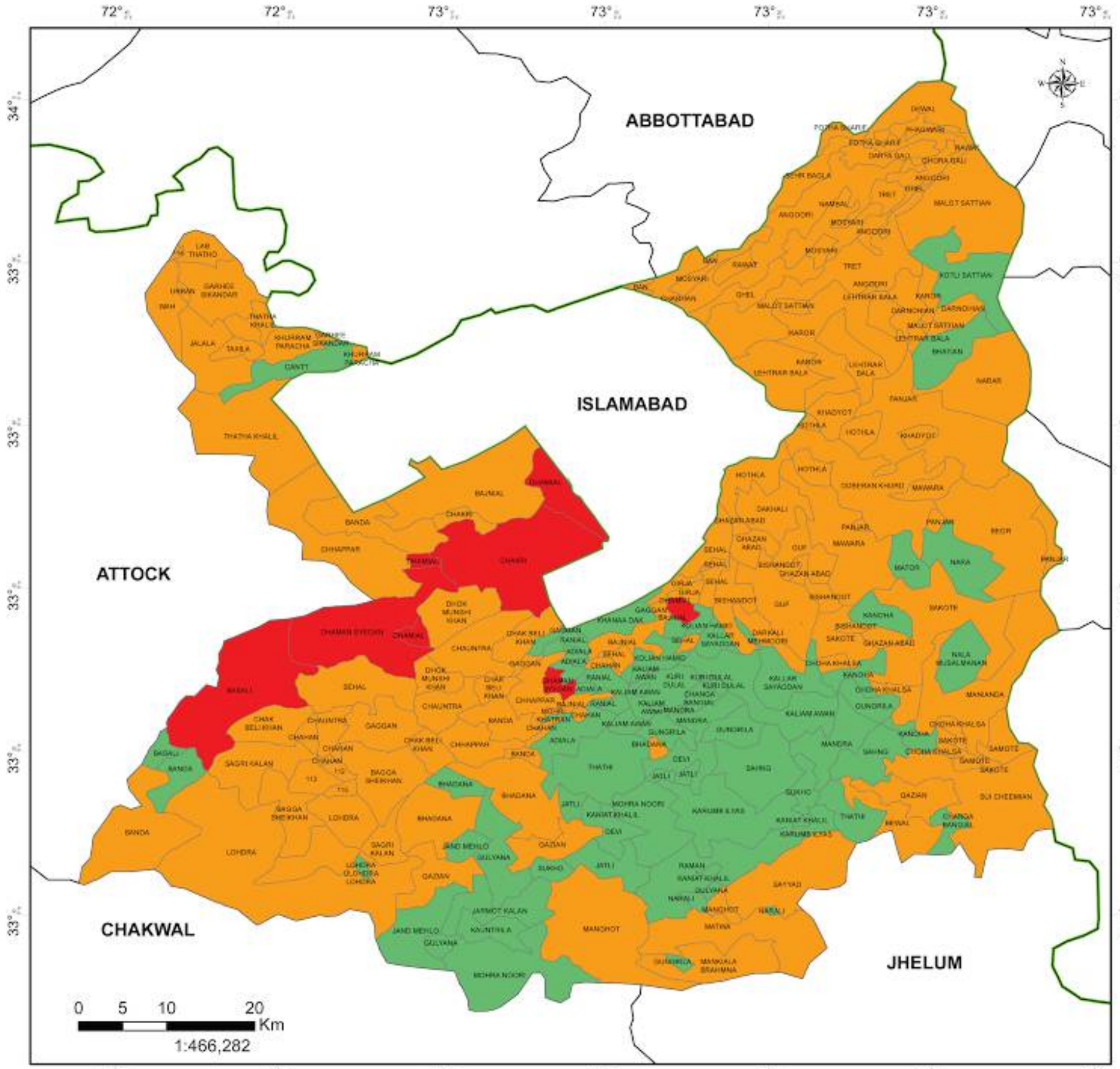
- Low
- Medium
- Very High
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

