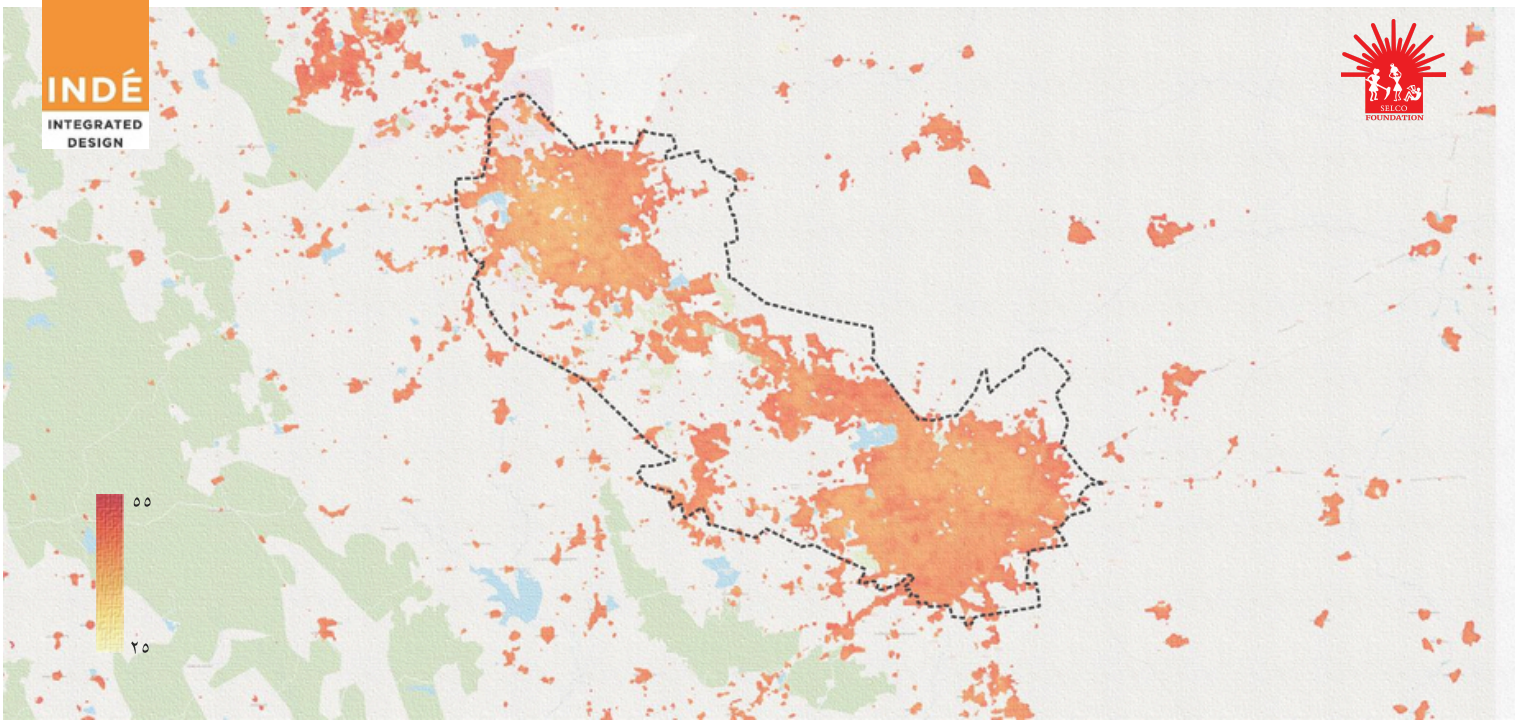

Assessing Climate Vulnerability and Livelihood Challenges of the Urban Poor in Hubbali-Dharwad

STUDY REPORT

INTEGRATED DESIGN

June2025

Acknowledgement

At SELCO Foundation, we extend our sincere gratitude to our consulting partner, Integrated Design, for providing their expertise and services in conducting the in-depth study in Hubli-Dharwad and preparing the report.

We are grateful to the Centre for Multi-Disciplinary Development Research (CMDR), Karnataka Slum Development Board, Hubli-Dharwad Municipal Corporation (HDMC), and other key stakeholders for their valuable guidance, constructive feedback, and unwavering support throughout the course of this study. Their expertise has been instrumental in shaping the direction and depth of this work.

We are especially thankful to all the community member respondents who generously shared their time, insights, and experiences. Their on-ground knowledge significantly enriched the findings of this study report. We express our gratitude to all local leaders, for their valuable insights and participation in key informant interviews, which enabled deeper engagement at the grassroots level.

This report is the result of collective effort, collaboration, and commitment. We deeply appreciate the contributions of each individual and institution involved.

This report is intended for policymakers, development practitioners, and ecosystem enablers working to develop sustainable and resilient urban programs in Hubli-Dharwad. It also serves as a valuable resource for NGOs, financial institutions, and researchers seeking insights into urban gaps and opportunities within the Climate-Livelihood Nexus.

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1. Introduction

Anthropogenic greenhouse gas emissions are warming the Earth, manifesting in changing climates and associated extreme events, the frequency and intensity of which is only expected to rise. In recent years, the severity of climate extremes has increased, with some changes already evident and their impacts projected to become more pronounced (Robinson, 2021; Das et al., 2024). This issue is especially critical in the global South, which is experiencing unprecedented urbanization and extreme inequality while being largely unprepared to handle the impacts of climate change (Aghaegbunam Onodugo & Hope Ezeadichie, 2020; Sen Roy, 2018).

Cities are at the forefront of both contributing to and experiencing the impacts of climate change. Urban areas account for a significant share of global greenhouse gas emissions and face heightened risks from extreme weather events, heat waves, and rising sea levels (Das et al., 2024). Further, amongst urban populations, the poor and their settlements are the most vulnerable, often disproportionately impacted by changing climates. The urban poor face a double disadvantage given the historical challenges of inadequate (or no) infrastructure, poor housing and limited resources along with other geographical, social, and economic factors (Giri et al., 2021; IPCC et al., 2014; Singh, 2013).

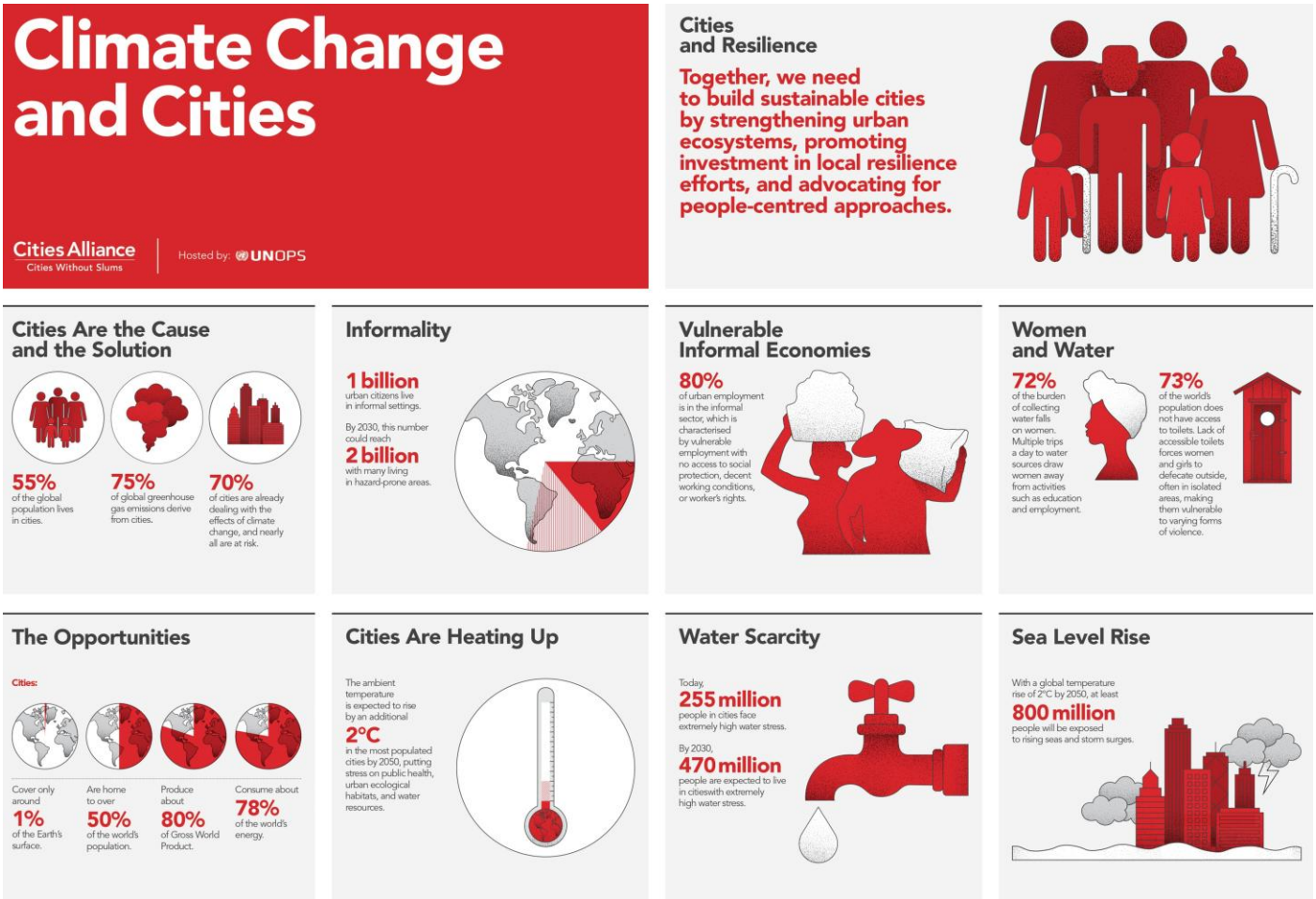


Figure 1 How cities, city population are intersecting with the climate change impact. Source: Cities Alliance by UNOPS

According to the IPCC AR6, even moderate levels of climate change are expected to further erode livelihood security in vulnerable regions. This erosion can intersect with ongoing humanitarian crises—such as displacement, forced migration, and violent conflict—potentially triggering social tipping points (Birkmann, et al., 2022). These social tipping points may also be linked with environmental tipping points, amplifying systemic risks. In this context, this study seeks to examine the impacts of climate change and urbanization on the livelihoods of urban poor communities residing in slum settlements within the Hubli-Dharwad Municipal Corporation (HDMC). The study aims to provide a data-informed understanding of HDMC's climate vulnerability followed by a detailed enquiry of the vulnerable livelihoods. Here, climate-vulnerable livelihoods are defined as those that are highly precarious and sensitive to climate impacts, often having limited capacity and opportunity for adaptation.

2. Objectives

1. **Assess Climate Risks and Vulnerabilities**
   Identify and evaluate the current climate risks faced within the Hubli-Dharwad Municipal Corporation (HDMC), and develop climate vulnerability maps to locate the most at-risk areas.
2. **Map Urban Poor Geographies**
   Map the spatial distribution of urban slum settlements within HDMC, and overlay these with the climate vulnerability assessment to identify areas of high risk.
3. **Livelihood Analysis in Selected Slum Settlements**
   Select representative slum settlements as case study areas to analyze the nature of livelihoods, their existing challenges, and how they are affected by climate risks.
4. **Climate Fragmentation and Livelihood Challenges**
   To synthesize findings from vulnerability mapping and community engagement to identify climate-induced fragmentations and their impact on livelihoods.

3. Methodology

The study was carried out in three stages, relying on secondary and primary methods. Stage I focuses on secondary research, stage II centers on primary research and finally, stage III outlines proposals for sustainable livelihood strategies to enhance the resilience of the urban poor affected by climate change (Refer Figure 2)

Stage I: Secondary Research and Vulnerability Mapping

The first stage involved secondary research, starting with profiling the city and preparing baseline information. This was followed by the application of spatial and quantitative analyses to determine and map climate vulnerabilities, focusing on heat and flood risks.

Vulnerability is a complex concept and it is a function of three components: exposure, sensitivity and adaptive capacity.

- **Exposure (Physical Vulnerability):** The nature and degree to which a system is exposed to significant climatic variations.

- **SENSITIVITY (SOCIAL VULNERABILITY):** The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli.
- **ADAPTIVE CAPACITY:** The ability of a system to adjust to climate change, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

For specific risk vulnerability assessments, its component was identified and quantified using specific factors/variables. The overall vulnerability was calculated using the formula:

Vulnerability = (Exposure × Sensitivity) / Adaptive Capacity

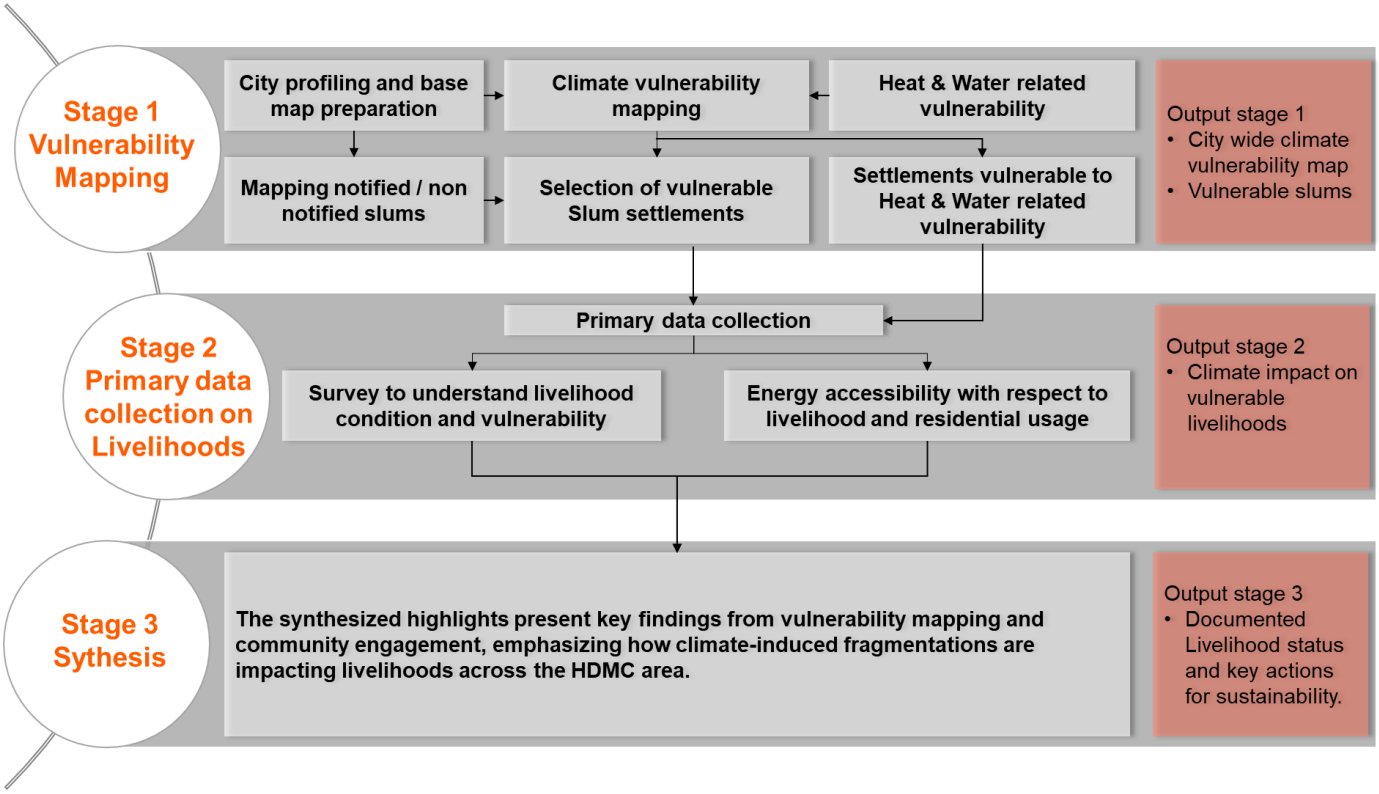


Figure 2 Study Methodology

Stage II: Primary Engagement in Identified Slums

The second stage focused on the primary engagement within the identified vulnerable slum settlements – the primary focus being an assessment of the prevailing livelihood and climate induced vulnerabilities. The engagement involved:

- Qualitative Surveys: Focus group discussions (FGDs) and stakeholder meetings to understand the impacts of climate risks such as flood risks and heat stress on livelihoods.
- Quantitative Surveys: Data collection on production-based, individual, and home-based livelihood activities to quantify the impacts of climate vulnerabilities.