PAKISTAN National Disaster Management Authority NDMA

UN-HABITAT

COMPOSITE RISK



Legend

Composite Risk

- Low
- Medium
- High
- District Boundary
- Provincial Boundary

Multi Hazard Vulnerability & Risk Assessment, Rawalpindi, Punjab, Pakistan

UN-HABITAT

GLOSSARY OF TERMS

Acceptable Risk	The level of potential losses that a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions.
Accountability	Obligation to demonstrate that work has been conducted in compliance with agreed rules and standards or to report fairly and accurately on performance results vis a vis mandated roles and/or plans. This may require a careful, even legally defensible, demonstration that the work is consistent with the contract terms.
Activity	Actions taken or work performed through which inputs, such as funds, technical assistance and other types of resources.
Adaptation	The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.
Affected Area	An area or part of country affected by disaster.
Alluvium Deposits	A deposit of clay, silt, and sand left by flowing floodwater in a river valley or delta, typically producing fertile soil.
Avalanche	An avalanche (also called a snow slide) is a rapid flow of snow down a sloping surface of a mountain. Avalanches are triggered due to mechanical failure of the snow when the forces on the snow exceed its cohesion strength.
Average Household Size	Average Number of persons per household.
Bare Area with Sparse Natural Vegetation	Sand Dunes with natural vegetation, bare rocks (with sparse vegetation) and desert flat pains are included in this class.
Bare Areas	This class describes areas that have very less natural and manmade vegetation cover which include sand dunes and barren land.
Base-Line Study	An analysis describing the situation prior to a development intervention, against which progress can be assessed or comparisons made.
Basic Health Unit (BHU)	The BHU is located at a Union Council and serves a catchment population of up to 25,000. Services provided at BHU are promotive, preventive, curative and referral. BHU provides all PHC services along with in tegral services that include basic medical and surgical care. MCH services are also part of the services package being provided at BHU. BHU provides first level referral to patients referred by LHWs. BHU refers patients to higher level facilities as and when necessary.
Built-up Area	It defines all built areas (urban, industrial, airport etc.) with all vegetated areas linked to the built-ups such as gardens, golf courses, urban recreation parks, plots devoted to urban expansion etc.
Capacity	The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals.
Capacity Building	Efforts aimed to develop human skills or societal infrastructure within a community or organization needed to reduce the level of risk. In extended understanding, capacity building also includes development of institutional, financial, political and other resources, at different levels of the society.
Census	Census is an official count or a survey, especially of a population.
Climate Change	(a) The Inter-governmental Panel on Climate Change (IPCC) defines climate change as: "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external force or to persistent anthropogenic changes in the composition of the atmosphere or in land use". (b) The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".
Climatology	Climatology or climate science is the scientific study of climate, scientifically defined as weather conditions averaged over a period of time.
Coping Capacity	The means by which people or organizations use available resources and abilities to face a disaster. In general, this involves managing resources, both in normal times as well as during crises or adverse conditions.
Craton	The term craton is used to distinguish the stable portion of the continental crust from regions that are more geologically active and unstable. Cratons can be described as shields, in which the basement rock crops out at the surface, and platforms, in which the

	basement is overlaid by sediments and sedimentary rock.
Critical Facilities	The primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency.
Crop Irrigated	Areas used for the production of annual crops, such as corn, vegetables, soybeans, tobacco and cotton. This class also includes all land being actively tilled.
Crop Marginal and Irrigated Saline	Crop marginal and irrigated saline are identified as those areas which are currently used for agriculture with low and unstable rainfall or higher rainfall areas intensively used, relative to user capability, under existing population densities, traditional technologies and institutional structures.
Crop Rainfed	The term rainfed agriculture is used to describe farming practicesthat rely only on rainfall for water.
Cyclone	A large-scale system of winds that spiral in toward a region of low atmospheric pressure. Because low-pressure systems generally produce clouds and precipitation, cyclones are often simply referred to as storms. A tropical cyclone is one that forms over warm tropical waters. Such a system is characterized by a warm, well-defined core and can range in intensity from a tropical depression to a tropical cyclone. While tropical cyclones can produce extremely powerful winds and torrential rain, they are also able to produce high waves and damaging storm surge.
Debris Flow	This is a phenomenon in which soil and rock on the hillside or in the riverbed are carried downward at a dash under the influence of continuous rain or torrential rain.
Demographics	It is the statistical data relating to the population and particular groups within it.
Density	Density refers to number of elements (population, buildings, roads etc.) per unit area.
Disaster	A catastrophe or a calamity in an affected area arising from natural or man-made causes or by accident which results in substantial loss of life or human suffering or damage to, and destruction of property. A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.
Disaster Management	Managing the complete spectrum of disaster including preparedness, mitigation, response, recovery, relief and rehabilitation.
Disaster Risk	The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period.
Disaster Risk Management (DRM)	The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.
Disaster Risk Reduction (DRR)	The concept and practice of reducing disaster risks through systematic efforts to analyses and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.
District Head Quarter (DHQ)	The District Head Quarters (DHQ) Hospital is located at District headquarters level and serves a population of 1 to 3 million, depending upon the category of the hospital. The DHQ hospital provides promotive, preventive, curative, advance diagnostics, inpatient services, advance specialist and referral services. All DHQ hospitals are supposed to provide basic and comprehensive care.
Drought	A drought is an extended period when an area notes a deficiency in its water supply when the demand for water exceeds the supply. Generally, this occurs when an area receives consistently below average precipitation. It can have a substantial impact on the ecosystem and agriculture of the affected region.
Early Warning	The provision of timely and effective information, through identified institutions, to communities and individuals so that they could take action to reduce their risks and prepare for effective response.
Earthquake	Earthquake is defined as shaking and vibration at the surface of the earth resulting from underground movement along a fault plane of from volcanic activity or due to movement of plate boundaries of the Earth. The scale of earthquakes is measured by moment magnitude and the shaking intensity at each location is usually reported by Mercalli intensity scale.
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved, taking into account their relative importance.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
Element at Risks	Elements at Risk include all tangible (population, essential and critical infrastructure, building, crops and so on) and intangible elements (monetary values) that are at risk to any potential damage during extreme events.
Elevation	The measurement of height of a surface above sea level or ground level.

Emergency Management	The management and deployment of resources for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation.
Employment	The "employed" comprises all persons ten years of age and above who worked at least one hour during the reference period and were either "paid employed" or "self-employed". Persons, employed on permanent/regular footings, who have not worked for any reason during the reference period are however, treated as employed.
Entity	Any government or non-government organization, national or international stakeholders including Federal, Provincial and District agencies and United Nations' agencies relevant to Disaster Management as described in Section 23-2 [(a) and (d)] of NDM Act 2010, which is interested in the execution of MHVRA activity hereinafter referred to as Entity.
Eolian Deposits	Eolian Deposits are the Wind-blown deposits on Planetary surface.
Evaluation	The systematic and objective assessment of an on-going or completed project, program or policy, its design, implementation and results. The aim is to determine the relevance and fulfillment of objectives, development efficiency, effectiveness, impact and sustainability. An evaluation should provide information that is credible and useful, enabling the incorporation of lessons learned into the decision making process of both recipients and donors.
Evaporites	Evaporites are individual minerals found in the sedimentary deposit of soluble salts that results from the evaporation of water.
Exposure	People, property, systems, or other elements present in hazard zones that are subject to potential losses.
Flash Flood	A flash flood is a phenomenon of rapid flooding (mostly less than 6 hours) of geomorphic low-lying areas due to downpour or heavy rains caused by low depression, climate front line (thunderstorm) or cyclone.
Flood	Flood is a phenomenon of inundation by water coming from a direct rainfall or river, drainage or other water bodies, such as lakes or seas due to overflowing from ordinary boundary between land and water or water surging.
Flood Plain Deposits	Floodplain deposits are also called as Alluvial Plain, flat land area adjacent to a stream, composed of unconsolidated sedimentary deposits (alluvium) and subject to periodic inundation by the stream.
Food Insecurity	The state of being without reliable access to a sufficient quantity of affordable and nutritious food.
Forecast	Estimate of the occurrence of a future event (UNESCO, WMO). The term is used with different meanings in different disciplines.
Geography	Geography is the study of the Earth and its features, its inhabitants, and its phenomena.
Geological Composition	Geological composition is the fundamental unit of lithostratigraphy that contain certain amount of rock strata that have a comparable lithology, facies or other similar properties.
Geology	Geology is an earth science concerned with the solid Earth, the rocks of which it is composed and the processes by which they change over time.
Geospatial Data Bank	Spatial Data and Geographic Information Management System (GIS) data relevant to disaster and the corresponding data integration in the form of geospatial data bank. In the context of disaster management, following types of data is required: i. Data on the disastrous phenomena (e.g. landslides, floods, earthquakes), their location, frequency, magnitude etc. ii. Data on the environment in which the disastrous events might take place: topography, geology, geomorphology, soils, hydrology, land use, vegetation etc. iii. Data on the elements that might be destroyed if the event takes place: infrastructure, settlements, population, socioeconomic data etc. iv. Data on the emergency relief resources, such as hospitals, fire brigades, police stations, warehouses etc.
GLOF	"GLOF" refers to a Glacial Lake Outburst Flood that occurs when water in a glacier lake suddenly discharges due to a breach of a moraine dam (glacier lake). The results can be catastrophic to the downstream riparian area. (Richardson and Reynolds 2000).
Hazard	A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.
Hazard Analysis	Identification, studies and monitoring of any hazard to determine its potential, origin, characteristics and behavior.
Hill Torrent (Flood)	Hill torrent floods are basically a rapid flooding of geomorphic steep surface areas at alluvial cones or floodplain areas caused by overflowing water from channels due to rapid velocity and any amount of flow quantity.
Household	A household is defined to be constituted of all those persons who usually live together and share their meals. A household may consist of one person or more than one person who may or may not be related to each other.
Human-Induced Disasters	Natural disasters that are accelerated/ aggravated by human influence. A landslide, for example, may be purely natural, as a result of a heavy rainfall or earthquake, but it may also be human induced, as a result of an over steepened road-cut.