In addition to livelihoods, the study examined the energy access and reliance amongst households. The findings from the vulnerability mapping and primary survey were analyzed to identify issues, challenges, and gaps, along with the impact of climate vulnerabilities on livelihoods and energy consumption.

Stage III: Synthesis: Climate-induced Fragmentations and Related Livelihood Challenges

The final stage synthesized findings from the vulnerability mapping and primary engagement to highlight climate-induced fragmentations and related challenges on the livelihoods in the HDMC area

The study has few limitations, particularly in the heat vulnerability assessment, due to data availability constraints. Much of the sensitivity data is drawn from the 2011 Census, which is now outdated. However, these datasets still hold relevance, as the factors being assessed—such as socio-economic vulnerability—tend to change slowly over time. While specific indicators like open defecation or lack of electricity may be less relevant today due to recent improvements, they still provide valuable insight into the broader development context of certain geographies. This understanding is essential for deep dive studies, targeted, location-specific interventions to effectively address vulnerability.

4. The City Context

The Hubballi–Dharwad Municipal Corporation (HDMC) is situated in the central region of Dharwad district in northern Karnataka. It encompasses the twin cities of Hubballi and Dharwad (20 km apart), which are among the most prominent urban centers in the region. The HDMC was formed by merging these two independent towns in 1962. Hubballi serves as a major commercial and industrial hub, while Dharwad is renowned for its educational institutions and administrative importance. At present HDMC is considered as one of the fastest growing cities in the state after Bengaluru. Together, they form a significant urban agglomeration governed by the HDMC, which spans across two taluks of the district—Hubballi taluk and Dharwad taluk.

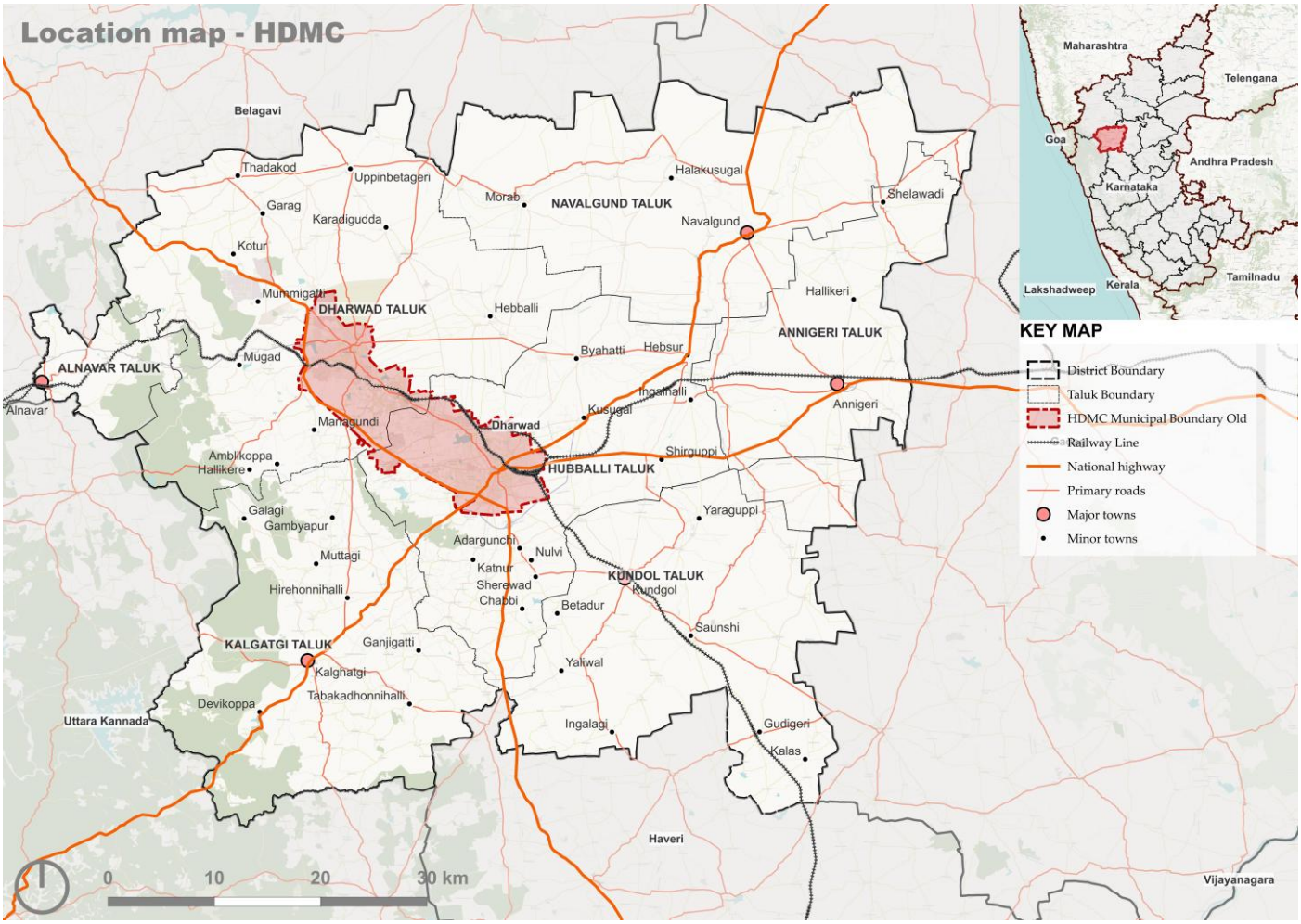


Figure 3 Location map - HDMC

Climatically, the HDMC region is located within a Northern transitional zone that bridges contrasting geographies in Dharwad district. To the southwest lies the Sahyadri range (Western Ghats), particularly in the areas like Kalghatagi taluk, also referred to as Malnad region—a zone characterized by hilly terrain and dense forests (Hilly agroclimatic zone). To the North and Northeast lie the black soil plains, referred to as Belavalanadu. These are a part of Navalgund taluk categorized as Northern dry agroclimatic zone. These plains are more arid but agriculturally vital and are historically significant as they are believed to have influenced the name “Karnataka”—derived from Karnad, meaning “land of black soil.” (Dharwad district census book - 2011)

This location grants HDMC a relatively moderate and pleasant climate, especially in comparison to the drier northern parts of the district. The proximity to the Western Ghats plays a role in tempering the region's weather conditions. In contrast, areas further North and Northeast, such as Navalgund, experience a much harsher and more arid climate. (Dharwad district census book - 2011) The area covered by HDMC has undulating topography with height varying from 600 to 750 meters above mean sea level.

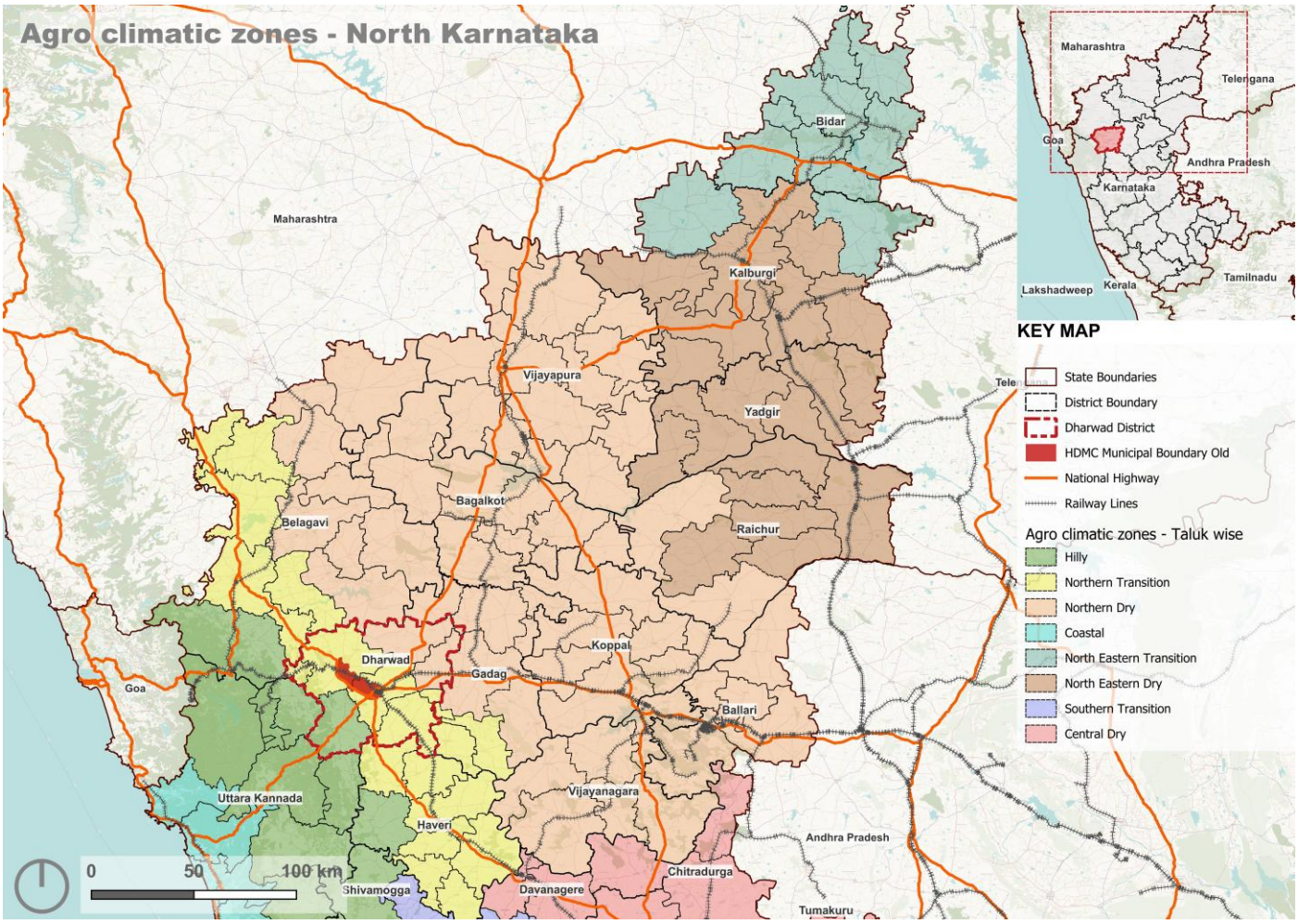


Figure 4 Agroclimatic regions and HDMCs location in the Northern Transition zone.

The average maximum temperature in the HDMC region is around 37 degree C occurring in April. Rainfall patterns vary significantly across the district in line with its geographic diversity. The Kalghatagi taluk in the south and southwest receives the highest annual rainfall, averaging around 989 mm, due to its closeness to the Western Ghats. The central region, which includes HDMC (Hubballi and Dharwad taluks), enjoys moderate rainfall levels ranging from 702 to 793 mm annually. Further southeast, Kundgol taluk receives about 656 mm of rainfall each year. The northernmost region, Navalgund taluk, is the driest part of the district, with annual rainfall as low as 611 mm. (Dharwad district census book - 2011)

Given its location in the cotton production belt, Dharwad district has leveraged numerous opportunities for the cotton manufacturing industry, alongside other agro-based industries, which form a major part of the district's economy. The industrial base in the region can be traced back to

the pre-British period, when the cotton industry flourished. Over time, various industrial efforts emerged, including the production of leather crafts, traditional machinery manufacturing, metal products, bamboo works, plywood, brick and tile manufacturing, and the production of brass and copper utensils—especially in Hubbali. Historically, the HDMC has played a pivotal role in the district and the region's industrial development, hosting the heaviest concentration of industries in the district. Specifically, Hubbali has been home to large-scale cotton textile industry, with smaller units engaged in power loom weaving. Alongside these, the region also saw the development of industries in chemicals, engineering, and other sectors, contributing to the overall economic activity in both Hubbali and Dharwad taluks. In fact, in the 2000s, approximately 50% of the district's total industries were concentrated in the HDMC region (Dharwad District Census Book, 2011). At its peak in 1951, handloom production in Dharwad was one of the most prominent industries in the entire state of Karnataka (Karnataka Gazetteer, 2002).

Several key factors contributed to the industrial growth in the region: the proximity to the cotton belt, the establishment of an Industrial Centre in 1978 in Dharwad District, and the 2003 declaration of Dharwad District as an industrially backward district by the state government. This recognition led to several incentives and subsidies for the industrial sector, which further spurred industrial growth, especially in the HDMC during the 2000s and later.

Following the growth of industry, trade and commerce emerged as key drivers of the district's economy. The Hubballi railway station connected the town directly to important regions like Bombay, Davanagere, Bellary, and Bengaluru, making Hubballi a vital transportation and trading hub. Additionally, wholesale cotton markets were established in Hubballi and Dharwad, further boosting the trade sector. With the rise of trade, banking and cooperative societies began to establish themselves in the district. For instance, the Hubballi Cotton Sales Society Ltd., founded in 1915, became the first Indian cooperative marketing society, paving the way for further growth in the industrial sector.

These developments, alongside the strong agricultural production base in the region, contributed to the flourishing economy of Dharwad District and, by extension, the HDMC.

HDMC is amongst the fastest-growing cities in Karnataka, second only to Bengaluru. This rapid growth has led to a significant influx of migrants seeking better economic and social opportunities. This migration has contributed to the expansion of the local economy and brought about various social and infrastructural challenges. The growing influx of people into HDMC has created new opportunities in multiple sectors, while also putting pressure on the city's infrastructure, public services, and housing.

5. Climate Change in the Hubballi–Dharwad Municipal Corporation

The HDMC—which falls in the Hubballi and Dharwad taluks—has historically enjoyed a relatively pleasant and moderate climate compared to the northern parts of Dharwad district, which are typically drier and more arid. Historically, this central region has benefited from favorable rainfall patterns and moderate temperatures, supporting a wide range of agricultural practices and contributing to its overall environmental stability.