Human-Made Disasters	Events which are caused by human activities (such as atmospheric pollution, industrial chemical accidents, major armed conflicts, nuclear accidents, oil spills etc.)
Impacts	Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended.
Indicators	Indicators are variables or parameters used to describe drought conditions. Examples include precipitation, temperature, streamflow, groundwater and reservoir levels, soil moisture, snowpack, etc.
Indices	Indices are typically a computed numerical representation of drought severity, assessed using climatic or hydro-meteorological inputs including the indicators listed above. In short, they aim to measure the qualitative state of drought on the landscape for a given time period. Indices are technically indicators as well. Monitoring the climate at various timescales allows identification of short-term wet periods within long-term droughts or short-term dry spells within long-term wet periods.
Infant Mortality Rate	The number of deaths of infants under one year of age per 1000 live births in a given year.
Irrigated Area	Irrigated agricultural area refers to the area in which the moisture of soil is controlled for the better growth of seeds and better crop production by providing water through different mode of water supply such as rivers, major, minor or distributary canals, tube wells, wells, spraying or other water to the crops.
Irrigation Sources	It refers to the source(s) by means of which the cultivated area is irrigated partially or wholly.
Land Cover	Land Cover is defined as the observed (bio) physical cover on the earth's surface.
Land Use	Land Use is characterized by the arrangements, activities and inputs that people undertake in a certain type of land in order to produce, change or maintain it.
Land Use Planning	The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long term economic, social and environmental objectives and the implications for different communities and interest groups, and the subsequent formulation and promulgation of plans that describe the permitted or acceptable uses. Land-use planning can help to mitigate disasters and reduce risks by discouraging high-density settlements and construction of key installations in hazard-prone areas, control of population density and expansion Mitigation Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.
Landslide	A landslide is a phenomenon in which the movement of a mass of rock, debris, or earth down a slope due to gravity. The materials may move by falling, toppling, sliding, spreading, or flowing. Since a large amount of soil mass usually moves, serious damage can occur.
Latitude	Latitude is a geographic coordinate that specifies the north–south position of a point on the Earth's surface. Latitude is an angle (defined below) which ranges from 0° at the Equator to 90° (North or South) at the poles.
Longitude	Longitude is a geographic coordinate that specifies the east-west position of a point on the Earth's surface. It is an angular measurement, usually expressed in degrees
Meander-Belt	The part of a valley bottom across which a stream shifts its channel from time to time especially in flood.
Middle Schools	Middle Schools are the schools that provide education from 5^{th} to 8^{th} grade.
Mitigation	The lessening or limitation of the adverse impacts of hazards and related disasters.
Monitoring & Evaluation (M&E)	A continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing development intervention with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds.
Mortality Rate	Number of deaths recorded in a population of particular region in a year.
Mouza / Deh	It is a territorial unit with a separate name, definite boundaries, and area precisely measured and divided into plots / khasras / survey numbers. Each mouza is a revenue estate and has a cadastral map maintained in the land revenue record with a Hadbast Number except Sindh Province. Mouza, Deh, Village, Killi and Chak are the names commonly used for it. The term mouza / deh is widely used in the settled areas while the term village and or killi are used in the unsettled areas. There may be one or more settlements, abadies, basties, dhokes, goths, etc. in the territory of a mouza / deh. The mouzas / dehs may also have scattered inhabitation while there may be some mouzas without population as well.
Multi Hazard Vulnerability and Risk Assessment (MHVRA)	Multi Hazard Vulnerability and Risk Assessment is a comprehensive study which intends to evaluate the expected vulnerabilities, risks and losses due to different hazardous events; both natural or man-induced.
Multi Hazards	The term Multi Hazards, as the name would suggest, are the hazards evolved from multiple sources, either inter-related or independent phenomena, and are subject to joint probability theory and analysis.