However, it is now critical to assess how these climatic conditions have changed over time. This is where the conversation around climate change becomes especially relevant. The focus is no longer just on past climatic advantages, but rather on how the region must adapt to shifting weather patterns, including rising temperatures, irregular rainfall, and extreme weather events. Understanding and addressing these evolving climate dynamics is essential for ensuring the HDMC's resilience and long-term sustainability.

A key resource in understanding this change is the 2020 report published by the Karnataka State Natural Disaster Monitoring Centre (KSNDMC), titled "Climate Change Scenario in Karnataka: A Detailed Parametric Assessment." This study analyzed critical variables such as temperature, rainfall, and humidity across Karnataka over a span of 58 years (1960–2017), divided into two periods: Period 1 (P1): 1964–1990 and Period 2 (P2): 1991–2017.

In terms of annual rainfall, Dharwad district showed no significant change between the two periods. While some districts in Karnataka recorded a decline in rainfall by 1% to 16%, with the sharpest decreases observed in Kalaburagi, Yadgir (north interior Karnataka), and Chamarajanagar (in the south interior Karnataka), others like Chitradurga, Kolar, Bengaluru Urban, and Shivamogga experienced rainfall increases ranging from 1% to 20%. Although Dharwad did not register a shift in total annual rainfall, a look at the southwest monsoon rainfall revealed a 21% decrease in the district. However, compared to other districts where southwest monsoon rainfall decreased by over 100% to 314%, this change in Dharwad is considered moderate and not indicative of a severe climatic shift.

When analyzing temperature and relative humidity data from 2002 to 2018, the KSNDMC report highlighted that average annual temperatures rose significantly in several districts of South Interior Karnataka—including Bengaluru Urban, Bengaluru Rural, Ramanagara, Kolar, and Mandya—as well as in Ballari in the north. While Dharwad was not explicitly identified among the districts showing a significant temperature increase, it was noted for a 0.47% decrease in average relative humidity.

Although Dharwad district, and by extension the HDMC region, has not been among the most severely affected areas in terms of temperature or rainfall extremes, other indicators point to increased climate vulnerability. According to KSNDMC, the district was declared drought-affected between 11 and 13 years from 2001 to 2019—placing it among the most frequently drought-affected regions in the state, on par with districts in North Interior Karnataka. While Kalghatagi taluk in Dharwad showed slightly lower drought incidence (9–10 years), the overall frequency remains a cause for concern. In addition to drought risk, Dharwad is also identified as a heat wave-prone district, like the state's northern parts.

With regard to extreme water-related events, the region has not been flagged as significantly prone to hazards such as floods, cyclones, or hailstorms, which tend to impact other parts of Karnataka more severely.

In conclusion, the transitional geography of the HDMC - the Northern Transitional Zone - positioned between the wetter Western Ghats in the southwest and the drier plains to the north and northeast. explains the regions moderate climate change impacts. While not extreme, the signs—particularly in the form of heat stress, reduced humidity, and recurrent droughts (in the district as a whole)—underscore the need for focused adaptation strategies to ensure the HDMC region remains resilient in the face of ongoing climate change.

5.2 Projected Climate Change in HDMC

Building on the historical analysis of climatic trends in the Hubballi-Dharwad Municipal Corporation (HDMC), the projections provided by UNEP STRATA offer valuable insight into the potential future impacts of climate change under two global emissions scenarios: SSP 4.5 and SSP 8.5. Shared Socioeconomic Pathway 4.5, represents a “middle-of-the-road” scenario where global development continues with moderate success in stabilizing emissions till 2100. It assumes some implementation of greenhouse gas mitigation strategies, leading to a moderate increase in temperatures and relatively manageable climate impacts. In contrast, SSP 8.5 is a “high-emissions” scenario characterized by sustained reliance on fossil fuels and minimal climate policy action (2100). This trajectory predicts intense global warming, more frequent extreme weather events, and significant environmental stress. These projections are derived from UNEP STRATA a global climate data platform that uses downscaled projections from global climate models to enable localized climate risk assessments and guide effective adaptation planning.

The data for Dharwad district, sourced from UNEP STRATA (figure 5 and 6), was analyzed to understand potential future changes and associated extreme events. The precipitation projections reveal a clear trend of increasing rainfall particularly in the western and southwestern parts of the district. As climate conditions intensify from SSP 4.5 to SSP 8.5, this increase becomes more pronounced. In the Baseline Scenario, rainfall in the districts ranges from 300 mm to 1200 mm, reflecting moderate and stable conditions. Under both SSP 4.5 and SSP 8.5 scenarios, rainfall shows a slight overall increase across the Dharwad district. However, the HDMC region consistently remains within the 900–1200 mm range across all three scenarios—Baseline, SSP 4.5, and SSP 8.5. This indicates that significant changes in precipitation levels within HDMC itself are unlikely.

While precipitation shows relatively minor changes in the HDMC area, the projections for maximum temperature indicate a significant rise—especially in the northern and northeastern parts of the district. The shift from the Baseline Scenario, where temperatures range between 30°C and 32°C, to SSP 4.5, where temperatures jump directly to 39°C and above, represents a sharp and substantial increase. This rise is likely to have a profound impact across the entire district, including HDMC. The widespread spread of high-temperature zones signals growing heat stress, underscoring the urgent need for heat-resilient targeted climate adaptation measures.

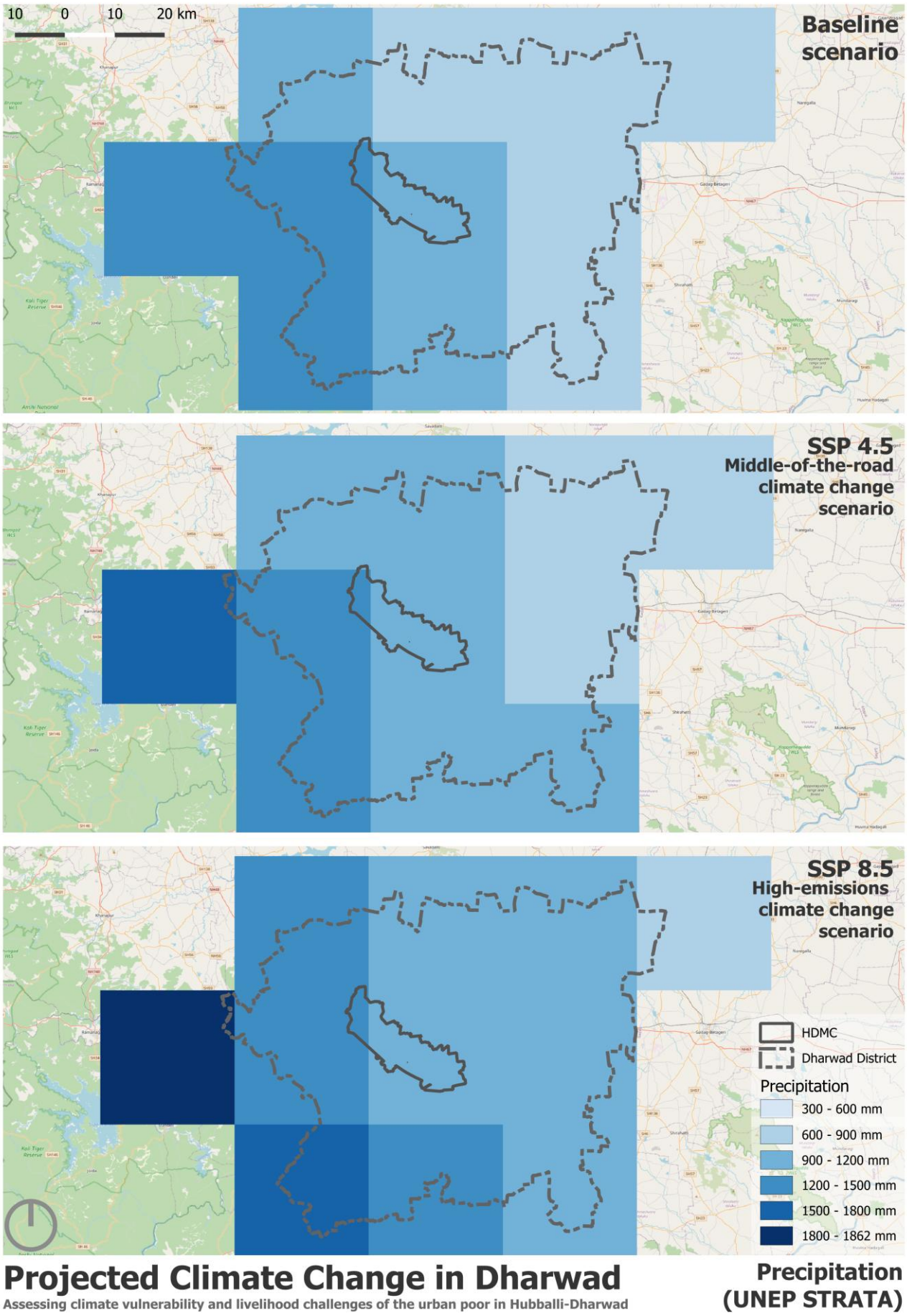


Figure 5 Projected climate change in Dharwad - Precipitation as per UNEP STRATA

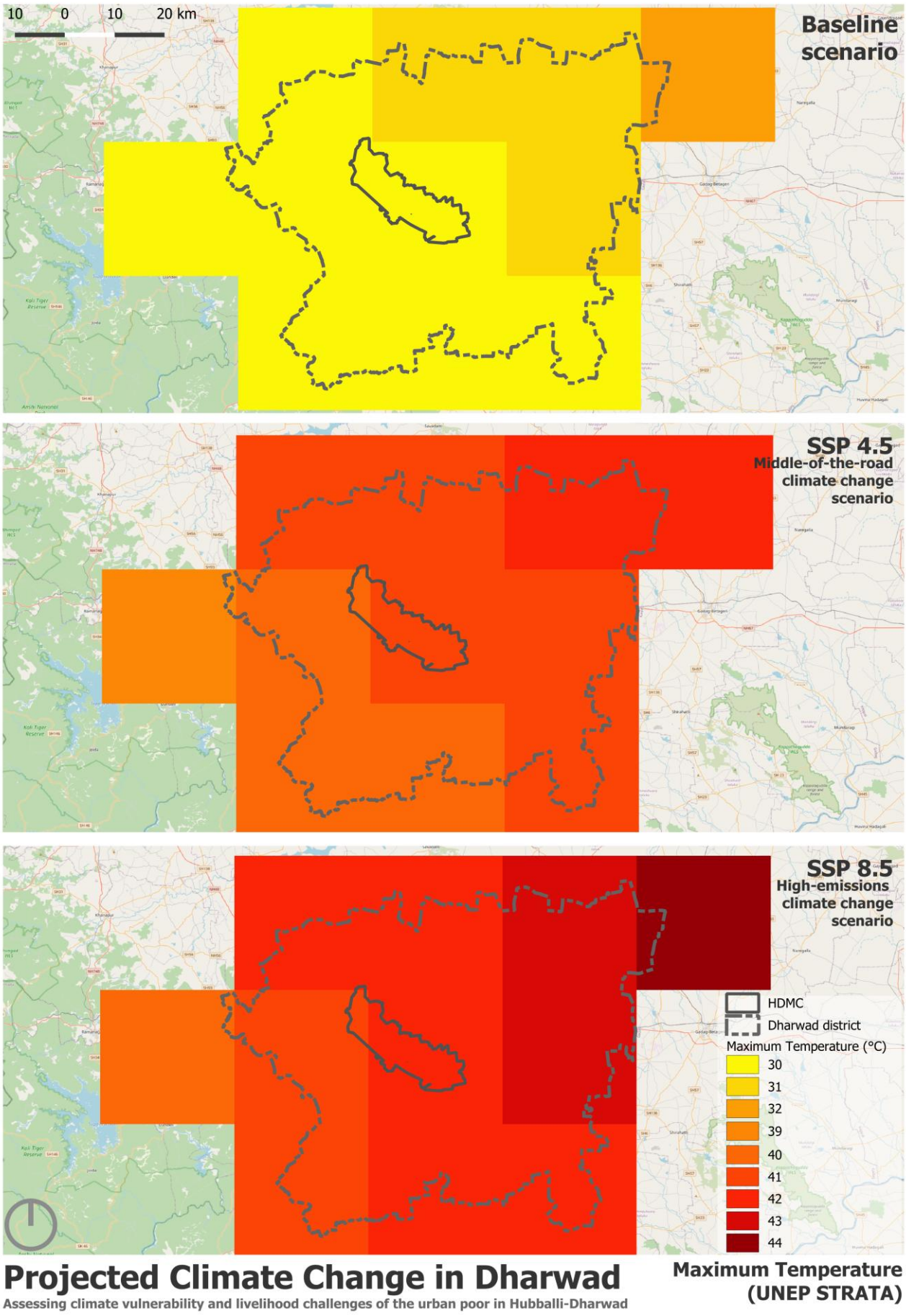


Figure 6 Projected climate change - Maximum temperature as per UNEP STRATA

6. Climate Vulnerability Assessment

According to the KSNDMC report, HDMC is not prone to extreme impacts of climate change. However, the effects of climate extremes are always relative. It is crucial to understand that the socio-economic diversity and environmental context within a region play a significant role in shaping how different communities and systems experience climate impacts. In this light, assessing the relative climate vulnerability within HDMC becomes essential for designing effective and inclusive climate actions aimed at mitigating future risks.

The rest of this section explores the meaning of vulnerability in this context. It also outlines the priorities of the present study and the approach taken to assess vulnerability, based on the contextual understanding of HDMC's climate conditions discussed earlier.

Assessment of vulnerability entails arriving at an understanding of who or what is affected by a shock. With climate change, vulnerability assessment would refer to as assessment of climate impact. It not only identifies the affected entities but also examines the extent to which different units or entities within a system would get affected. Given the diversity within systems, the real-world diversity becomes the starting point for vulnerability assessments, which can vary across people, sectors, and regions.

The general approach to assessing vulnerability to climate change involves understanding its key functional components: exposure, sensitivity, and adaptive capacity. Exposure refers to the extent to which a system is subject to climate change effects. Sensitivity is the degree to which the system is affected or impacted by those effects. Adaptive capacity represents the system's ability to respond, adjust, and mitigate the effects of climate change. By applying this systematic approach with contextual modifications, the study developed a vulnerability assessment for the HDMC, as discussed under.

Following from the KSNDMC report, heat is considered as the primary risk in the HDMC area. While water-related risks—such as flooding and urban inundation—are also considered, their occurrence in HDMC has been relatively limited. Over the past decade, the city has experienced only a few instances of flood-like conditions, which were localized and mostly affected low-lying areas of Hubballi. Most of these events were characterized as urban waterlogging rather than widespread flooding. Given this context, a simplified and context-specific method was adopted to assess vulnerability to water-related risks, in contrast to the more data-intensive approach used for evaluating heat vulnerability.

With regard to drought vulnerability, the KSNDMC report highlights that drought is a recurring phenomenon in Dharwad district, including the northern plains and transition zones. However, the district has not experienced a sharp decline in rainfall. HDMC, situated in this transition zone, generally receives adequate rainfall—a critical factor in determining drought conditions. As such, the city is not significantly affected by drought.

Drought vulnerability is also shaped by socio-economic factors. In HDMC, the economy is not heavily dependent on agriculture or irrigation-intensive activities. Instead, it relies more on non-agricultural sectors with lower water demands. Therefore, even if surrounding towns and villages experience drought, the impact on HDMC is likely to be minimal to no impact.

There are no public records of severe drought events in HDMC. While drought can cause groundwater depletion—a key urban water source—this is more typical in large, densely populated cities. For instance, Bengaluru has faced significant water stress due to high demand and over-extraction. In contrast, HDMC's population is much smaller—about one-tenth that of Bengaluru—making such risks less relevant.

HDMC has also taken steps to provide 100% municipal water supply through a 24x7 system, sourced from the Malaprabha Reservoir, which currently has ample water to meet the city's demand. Although full supply coverage is still in progress, this effort shapes the city's impact and resilience to water scarcity linked to drought. Taken together, HDMC's geographic location, socio-economic profile, and improving water infrastructure suggest it is not highly vulnerable to drought—now or in the near future—even if nearby areas in Dharwad district are affected.

In terms of identifying vulnerability, the study prioritized the "who"—focusing on socio-economically disadvantaged groups, particularly the slum population who are most at risk and the "where"—within the spatial extent of the HDMC.

Notably, the cities of Hubballi and Dharwad are separated by a large swath of rural landscape in between. The diverse urban and rural landscapes, along with the distinct socio-economic and natural environments of the two cities, adds complexity when assessing vulnerability across the entire municipal corporation. Each area within the corporation jurisdiction exhibits unique features in terms of development trends, land use, and socio-economic factors. This variation makes it difficult to apply a uniform set of indicators to assess vulnerability across the entire HDMC.

For example, applying Land Surface Temperature (LST) as one of the indicators of exposure reveals anomalies when applied across the urban-rural landscape. LST for the peak temperature month (April) reveals that the rural landscape in this region experiences higher temperatures than the urban landscape of Hubbali and Dharwad, which deviates from the common assumption that urban areas generally experience higher temperatures than their rural counterparts due to the Urban Heat Island (UHI) effect. While this holds true in most cases, the urban-rural diversity in HDMC demonstrates how factors such as topography and natural features of the land, land use, soil condition, and agricultural practices can lead to unique temperature behaviors, requiring a more nuanced approach to understanding vulnerability in these areas.

Several studies indicate that temperature differences depend on various factors, such as the type of vegetation, the built environment, agricultural practices, and the physical state of the exposed soil. For instance, the soil condition can significantly affect temperature behavior—dry, exposed soil in certain agricultural areas absorbs heat just as effectively as concrete structures. Additionally, factors like day and night-time temperatures show notable differences in certain cases: urban areas may have higher nighttime temperatures compared to rural areas, while rural areas may experience higher temperatures during the day.

6.1 Vulnerability Assessment Approach for Heat related Risk

Given the inherent diversity of the landscape, socio-economic conditions, and development factors within the HDMC, a granular approach to vulnerability assessment was adopted. Rather than treating the entire corporation as a single entity, it was essential to assess the three distinct areas—

Hubballi urban, Dharwad urban, and the Rural landscape in between—individually. Doing so allows for a more accurate representation of vulnerability and prevents the dilution of critical outcomes.

For instance, if LST were used as the sole indicator for exposure, the rural landscape would likely show the highest vulnerability due to its higher temperatures. However, other factors—such as physical configuration, infrastructure, and land use—also contribute to exposure in the urban landscapes of Hubballi and Dharwad. Treating these diverse landscapes as a single unit and applying a uniform vulnerability assessment would likely overlook important contextual factors, leading to ineffective outcomes.

Therefore, the decision to assess the three distinct areas—Hubballi urban, Dharwad urban, and the rural landscape—individually. This approach ensures that unique vulnerability dimensions are identified for each area, providing a comprehensive understanding of vulnerability that reflects the region's full diversity. This, in turn, ensures that the vulnerability assessment accurately captures the complexities of the HDMC. The wards of HDMC were segregated into these three categories accordingly, shown in figure 7.

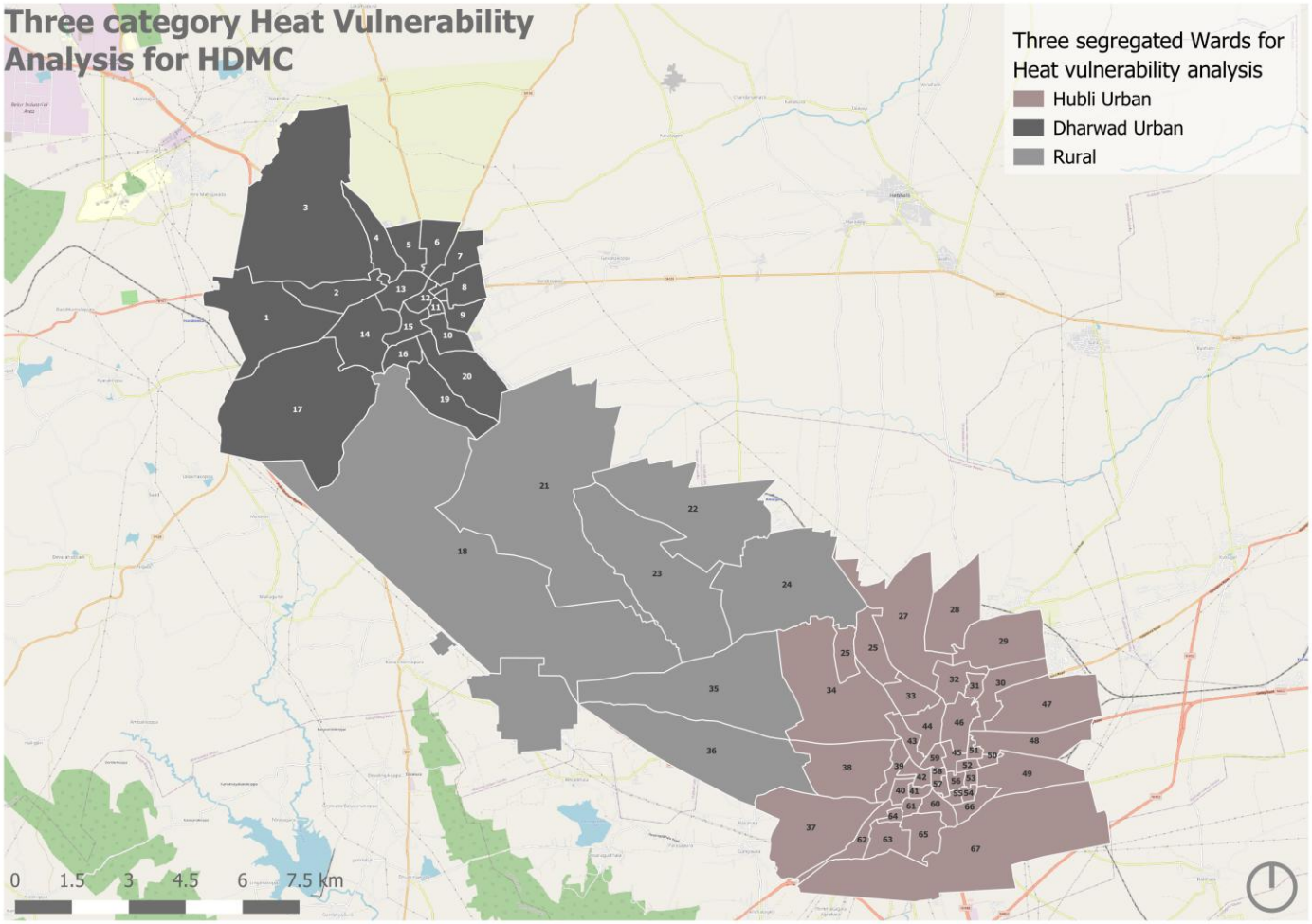


Figure 7 Wards categorized into the three categories of heat vulnerability assessment

The first step required identifying indicators to evaluate exposure, sensitivity, and adaptive capacity (see Table 1). Following this, an additional layer of data analysis was applied using the entropy method to determine the varying significance of these indicators across the different geographies.

This process helped allocate distinct weightages (percentages) to the identified indicators based on the unique characteristics of each geography.

Table 1 Indicators for Assessing Heat vulnerability

S.no	Indicators	Rationale
	Exposure	
1	Land Surface Temperature	This indicator measures the radiant thermal emission of the Earth's surface (in temperature), capturing how heat is distributed and varies across the area. It provides insight into localized hotspots and overall intensity of heat, which is essential for identifying areas at risk during heat extremes.
2	Built-up density – represented as sqm built area per 100 X 100 area of land	This indicator quantifies the intensity of urban development. High intensity areas tend to absorb and retain heat, leading to the Urban Heat Island effect.
	Sensitivity	
3	Total no. of Households	This indicator quantifies the number of housing units within an area, serving as a proxy for the total community exposure.
4	Total population	Measuring the total number of residents provides a direct understanding of how many individuals are exposed to heat extremes.
5	Total Female population	Research indicates that women, due to both biological and social factors, may experience higher sensitivity to heat.
6	Total population below age 6	Young children have underdeveloped thermoregulatory systems, making them particularly susceptible to heat.
7	Total marginalized (SC/ ST) Population	Marginalized communities often face socioeconomic disadvantages and may live in areas with substandard infrastructure and limited access to cooling resources.
8	Total Illiterate population	Lower literacy rates can hinder individuals' access to vital information on heat risks and coping strategies. This can reduce their ability to respond effectively during heat events.
9	Total agricultural laborers	Agricultural workers are typically exposed to outdoor conditions for prolonged periods, making them particularly prone to the adverse effects of heat extremes.
10	Total Marginal workers	Individuals in marginal or informal employment often have unstable incomes and limited access to resources. This economic insecurity reduces their capacity to adapt to or recover from heat extremes.
11	Total no. of households involved in open defecation	Households practicing open defecation often lack access to proper sanitation infrastructure. This is indicative of broader socioeconomic challenges, which can correlate with inadequate access to cooling resources, water, and overall poor living conditions. Such factors can amplify the adverse health effects during heat extremes.
12	Total no. of household without electricity	Access to electricity is vital for operating cooling devices (e.g., fans, air conditioners) during heat extremes. Households without electricity are unable to use these devices, leaving residents more exposed to indoor heat stress. This deficiency often points to lower economic status and infrastructural gaps that heighten vulnerability
13	Total no. of household with poor roof materials (to total household) Grass/ Thatch/ Bamboo/ Wood/Mud etc., Plastic/ Polythene Handmade and Tiles	Roof materials such as grass, thatch, bamboo, wood, mud, plastic, and other low-insulation materials allow excessive heat penetration, leading to higher indoor temperatures. Poor roof quality is typically associated with low-income households that cannot afford better construction, thereby increasing their sensitivity to heat extremes.

	Machine made Tiles Burnt Brick Stone/ Slate	
14	Total no. of household with temporary structure	Temporary structures are usually built with materials that offer minimal insulation and durability against weather extremes. These makeshift homes are less effective at regulating indoor temperatures.
15	Total no. of household without drinking water within the house or premises	Readily available drinking water is crucial to prevent dehydration during heat extremes. Households that lack in-house or on-premises water supply face difficulties in accessing water, increasing their risk of dehydration and heat-related illnesses.
16	Total slum population	This indicator measures the count of individuals residing in slum or informal settlements. Such communities typically face substandard housing, overcrowding, and limited access to essential services like water, sanitation, and healthcare. These factors heighten their vulnerability to heat extremes.
	Adaptive capacity	
17	Road accessibility – represented though Euclidean distance to the nearest road	Roads are critical for ensuring effective connectivity and access to essential services. A robust road network facilitates rapid response and evacuation during extreme events.
18	Distance to healthcare Institution – represented through Euclidean distance to nearest government hospital	Proximity to healthcare facilities is vital during heat-related emergencies. Shorter distances mean quicker access to medical care.
19	Public transport accessibility – represented as distance to nearest public transport route	Public transport provisions are a key development indicator as they provide access to essential services during climate extremes.
20	The moisture content in the surfaces – represented as normalized difference moisture index	The moisture content of surfaces is used as a proxy to understand vegetation and water factors, which contribute to microclimatic cooling effects, helping to reduce local temperatures.
21	Open spaces	Open spaces, such as parks and recreational areas, provide relief from urban heat by creating cooler microenvironments.

The second step is understanding the role of different indicators across distinct geographic categories and their significance in shaping overall vulnerability—exposure, sensitivity, and adaptive capacity. For instance, consider total population and children population as sensitivity indicators. If data analysis reveals that the total population remains consistent across the city's wards, while the children population varies significantly, the latter assumes greater importance in assessing sensitivity and, ultimately, vulnerability. Similarly, the variability of datasets in the HDMC was analyzed to allocate appropriate weightages to the indicators. The datasets for indicators were assessed individually across Dharwad Urban, Hubballi Urban, and the Rural area, thereby factoring in the diversity across these landscapes. The weightages were assigned using the Entropy method[1] (See table 2, 3 and 4 below). Those weightages were also plotted in radar diagrams giving a better understanding (see figure 8, 9 and 10).

[1] The core principle of the Entropy Weight Method is that the greater the variation in an indicator's values across different evaluation points, the more significant that indicator is in assessing vulnerability (Ye et al., 2011; Zhu et al., 2020). This ensures that the weighting process is data-driven and reflects the actual disparities in vulnerability indicators.