National Authority	National Authority means National Disaster Management Authority (NDMA).
Natural Disasters	Events which are caused purely by natural phenomena such as earthquakes, floods, cyclones etc.
Nullah	A Pakistani term, used for small rivers a streams carrying fresh water or sewerage disposal.
Performance Indicator	A variable that allows the verification of changes in the development intervention or shows results relative to what was planned.
Physical / Structural Vulnerability	The measure of the fragility structure, engineered or non-engineered, and its associated susceptibility to the natural stresses such as earthquake, flood etc.
Piedmont	Piedmont, in geology, landform created at the foot of a mountain or mountains by debris deposited by shifting streams.
Population Growth Rate	The growth rate is the rate at which a population is increasing (or decreasing) in a given year.
Population Projections	Population Projections are estimates of population number typically based on an estimated population consistent with most recent decennial census and are produced using cohort-component method.
Precipitation	Precipitation is the water that falls from the clouds towards the ground, especially as rain or snow.
Preparedness	Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.
Prevention	Activities to ensure complete avoidance of the adverse impact of hazards.
Primary Healthcare	The primary care facilities include Basic Health Units (BHUs) and Rural Health Centers (RHCs) mainly preventive, outpatient and basic inpatient care.
Primary School	. A primary school is an education facility in which children receive primary or elementary education, coming after preschool and before secondary school.
Quality Assurance	Quality assurance encompasses any activity that is concerned with assessing and improving the merit or the worth of a development intervention or its compliance with given standards. Note: examples of quality assurance activities include appraisal, RBM, reviews during implementation, evaluations, etc.
Range Lands	Range Lands are vast natural landscapes grasslands, shrub lands and wood lands.
Recovery	Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.
Relative Humidity	The amount of water vapour present in air expressed as a percentage of the amount needed for saturation at the same temperature.
Reliability	Consistency or dependability of data and evaluation judgments, with reference to the quality of the instruments, procedures and analyses used to collect and interpret evaluation data.
Relief / Response	The provision of assistance during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term, or protracted duration.
Residual Risk	The risk that remains in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained.
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.
Retrofitting	Reinforcement of existing buildings and structures to become more resistant and resilient to the forces of natural hazards.
Risk	The combination of the probability of an event and its negative consequences.
Risk Assessment	A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.
Risk Management	The systematic approach and practice of managing uncertainty to minimize potential harm and loss.
Risk Transfer	The process of formally or informally shifting the financial consequences of particular risks from one party to another whereby a household, community, enterprise or state authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party.

River	A river is a natural waterway, usually freshwater, flowing toward lower level of water surface such as a lake, a sea, or another river.
Riverine Flood	Flood is a phenomenon of inundation by water coming from a river, drainage or other water bodies, such as lakes or seas due to overflowing from ordinary boundary between land and water or water surging.
Rural Area	A rural area is an open area that has very low population and building density. Generally rural areas are away from cities/towns and its inhabitants are mostly linked with agriculture based livelihood.
Rural Health Centre (RHC)	The RHCs have 10-20 inpatients beds and each serves a catchment population of up to 100,000 people. The RHC provides promotive, preventive, curative, diagnostics and referral services along with inpatient services. The RHC also provides clinical, logistical and managerial support to the BHUs, LHWs, MCH Centers, and Dispensaries that fall within its geographical limits. RHC also provides medico-legal, basic surgical, dental and ambulance services.
Secondary Health Care	It is an intermediate level of health care that is concerned with the provision of specific technical, therapeutic or diagnostic services. It is the first referral level serving a district or a tehsil. Specialist consultation procedures and hospital admissions fall into this category of care. The role of a district hospital in primary health care has been expanded beyond being dominantly curative and rehabilitative to include promotional, preventive and educational roles as part of a primary health care approach.
Secondary School or Higher School	Secondary Schools are the schools which provide education from grade 8 till Intermediate Level, i.e. 12th Grade or FSc.
Sedimentary Rocks	Sedimentary rocks are types of rock that are formed by the deposition and subsequent cementation of that material at the Earth's surface and within bodies of water.
Slope Failure	In this phenomenon, a slope abruptly collapses when the soil that has already been weakened by moisture in the ground loses its self-cohesiveness under the influence of rain or an earthquake. Due to sudden collapse, many people fail to escape if it occurs near a residential area, thus leading to a higher rate of fatalities.
Social Vulnerability	Characteristics of social systems that create the potential for harm or loss to it
Steppe Climate	A semi-arid climate or steppe climate is the climate of a region that receives precipitation below potential evapotranspiration, but not as low as a desert climate.
Storm Surge	A Storm Surge is phenomena of sea level rise associated with a low-pressure weather system, typically a tropical cyclone. Therefore, an early warning plan for “storm surge” should be incorporated with that of “cyclone”.
Streambed	A stream bed is the channel bottom of a stream or river, the physical confine of the normal water flow
Structural / Non-Structural Measures	Structural measures refer to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure. Non-structural measures refer to policies, awareness, knowledge development, public commitment, and methods and operating practices, including participatory mechanisms and the provision of information, which can reduce risk and related impacts.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs. (Brundtland Commission, 1987)
Tehsil Head Quarter (THQ)	These hospitals are located at each THQ and serves a population of 0.5 to 1.0 million. At present majority of THQ hospitals have 40 to 60 beds. The THQ hospital provides promotive, preventive, curative, diagnostics, in patients, referral services and also specialist care. THQ hospitals are supposed to provide basic and comprehensive Emergency Obstetric and New born Care (EmONC). THQ hospital provides referral care to the patients including those referred by the Rural Health Centers, Basic Health Units, Lady Health Workers and other primary care facilities.
Tertiary Healthcare	Tertiary care hospitals are located in the major cities for more specialized inpatient care. Tertiary care is specialized consultative health care, usually for inpatients and on referral from a primary or secondary health professional.
Tsunami	A tsunami is a series of waves in a water body caused by the displacement of a large volume of water, generally in an ocean or a large lake. Earthquakes, volcanic eruptions and other underwater explosions, landslides, avalanche, meteorite impacts and other disturbances above or below water all have the potential to generate a tsunami.
Unemployment	The “unemployed” comprises all the persons ten years of age and above who during the reference period were without work, currently available for work and are seeking work.
Urban Area	An Urban area is human settlement with high population density and infrastructure of built environment. Urban areas are created through urbanization and are categorized by urban morphology as cities, towns, conurbations and suburbs.
Urban Flood	Flood and inundation phenomena occurring in the city or built-up areas.

Veterinary Facility	It refers to the availability of veterinary facilities for livestock with qualified veterinarian (Doctor / Assistant) for provision of medical facilities for farm animals.
Vulnerability	The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.
Wet Areas	Areas which are naturally covered with fresh or saline water such as river and lakes are grouped in this class.
Wheat Procurement Centre	These centres are established every year at the time of wheat harvest in surplus wheat producing areas particularly of the Punjab and Sindh provinces by the Provincial Food Departments and or Pakistan Agricultural Services and Storage Corporation (PASSCO) at appropriate locations. These centres are not permanent in nature and their number in a tehsil / district varies on year to year basis depending upon the procurement policy.