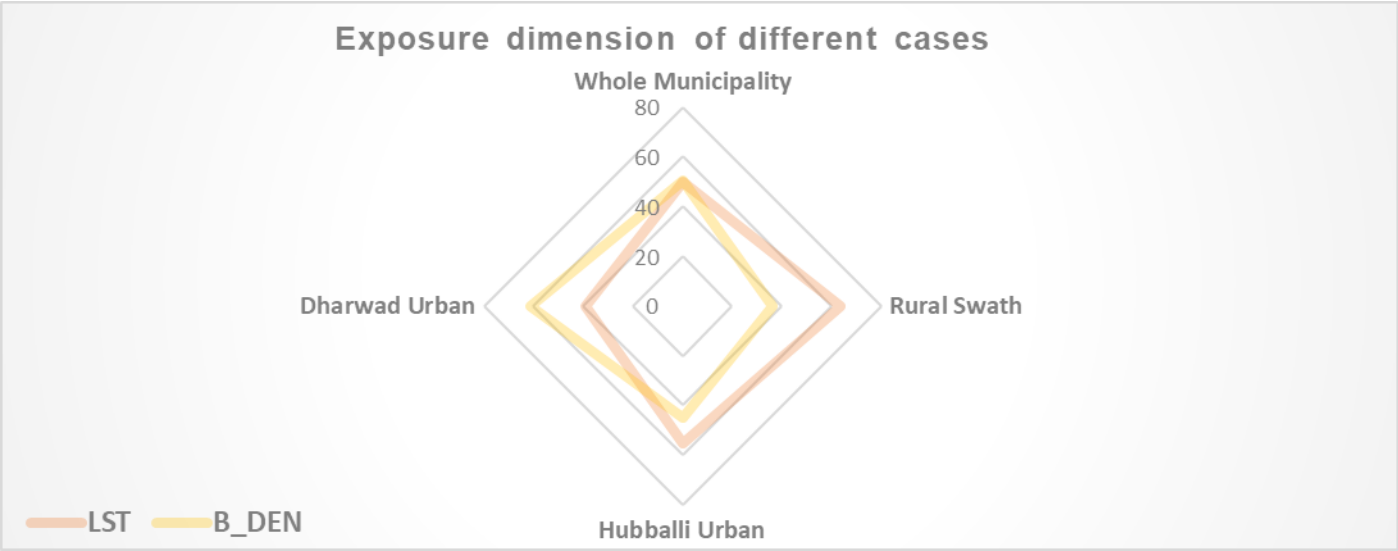


Figure 8 Radar plot of the weightages calculated for exposure layers - showing the indicator's dimensions across different categories of the assessment area (refer to table 2 for the expansions of the abbreviations to the indicators)

Table 2 Weightages calculated for the exposure layers

Indicator	Weightages			
	Whole Municipality	Hubballi Urban	Dharwad Urban	Rural
Land surface temperature (LST)	50	55	39	64
Built Density (B_DEN)	50	45	61	36

As is evident from the above table and radar plot, different indicators play distinct roles in shaping vulnerability across the three geographic landscapes, as reflected in the significant variation in entropy-derived weightages. When analyzing the municipality, Land Surface Temperature (LST) and Built Density (B_DEN) receive equal weight, indicating their shared influence on the exposure factor of vulnerability. However, this balance shifts when examining the HDMC's three distinct landscapes.

In rural areas, Land Surface Temperature (LST) carries greater weight than Built Density (B_DEN), as the latter shows minimal variation across the rural landscape. LST played a major role in shaping the exposure dimension of vulnerability in these regions. Conversely, in Dharwad and Hubballi urban areas, Built Density (B_DEN) holds greater significance, making it a key factor in determining exposure and overall vulnerability.

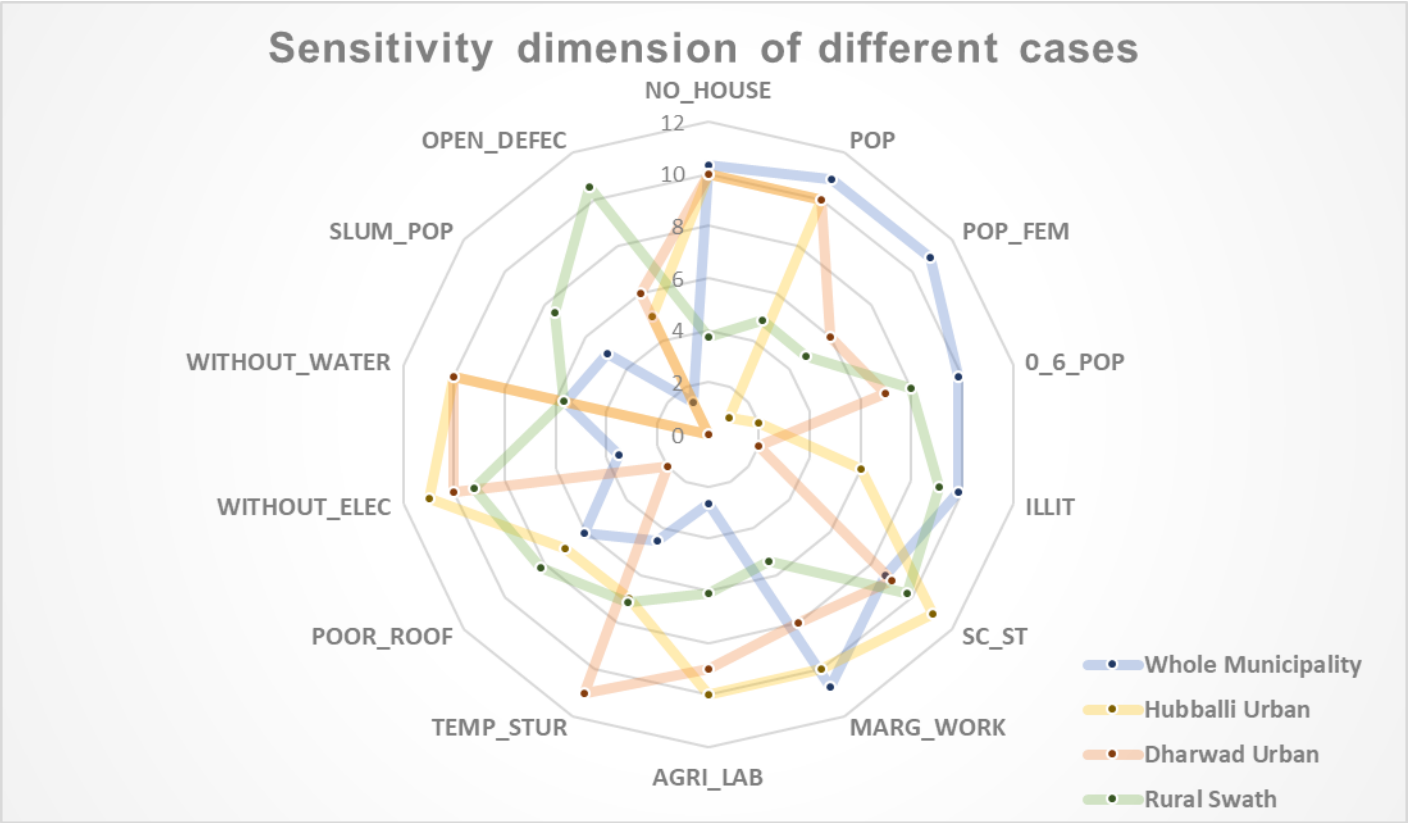


Figure 9 Radar plot of the weightages calculated for sensitivity layers - showing the indicator's dimensions across different categories of the assessment area (refer to table 3 for the expansions of the abbreviations to the indicators)

Table 3 Weightages calculated for the sensitivity layers

Indicators	Weightages			
	Whole Municipality	Hubballi Urban	Dharwad Urban	Rural
Total no. of Households (NO_HOUSE)	10	10	10	4
Total population (POP)	11	10	10	5
Total Female population (POP_FEM)	11	1	6	5
Total population below age 6 (0_6_POP)	10	2	7	8
Total Illiterate population (ILLIT)	10	6	2	9
Total marginalized (SC ST) Population (SC_ST)	9	11	9	10
Total Marginal workers (MARG_WORK)	11	10	8	5
Total agricultural laborers (AGRI_LAB)	3	10	9	6
Total no. of household with temporary structure (TEMP_STUR)	5	7	11	7
Total no. of household with poor roof materials (POOR_ROOF)	6	7	2	8
Total no. of household without electricity (WITHOUT_ELEC)	4	11	10	9
Total no. of household without drinking water within the house or premises (WITHOUT_WATER)	6	10	10	6
Total slum population (SLUM_POP)	5	0	0	7

Total no. of households involved in open defecation (OPEN_DEFEC)	1	5	6	11

Variations in the sensitivity factors are also distinct across geographic categories. For example, the percentage of households practicing open defecation emerges as a significant sensitivity factor in rural areas but holds limited relevance in urban settings. At the municipal level, this indicator does not emerge as a major factor, illustrating how aggregation can obscure local realities.

Illiteracy is another indicator showing stark differences across landscapes. Entropy values suggest that illiteracy contributes significantly to rural vulnerability, with higher data variation observed in these areas. In contrast, it plays a less significant role in Dharwad, where entropy values are lower, while Hubballi urban areas fall somewhere in between.

Indicators related to SC and ST populations show relatively high entropy across all three landscapes, indicating their wide distribution and consistent relevance in determining vulnerability. A closer look reveals slight differences in weightage, with Hubballi urban showing the highest, followed by rural areas, and then Dharwad.

The houseless population indicator highlights notable disparities between rural and urban areas. In rural regions, lower entropy values suggest limited variation, indicating that houselessness is not a critical factor shaping vulnerability. Conversely, in urban areas, higher entropy values reflect greater variation in the distribution of houseless populations, suggesting that certain urban pockets are disproportionately affected, thereby increasing localized vulnerability.

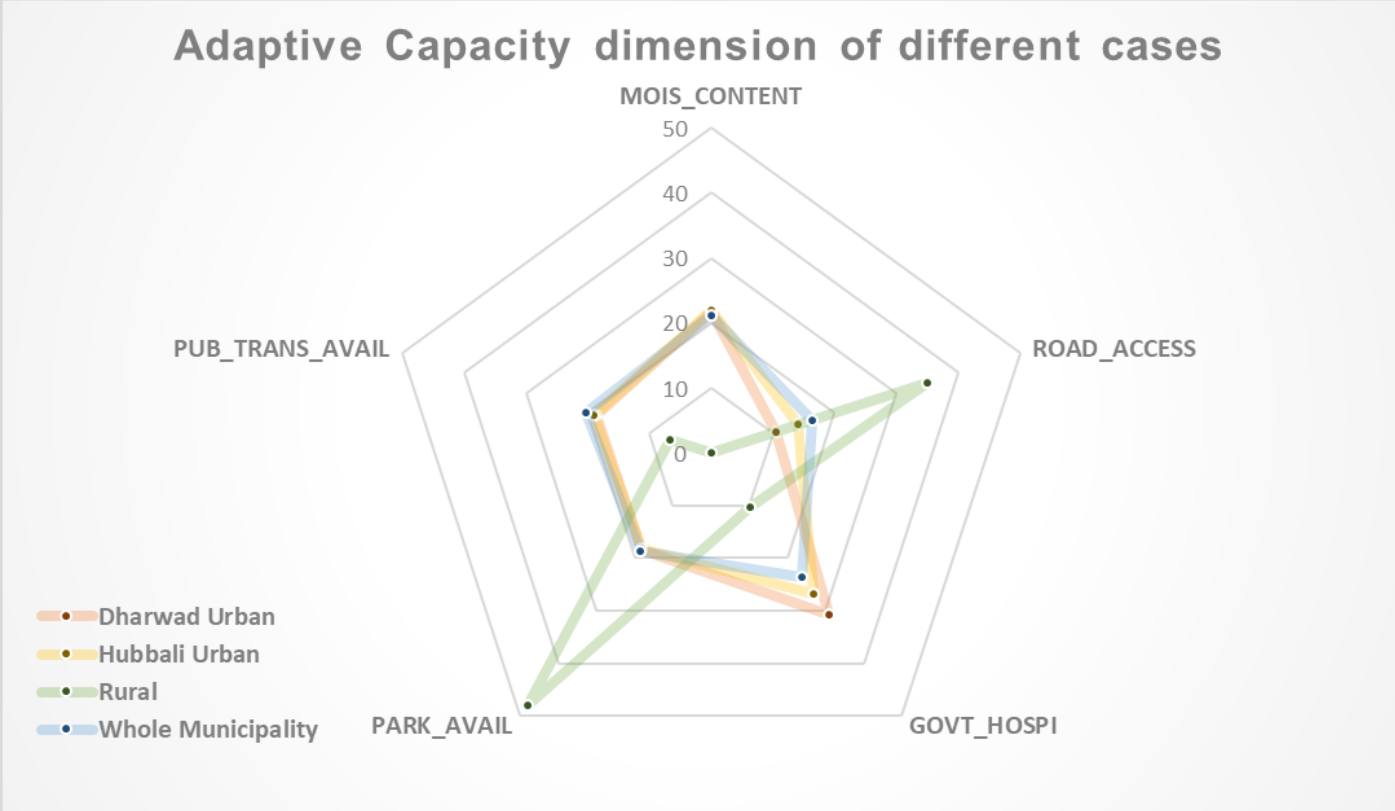


Figure 10 Radar plot of the weightages calculated for adaptive capacity layers - showing the indicator's dimensions across different categories of the assessment area (refer to table 4 for the expansions of the abbreviations to the indicators)

Table 4 Weightages calculated for the adaptive capacity layers

Indicators	Weightages			
	Whole Municipality	Hubballi Urban	Dharwad Urban	Rural
Surface moisture content (MOIS_CONTENT)	21	22	22	0
Accessibility to road service (ROAD_ACCESS)	16	14	10	35
Availability of nearest government hospital service (GOVT_HOSPI)	24	27	31	10
Availability of nearest park facility (PARK_AVAIL)	19	18	18	48
Availability of nearest public transport facility – route (PUB_TRANS_AVAIL)	20	19	19	7

In the adaptive capacity dimension, there is a clear distinction between urban and rural areas. The two urban zones—Hubballi and Dharwad—exhibit almost identical patterns, while the rural landscape diverges significantly. However, it's important to note that the entropy method used to derive weightages in the vulnerability assessment is not intended for direct comparison across these distinct geographic contexts. For example, it should not be interpreted that the lower weightage for public transport availability in rural areas, compared to the higher weightage in urban areas, as an indication that rural regions have better connectivity and needs less attention in that matter. Such a conclusion would be misleading.

Instead, the correct interpretation of entropy-derived weightages is within each individual landscape. A lower weightage for public transport in rural areas simply reflects that access is relatively uniform across the rural landscape—it does not vary much from one location to another. On the other hand, a higher weightage for park availability indicates significant intra-regional differences within rural areas—some communities have good access to parks (which can help with heat stress), while others lack these facilities entirely, increasing their vulnerability.

These weightages are not just numerical outcomes used in vulnerability assessment further—they are critical indicators that help guide priorities for working towards reducing vulnerability. For instance, if funds are available for the entire municipality, weightages at the municipal scale can be used to identify where (i.e., the indicators) disparities are most pronounced. A high weightage for hospital availability, for instance, suggests substantial variation in access to healthcare services across the municipality. Addressing this gap would likely have a broader and more equitable impact than investing in services like road accessibility, which may already be relatively evenly distributed.

On the other hand, if funding is restricted to rural areas, the priority should be on improving road accessibility—where the entropy analysis indicates the greatest variation—followed by healthcare access and public transport. The point is to use weightages to drive the vulnerability assessment based on contextually relevant indicators (additionally prioritize interventions within a specific area), not to make comparisons between areas or assume that higher weightage equals poorer conditions.

Ultimately, this approach reinforces a key point made in the introduction: aggregating data at the municipal level can obscure important contextual differences. Disaggregated, landscape-specific analysis is essential for uncovering localized vulnerabilities.

6.2 Vulnerability Assessment Approach for Water related Risk

The previous section outlined the methodology used to assess heat vulnerability. In contrast, the approach for assessing water-related extreme vulnerability in the HDMC area is premised on:

- **Historical records of waterlogged / flooded locations,**
- **Topographic and hydrological characteristics of the urban area**
- **Changes in water bodies and natural drainage systems caused by rapid urban expansion.**

It is important to clarify that it would be inaccurate to categorize HDMC as flood-prone, as flooding refers to river overflow due to breach of riverbanks. This scenario is not applicable to HDMC, as no major river flows through the city. Initial surveys and consultations revealed that the water-related issues in HDMC are predominantly cases of local urban inundation occurring in a few low-lying areas. These events are largely a result of unplanned urbanization and inadequate stormwater drainage infrastructure, rather than riverine flooding. In some instances, overflow from major natural drainage channels of the city has affected settlements located along, especially in Hubballi.

Through this analysis, the study aimed to identify critical locations within the city that could be at risk of inundation / flooding, particularly under scenarios of extreme rainfall. Given the increasing unpredictability of weather patterns due to climate change, understanding and addressing this type of vulnerability is essential for climate-resilient urban planning in HDMC. The analysis and its findings are discussed in the further section of insights and outputs of the vulnerability assessment.

7. Insights and Outputs of the Vulnerability Assessment

Using the methods outlined above, vulnerability assessments for both heat and water-related risks were conducted. These assessments generated insights that informed the identification and selection of slum settlements for a focused livelihood vulnerability study— at the intersection of climate-induced risks in the later sections.

7.1 Vulnerability to Heat related Risk

This section outlines the layers and outputs across the three components (exposure, sensitivity and adaptive capacity) of the heat vulnerability assessment. Each component concludes with tables detailing the heat vulnerability status of individual wards within the HDMC area. These outputs were instrumental in informing the criteria for slum selection and will also serve as a key resource for climate adaptation planning in HDMC. The ward-level heat vulnerability data provides a critical foundation for the local authorities for prioritizing actions during extreme heat events and guiding targeted interventions.

7.1.1 Heat Exposure

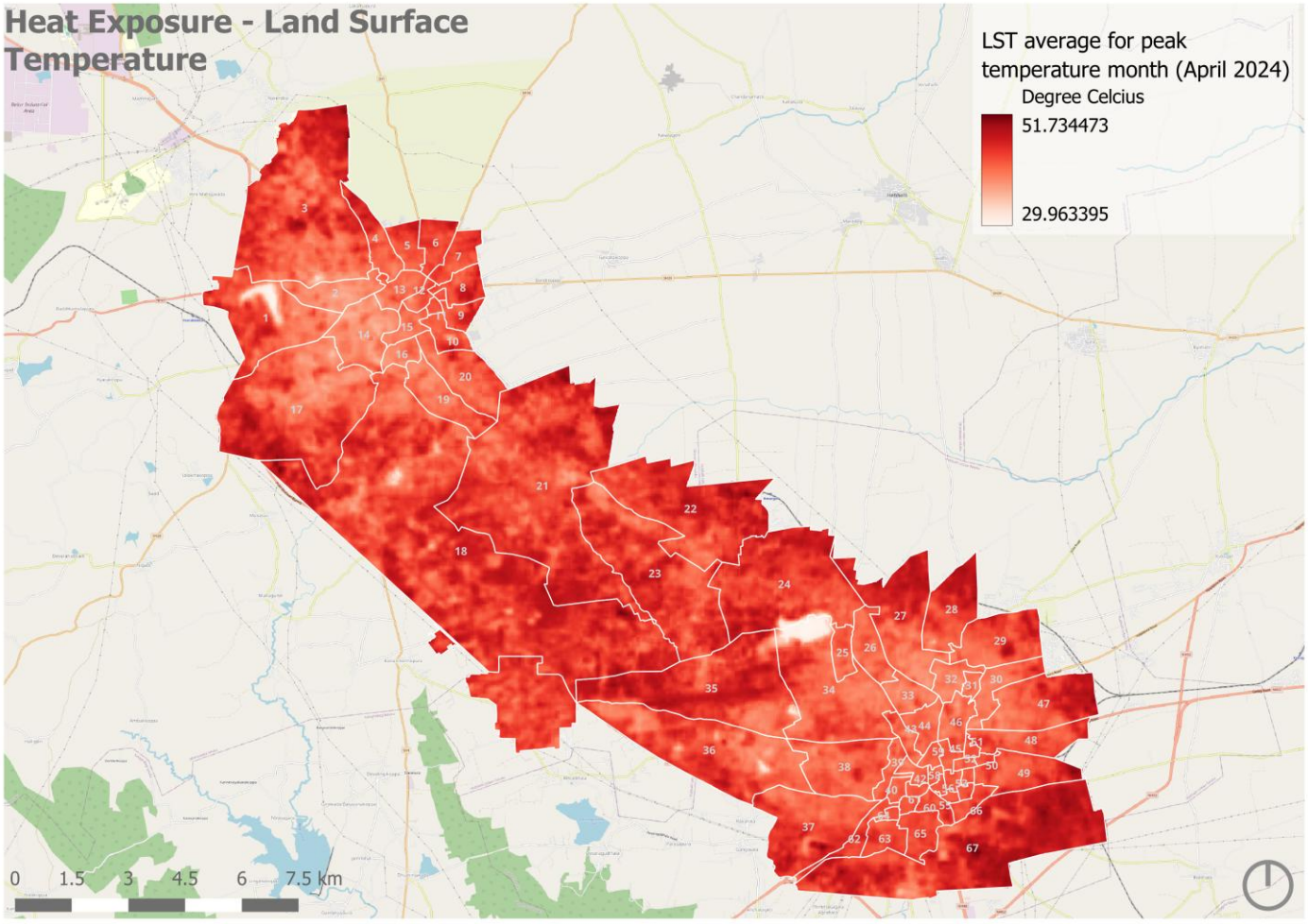


Figure 11 Land surface temperature - Exposure layer

Figure 11 illustrates the land surface temperature (LST), highlighting that the peripheral and rural areas of Hubballi and Dharwad experience the highest average temperatures during the peak month of April. Within the urban core, a positive correlation was observed between LST and built density—indicating that areas with higher built density tend to exhibit higher average surface temperatures, thus evidencing the importance of this indicator for the Urban Heat Island (UHI) effect in the exposure component of the heat vulnerability assessment, alongside LST. Built density was assessed by calculating the built-up area within a 100 x 100-meter grid land area in HDMC (Figure 12) revealing that built density is primarily concentrated in two urban landscapes within the HDMC. Specifically, in Hubballi, the density is concentrated in the southeastern part of the city, while in Dharwad, it is concentrated in the northeastern area. By combining (weighted overlay) the two heat exposure layers, a cumulative heat exposure layer is developed, as shown in Figure 13.

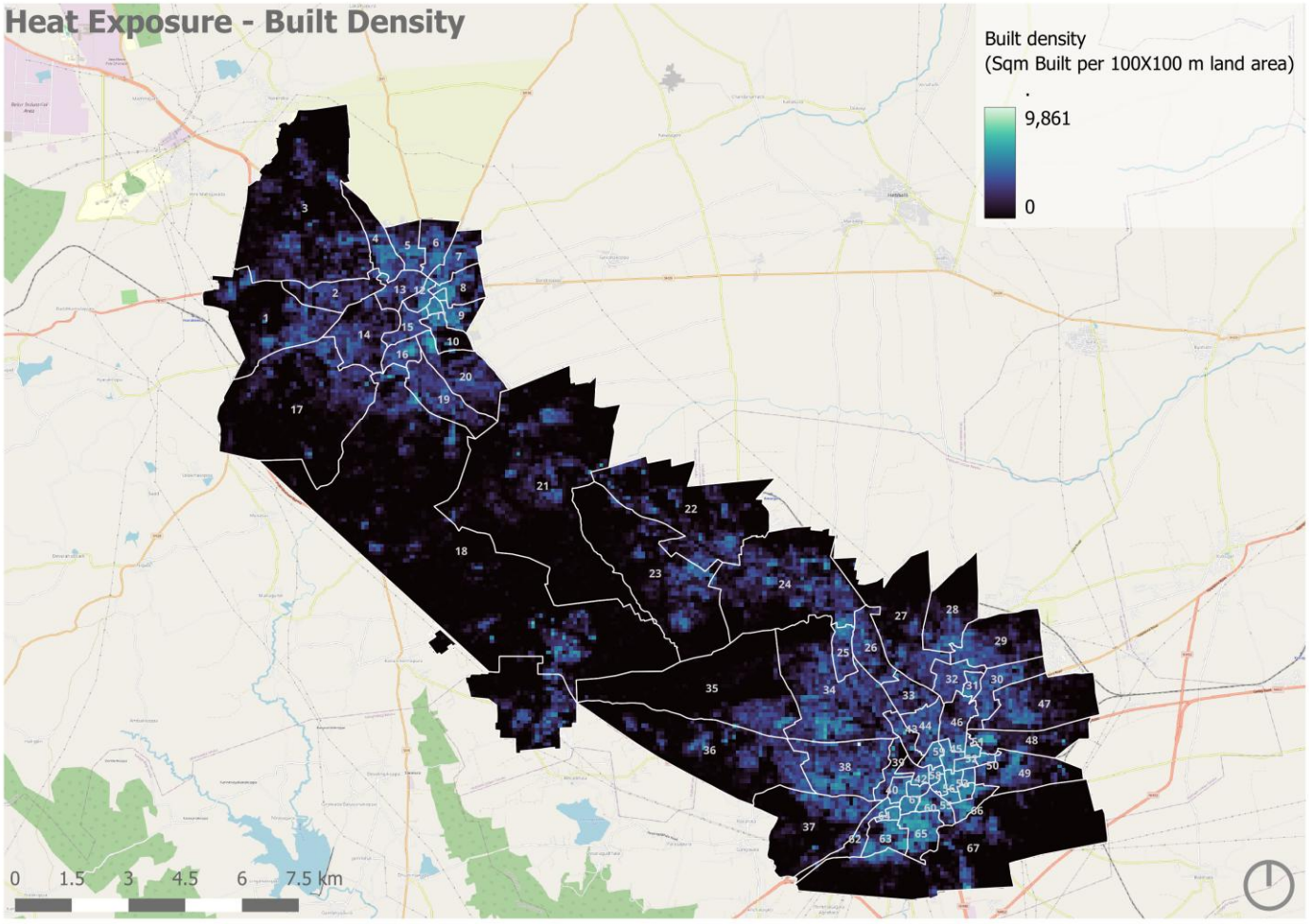


Figure 12 Built Density - Exposure layer

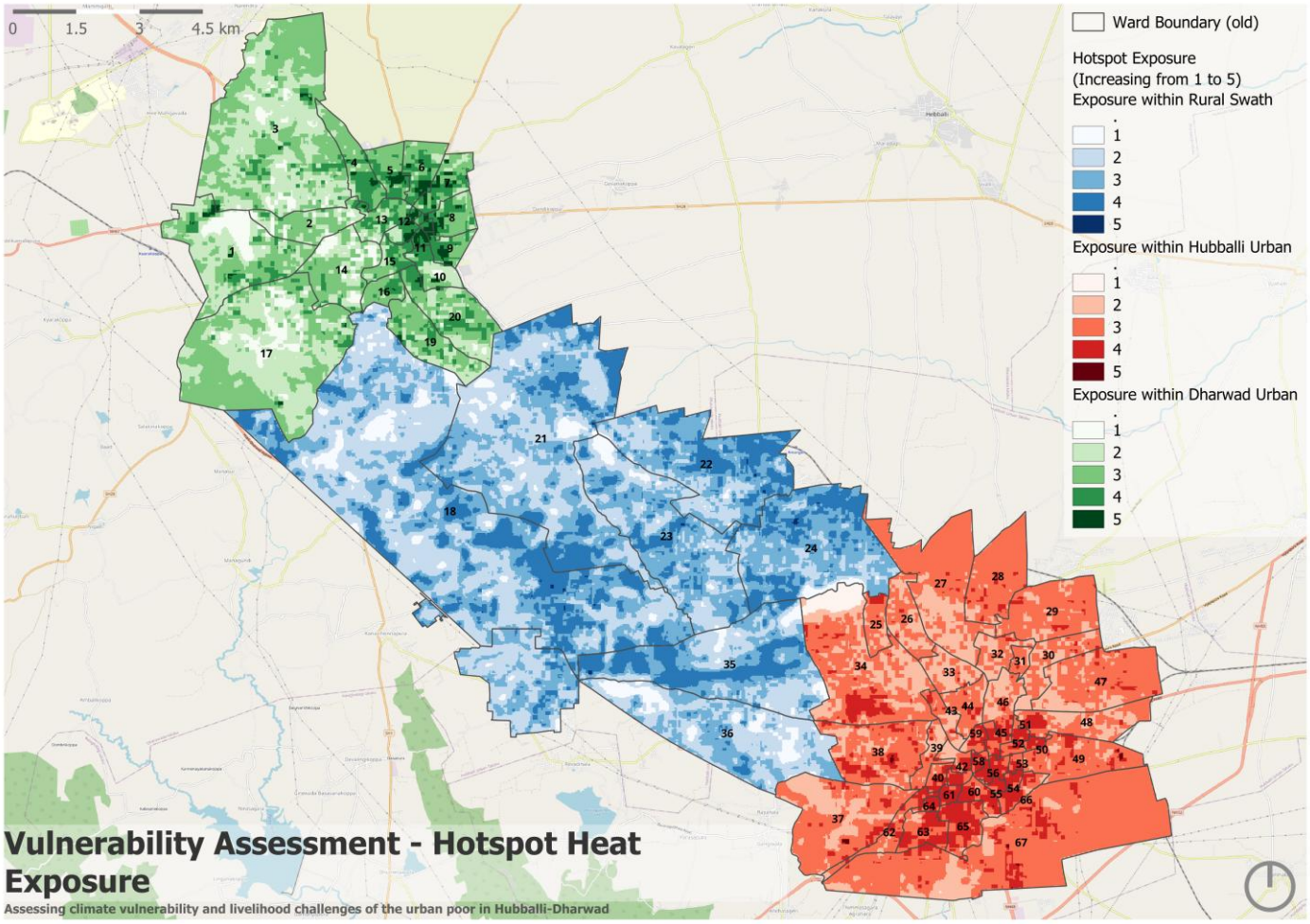


Figure 13 Cumulative Heat exposure output after weighted overlay

In Hubballi, the wards experiencing the highest heat exposure are 50, 51, 52, 45, 59, 58, 42, 40, 61, 60, 55, 56, 54, 66, 65, 63, and 64. These form the older and denser parts of the city, the Old Hubballi, and are characterized by high population density and compact built environments. Most of these wards are relatively small in area. Additionally, parts of wards 34 and 38 also show higher levels of heat exposure. A general pattern of medium heat exposure is observed throughout much of the city, particularly in the peripheral wards. In contrast, the northern part of the core city records relatively lower heat exposure, likely due to better green cover and more open spaces.

In Dharwad, the highest heat exposure is concentrated in the northeastern wards with the densest built environments—specifically wards 3, 5, 6, 7, 8, 9, 11, and 12. These are followed by surrounding wards such as 4, 13, 15, and 16. In contrast, the northwestern, western, and southwestern parts of the city show the lowest to medium levels of heat exposure.

In the rural swath, wards 18, 22, 24, and 35 contain large portions of land assessed under high heat exposure areas. Given the large geographical size of these wards, the hotspot data offers valuable granularity, enabling more targeted and effective intervention planning.