LIST OF ACRONYMS

AMS	Assistant Medical Superintendent
APWMO	Assistant Principal Women Medical Officer
AWO	Automatic Weather Observation
AWS	Automatic Weather Station
C&W	Communication & Works
CBDRM	Community Based Disaster Risk Management
CBEWS	Community-Based Early Warning System
CMO	Casualty Medical Officer
CRI	Composite Risk Index
DC	Deputy Commissioner
DCO	District Coordination Officer
DDMA	District Disaster Management Authority
DDRMP	District Disaster Risk Management Plan
DEWS	Disease Early Warning System
DHQ	District Headquarter Hospital
DM	Disaster Management
DMS	Deputy Medical Superintendent
DRR	Disaster Risk Reduction
DSHA	Deterministic Seismic Hazard Assessment
ENT	Ear, Nose, Throat
EPI	Expanded Program on Immunization
EWS	Early Warning System
PDMA	Provincial Disaster Management Authority
FFC	Federal Flood Commission
FGD	Focus Group Discussion
GIS	Geographic Information System
GLOF	Glacial Lake Outburst Flood
GMPE	Ground Motion Prediction Equation
GOERE	Government Officer Emergency Response Exercise
GPS	Global Positioning System
GSP	Geological Survey of Pakistan
HFA	Hyogo Framework for Action
HTC	Hydro-Thermal Coefficient
INGOs	International Non-governmental Organizations
LSWI	Land Surface Water Index
M&E	Monitoring and Evaluation
MBT	Main Boundary Thrust
MCE	Maximum Considered Earthquake
MGDs	Millennium Development Goals
MHVRA	Multi Hazard Vulnerability and Risk Assessment
MKT	Main Karakorum Thrust
MMT	Main Mantle Thrust
MO	Medical Officer
MOVERE	Mobilization of Volunteer for Emergency Response Exercise
MPE	Most Probable Earthquake
MS	Medical Superintendent
MSSP	Micro Seismic Study Program (Pakistan Atomic Energy Commission)
MM	Moment Magnitude
NARC	National Agricultural Research Center
NCEG	National Center of Excellence in Geology
NDI	NOAA Drought Index
NDMA	National Disaster Management Authority
NDMC	National Disaster Management Commission
NDMP	National Disaster Management Plan
NDMP-SC	Steering Committee for National Disaster Management Plan
NDRIS	National Disaster Risk Information System
NDVI	Normalized Difference Vegetation Index
NDWI	Normalized Difference Water Index
NEOC	National Emergency Operations Centre
NFPP	National Flood Protection Plan
NHA	National Highway Authority
NHEPRN	National Health Emergency Preparedness and Response Network
NIDM	National Institute of Disaster Management
PARC	Pakistan Agricultural Research Council
PASSCO	Pakistan Agricultural Services and Storage Corporation
PBC	Pakistan Broadcasting Corporation
PBS	Pakistan Bureau of Statistics
PCIW	Pakistan Commissioner for Indus Waters
PCRWR	Pakistan Center for Research on Water Resources
PDMA	Provincial Disaster Management Authority
PDSI	Palmer Drought Severity Index
PGA	Peak Ground Acceleration
PHDI	Palmer Hydrological Drought Severity Index
PIPD	Provincial Irrigation and Power Department
PMD	Pakistan Meteorological Department
PMO	Principal Medical Officer
PMU	Project Management Unit
PRA	Participatory Risk Assessment
PSC	Project Steering Committee
PSHA	Probabilistic Seismic Hazard Assessment
PTA	Pakistan Telecommunication Authority
PTCL	Pakistan Telecommunication Company Limited
PTWC	Pacific Tsunami Warning Center
PWMO	Principal Women Medical Officer

R&D	Research and Development
RDMC	Regional Drought Monitoring Centre
RP	Return Period
SFDRR	Sendai Framework for Disaster Risk Reduction
SMA	Soil Moisture Anomaly
SMDI	Soil Moisture Deficit Index
SMO	Senior Medical Officer
SMRFC	Specialized Medium Range Forecasting Centre
SOP	Survey of Pakistan
SoVI	Social Vulnerability Index
SPEI	Standardized Precipitation Evapotranspiration
SPI	Standard Precipitation Index
SPI	Stream Power Index
SPT	Standard Penetration Test
SRSI	Standardized Reservoir Supply Index
SSFI	Standardized Stream Flow Index
SSI	Semi Structured Interviews
SUPARCO	Pakistan Space and Upper Atmospheric Research Commission
SWI	Standardized Water-Level Index
SWMO	Senior Women Medical Officer
SWS	Soil Water Storage
SWSI	Surface Water Severity Index
SWSI	Surface Water Supply Index
TCI	Temperature Condition Index
THQ	Tehsil Headquarter Hospital
TMA	Tehsil Municipal Administration
UC	Union Council
UN	United Nations
VCI	Vegetation Condition Index
VegDRI	Vegetation Drought Response Index
VIC	Variable Infiltration Capacity
WAPDA	Water and Power Development Authority
WASA	Water and Sanitation Agency
WFP	World Food Program
WHO	World Health Organization
WMO	World Meteorological Organization
WMO	Women Medical Officer
WOE	Weight of Evidence (Statistical Model)
WRF	Weather Research and Forecast (Name of Numerical Calculation Model)