7.1.2 Heat Sensitivity

Following the exposure assessment, the sensitivity layers were prepared individually, and the cumulative sensitivity was calculated for the three distinct landscapes. Table 3 in the previous

section of vulnerability assessment approach shows the list of layers used for the individual sensitivity components. The ward-level datasets, collected from the 2011 Census, were utilized for this analysis. Figure 14 below shows the final heat sensitivity assessment.

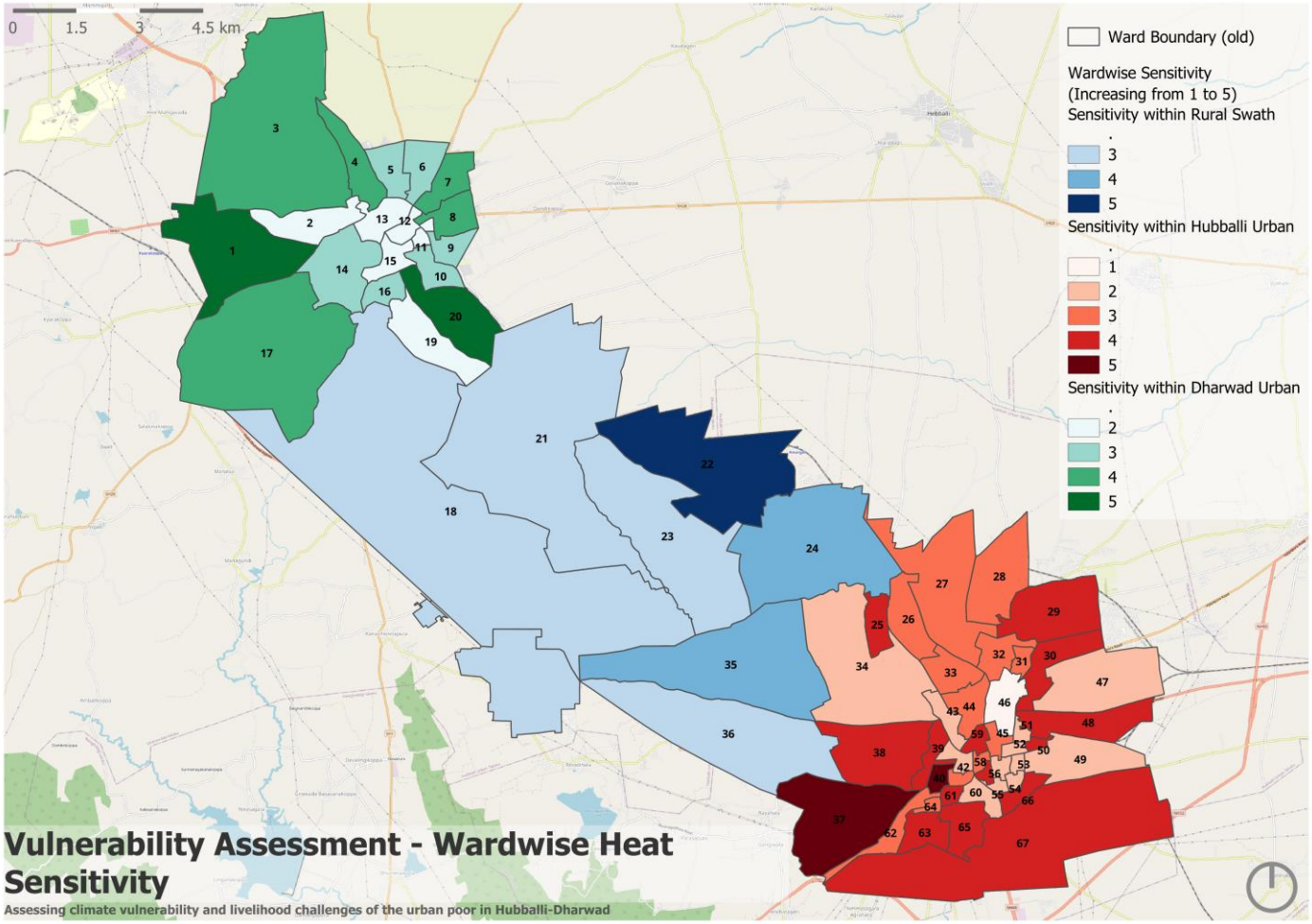


Figure 14 Cumulative Heat sensitivity output after weighted overlay

The assessment of socio-economic characteristics in the three distinct geographies as part of the sensitivity analysis revealed contextual socio-economic rankings (with different indicator weightages for each geography) that reflect the heat sensitivity of these areas, without diluting the role of context-specific indicators. The results of the cumulative sensitivity, derived from the weighted overlay, show that, at first glance, the wards in the central parts of the two cities appear to have lower sensitivity, moving outward, the sensitivity increases. Specifically, in Hubballi, the wards with the highest heat sensitivity are 37, 67, 38, 40, 63, 65, 66, 29, and 43. In Dharwad, the wards with the most heat sensitivity are 1, 20, 3, 17, 4, 7, and 8. In the rural landscape, the highest sensitivity is found in wards 22, 24, and 35.

7.1.3 Adaptive Capacity to Heat Risks

Following the analysis of exposure and sensitivity, relevant indicators were selected to assess adaptive capacity, making the final adaptive capacity layer shown in Figure 15. Table 4 highlights the indicators of adaptive capacity within the overall vulnerability assessment. The selected indicators focus on publicly accessible services and infrastructure as against individual factors. Although these services are meant to be widely available, they are unevenly distributed across the

HDMC area, underscoring the need to include them as critical elements in assessing adaptive capacity at the city scale. Most of these layers were developed using data from satellite imagery, Karnataka government open databases, and other secondary open sources.

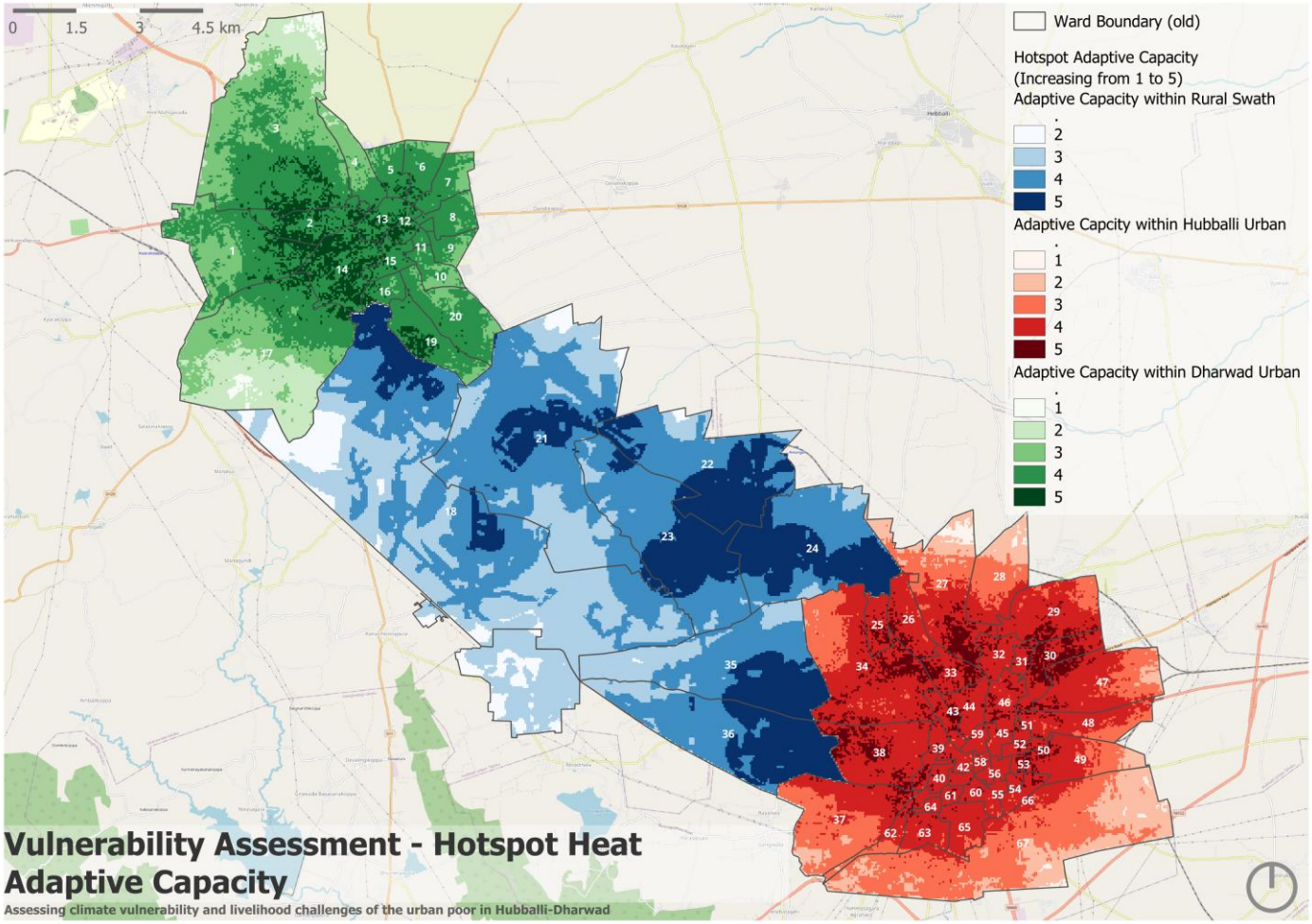


Figure 15 Cumulative Heat Adaptive capacity output after weighted overlay

The adaptive capacity assessment within the municipal corporation reveals a similar pattern for both the cities Dharwad and Hubballi: core urban areas possess the highest adaptive capacity, while peripheral areas exhibit the lowest. This is a common phenomenon, as peripheral zones typically lack adequate infrastructure and public amenities. In the rural swath between the two cities, higher adaptive capacity is observed in areas with better access to facilities such as hospitals and parks. Additionally, regions closer to the cities and those situated along the BRTS (Bus Rapid Transit System) corridor connecting Hubballi and Dharwad show relatively higher adaptive capacity. In contrast, the southern and southwestern parts of the rural swath demonstrate the lowest levels of adaptive capacity.

In Hubballi urban, the wards with the least adaptive capacity include 67, 37, 27, 34, and 28. Smaller wards in the southern part of the core city—namely wards 40, 42, 61, 60, 55, 54, 53, 59, 56, and 65—also show low adaptive capacity. Meanwhile, the northern parts of Hubballi urban exhibit better adaptive capacity. In Dharwad urban, the adaptive capacity follows the same core–periphery pattern, with the highest capacity in central areas and the lowest in the outskirts. Wards 17, 3, 20,

10, 9, and 8 are identified as having particularly low adaptive capacity. In the rural swath, the lowest capacity is found in wards 13 and 21.

7.1.4 Assessed Resultant Heat Risk Vulnerability

By integrating the three key components of the vulnerability assessment—Exposure, Sensitivity, and Adaptive Capacity—the final heat vulnerability for the HDMC area has been derived using a widely accepted formula:

Vulnerability (f) = (Exposure × Sensitivity) / Adaptive Capacity

Using the spatial layers developed for each of these components, this formula was applied to compute the overall heat vulnerability. The resulting analysis provides a comprehensive understanding of vulnerability patterns across the HDMC and is presented in detail in the following section.

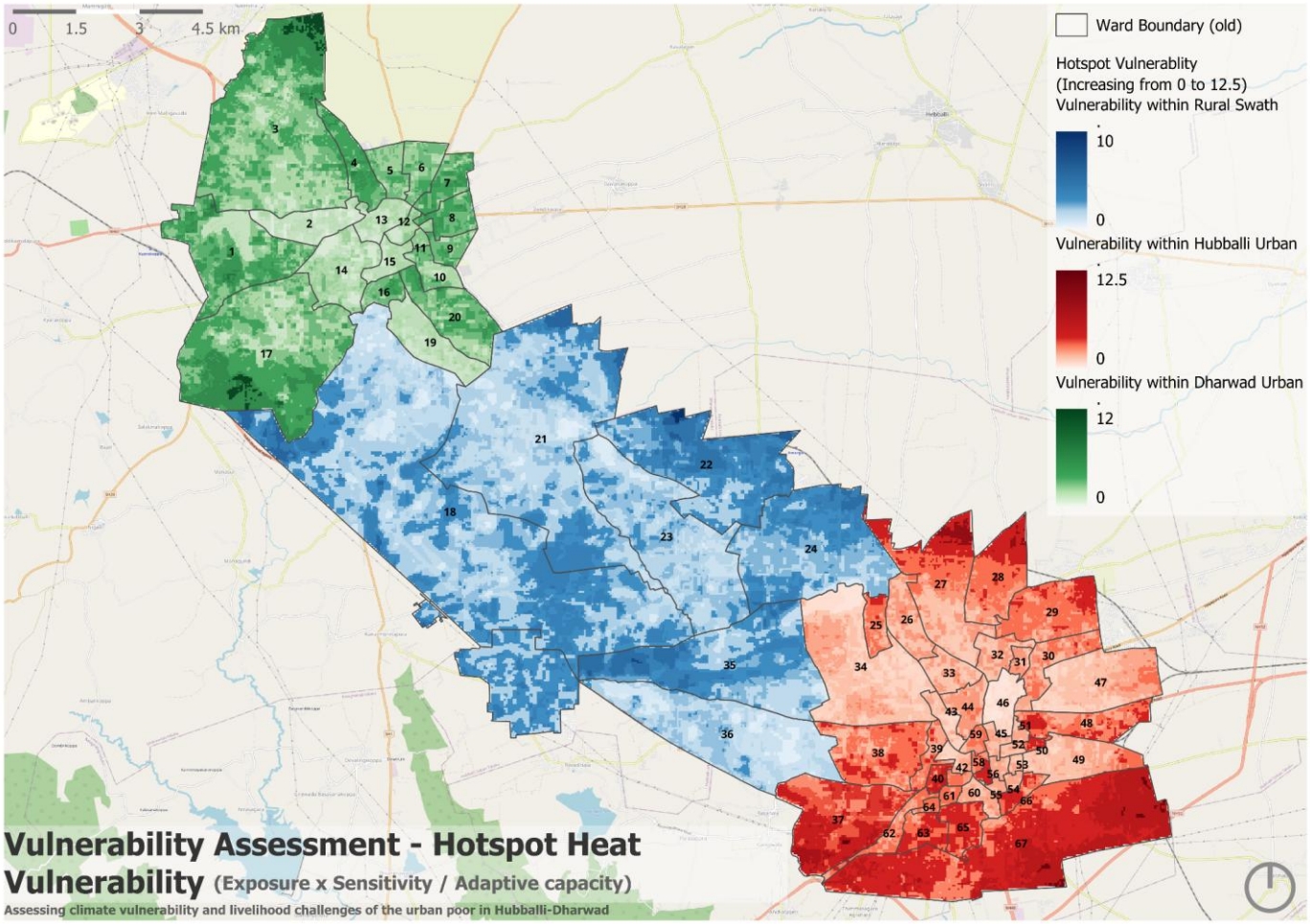


Figure 16 Resultant Heat Risk Vulnerability

The results of the heat vulnerability assessment reveal several critical insights. These findings are highly relevant for HDMC, providing a basis for prioritizing heat-related interventions and adaptation measures in the face of increasing climate hazards.