DATA SOURCES

DATA TYPE	DATA SOURCE
Agriculture Based Industries	Directorate of Agriculture, Crop Reporting Service, Punjab, Lahore x(Development Statistics-2015)
Animals Slaughtered in Recognized and Un-recognized Slaughter Houses by Type in the District	Directorate of Livestock and Dairy Development (Ext.) Punjab,Lahore
Annual Cellular Subscribers	Pakistan Telecommunication Authority (PTA)
Area Sown under Wheat, Rice, Cotton and Sugarcane in the District	Directorate of Agriculture, Crop Reporting Service, Punjab, Lahore.
Area Sown by Mode of Irrigation	Bureau of Statistics, Punjab, Lahore (2013-2014)
Birth Registration	Multiple Indicator Cluster Survey (MICS) Punjab: 2011
Broadband Subscribers by Technology	Pakistan Telecommunication Authority (PTA)
Building Distribution	PBS
Canal System	Agriculture Department Punjab
Cellular Communication Towers	Pakistan Telecommunication Authority (PTA)
Child Delivery - Location and Type of Assistance	Pakistan Social and Living Standard Measurement (PSLM): 2013-2014
Child Statistics	Multiple Indicator Cluster Survey (MICS) Punjab: 2011
Climatology	http://www.Myweather2.Com/City-Town/Pakistan/Khushab/Climate-Profile.Aspx http://en.Climate-Data.Org/Location/3077/
Diesel and Electric Tube wells Installed by Ownership	Directorate of Agriculture Crop Reporting Service, Punjab, Lahore.
Distribution Of Land Use/ Land Cover (LU/LC)	Space and Upper Atmosphere Research Commission (SUPARCO)
Education Facilities	School Education Department, Government of Punjab
Elevation Bands	National Aeronautics and Space Administration (NASA)
Establishment of Private Poultry Farms in the District (2013-14)	Directorate of Poultry Research Institute, Punjab, Rawalpindi
Flood Inundation Frequency	National Disaster Management Authority (NDMA)
Geology	Geological Survey of Pakistan (GSP)
Health Facilities	Health Department Punjab/ District Health Information System Punjab (Government Of Punjab)
Household Characteristics	Multiple Indicator Cluster Survey (MICS) Punjab: 2011
Industries	District Officer (E&IP), Khushab
Key Indicators - Child Mortality Statistics	Multiple Indicator Cluster Survey (MICS) Punjab: 2011
Khushab City Land Use Map 2013	NDMA
Landline Service	District Pre-Investment Study – 2012, Directorate Of Industries, Punjab Poonch House, Multan Road, Lahore.
Literacy Rate- 2015	2015 Projected

DATA TYPE	DATA SOURCE
Literacy Ratio	Pakistan Social and Living Standard Measurement (PSLM): 2014-2015
Major Industries	District Officer(E&IP), Khushab
Metaled Roads Length By Type Zone and District	Planning & Design Directorate, Punjab Highway Department, Lahore.
Mineral Productions	Directorate General, Mines and Minerals, Punjab, Lahore. (Development Statistics-2015)
Motor Vehicles 'Registered' By Type	Additional Director General, Excise & Taxation, Punjab, Lahore.
Number of Cattle, Sheep and Buffaloes in the District	Source:-Census of Agriculture 2000 & 2010- Census of Livestock 1996 & 2006
Number of Registered Factories & Employment Level	Bureau of Statistics, Punjab, Lahore
Number of Work Animals by Type in the District (2006)	2006 Census of Livestock, Agricultural Census Organization, Pakistan Bureau of Statistics
Percentage of children that have been immunized by Type of Antigen- Based on record and recall	Pakistan Social And Living Standard Measurement Survey (PSLM) 2013-2014
Population	Population Census 1998, Population Census Organization, Government of Pakistan. Projections were calculated on the basis of the Inter-Census Growth Rate for the two Censuses Of 1981 And 1998, and do not factor in changing Fertility And Migration Patterns.
Population by Age Group, Gender and Rural /Urban	Population Census 1998
Population by Mother Tongue- 2015	2015 Projected
Population Distribution	Pakistan Bureau Of Statistics (Population Census 1998, Population Census Organization, Government Of Pakistan. Projections Were Calculated On The Basis Of The Inter-Census Growth Rate For The Two Censuses Of 1981 And 1998, And Do Not Factor In Changing Fertility Patterns)
Population on Basis of Religion-1998	1998 Census
Post-Natal consultations of the District	Pakistan Social and Living Standard Measurement (PSLM): 2013-2014
Railway Network	Punjab Development Statistics 2011 / Respective District Offices
Sales of Fertilizer by year 2013-2014	Director General Agriculture, Punjab, Lahore
Socio-Economic Statistics of The District Khushab (In Percentage)	Multiple Indicator Cluster Survey (MICS) Punjab: 2011
Threshers and Harvesters in the District (2012-13)	Directorate of Agriculture Crop Reporting Service, Punjab, Lahore.
Total tractors in the District by 2004 Census	2004 Agricultural Census Wing & Pakistan Bureau of Statistics, Government of Pakistan, Lahore)
Tractors by Make in District (2012-13)	Directorate of Agriculture Crop Reporting Service, Punjab, Lahore
Types Of Health Facility	Health Department Punjab
Veterinary Institution in the District	Department Of Livestock & Dairy Development, Khushab

National Disaster Management Authority (HQ),
Main Murree Road Near ITP Office, Islamabad
www.ndma.gov.pk