A clear core–periphery pattern is observed in both Hubballi and Dharwad urban areas, consistent with earlier findings from the adaptive capacity and sensitivity analyses. However, a more detailed

examination provides further granularity. In Hubballi urban, the most heat-vulnerable areas are in the southern part of the city, particularly in wards 67, 37, 62, 63, 40, 65, and 55. Additionally, certain northern peripheral wards—specifically 27, 28, and 29—also exhibit high levels of vulnerability.

In Dharwad urban, higher heat vulnerability is concentrated in peripheral wards surrounding the city center. Notable among these are wards 1, 3, 17, 7, 8, 9, and 20. The highest levels of vulnerability across both cities are found in specific wards, including patches within wards 27, 37, and 67 in Hubballi, and wards 17 and 3 in Dharwad.

In the rural swath between the two cities, heat vulnerability is more widely distributed. However, relatively lower vulnerability is observed along the BRTS corridor. The highest vulnerability in the rural region is concentrated in wards 22, 24, 35, and 18.

The table 5 comprehends all the wards which are identified to be at most vulnerable to heat risks.

Table 5 Wards at identified to be most vulnerable to heat risk based on the assessment

Component of the Heat vulnerability assessment	Wards identified to be most at risk		
	In the Urban Hubballi	**In the Urban Dharwad**	**In the Rural swath**
Heat exposure	50, 51, 52, 45, 59, 58, 42, 40, 61, 60, 55, 56, 54, 66, 65, 63, and 64	3, 5, 6, 7, 8, 9, 11, and 12	18, 22, 24, and 35
Heat sensitivity	37, 67, 38, 40, 63, 65, 66, 29, and 43	1, 20, 3, 17, 4, 7, and 8	22, 24, and 35
Adaptive capacity to heat risk	67, 37, 27, 34, and 28	17, 3, 20, 10, 9,1 and 8	13 and 21
Final resultant heat vulnerability	67, 37, 62, 63, 40, 65, 27, 56, 40, 54, and 55	1, 3, 17, 4, 7, 8, 9, 16, and 20	22, 24, 35, and 18

7.2 Vulnerability to Water related Risk

The topographic elevation in HDMC ranges between 575 meters and 785 meters above mean sea level (MSL), with a difference of nearly 210 meters. Hubballi urban areas fall within the lower elevation profile, while Dharwad urban areas are situated at higher altitudes. The intermediate rural swath shows a gradual slope, transitioning from Dharwad towards the Hubballi urban area. The lowest elevation is found in the southern and southwestern parts of Hubballi urban, which also correspond to areas where most of the historic flood & inundation events have been recorded, as shown in Figure 17.

Given the topographical context and natural drainage patterns outlined earlier in the context sections, Hubballi is significantly more vulnerable to high-volume peak drainage overflow events—typical of flooding. In contrast, Dharwad, being at a higher elevation and lacking any major natural drainage channels, is less prone to such flooding. Vulnerability in Dharwad would primarily be limited to localized inundation, often resulting from inadequate infrastructure and / or unplanned urbanization.

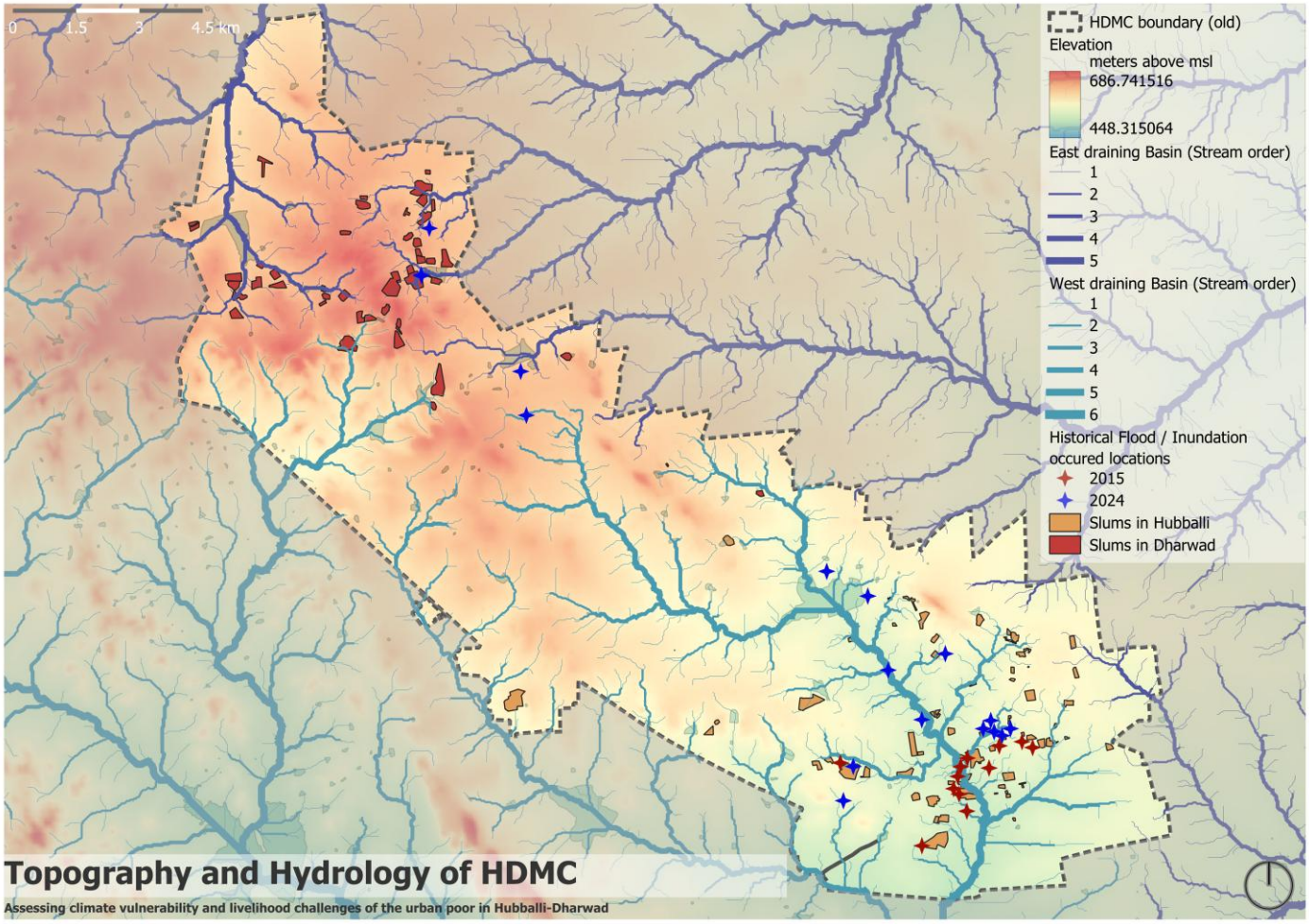


Figure 17 Topography - Elevation profile and the historic flood occurred spots

7.2.1 Hydrological Analysis

To assess water related risk vulnerability more precisely, a hydrological analysis was carried out to identify the most at-risk areas. This approach considered both localized inundation in Dharwad and natural drainage overflow in Hubballi.

Using a Digital Elevation Model (DEM) from Cartosat-1 satellite imagery (accessed via ISRO's Bhunidhi portal), the study mapped out the lower-order drainage network across HDMC. This allowed for a detailed understanding of water flow patterns across the landscape. The hydrological findings were then cross-referenced with historical flood data and local knowledge to identify the area most vulnerable to water related risk such as inundation and flooding.

The analysis focused on two key aspects:

1. **Areas with maximum peak flow and potential for water body breaches**
2. **Areas susceptible to localized inundation due to poor infrastructure and haphazard urbanization**

Based on these two aspects, a set of wards was identified as having a potential risk of flooding and inundation. The dataset of historically recorded flood locations played a key role in arriving at these wards. However, it is important to note that while the listed wards indicate areas with a potential risk,

this data alone should not be used to determine overall vulnerability, as the underlying dataset is quite limited.

To complement this limitation, a more granular understanding of areas adjacent to streams within the HDMC was developed. This helped in identifying slum settlements most vulnerable to water-related risks—an aspect discussed in detail in later sections following the introduction to slums in HDMC. The resultant stream network and drainage order mapping (shown in figure 18) supported the identification of high-risk wards. These wards are listed in the table 6.

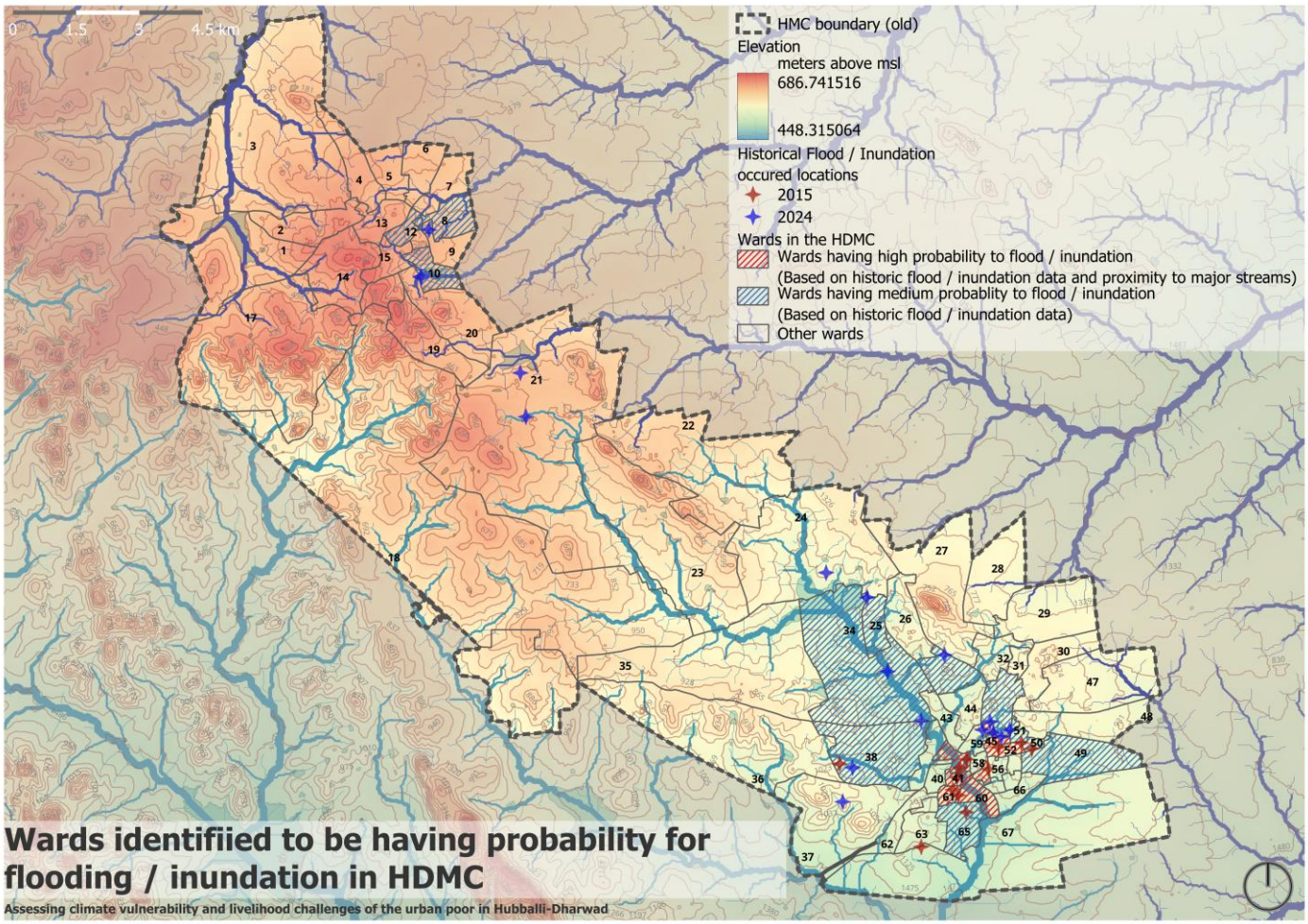


Figure 18 Wards identified to be having probability for water related risk

Table 6 Wards identified to be having probability for water related risk (based on a general analysis of the topography and the historic flooding / inundation data)

Water related risks	Wards identified to be most at risk	
	In the Urban Hubballi	In the Urban Dharwad
Flood and Local Inundation	25, 33, 34, 38, 41, 42, 45, 46, 49, 50, 51, 52, 57, 60, 61, and 65	8, 10, and 12

8. Urban Poor and their Vulnerability to Climate related risks in HDMC

The previous section outlined the approach taken for the vulnerability assessment in HDMC, along with key insights and findings. To contextualize these findings in relation to the urban poor, it is essential to understand in brief the overview of HDMC's urban poor and their current socio-economic situation. As the climate change get severe it increasingly impacts the pillars of society: environmental, economic, and social development. This section aims to present that context and sets the base for exploring how the urban poor in HDMC are disproportionately affected by climate-related risks.

8.1 The Growth of Slums

As per the 2011 census, the population of HDMC was 943,788. Since then, the region has experienced a consistent migration rate, becoming an increasingly suitable destination for migrants. HDMC among its surrounding areas have long held economic importance in northern interior Karnataka and neighboring states like Maharashtra. The availability of jobs and economic opportunities has consistently drawn people to the region, making migration a natural outcome. The RAY Slum-Free City report for Hubballi-Dharwad highlights this, stating, "The people of these two cities (Hubballi and Dharwad) came from several places within and around the state, irrespective of language, religion, and culture."

The HDMC as mentioned, resulted in a rapid pace of urbanization and the sharp rise in population leading to a significant housing gap. This gap, coupled with insufficient infrastructure, has contributed to the growth of slums in the HDMC, some of which date back over a century. The rapid expansion of slums in Hubballi-Dharwad has placed immense pressure on the limited land and existing infrastructure, exacerbating the degradation of the physical environment.

Migration in search of employment and the availability of cheap, informal housing are the primary drivers of slum growth in HDMC as in any other large city. These settlements include both tenable and untenable housing options, often taken up by incoming migrants. Since housing is a critical factor in the development and environmental health of slum areas, it is essential to examine the broader housing scenario in Karnataka, which reflects the state's economic conditions and underlying challenges.

According to the 2011 Census data of Karnataka, Bengaluru Urban district reports the highest housing deficit, with 21.5%. Following Bengaluru, Dharwad district has the next highest shortage at 6.1%. Apart from the metropolitan area of Bengaluru, Dharwad ranks the highest in the state for housing inadequacy.

This data clearly underscores Dharwad district—and by extension the HDMC area—as a key destination for migrants. With its continued economic appeal, the region is likely to witness further population growth in the future. This growing demand calls for attention not just to economic development, but also to associated issues in social development—especially in areas marked by high housing shortages and poor living environments, such as the slums of HDMC.

8.1.1 Slums in HDMC

This section, draws on three major sources of literature to trace the growth of slums in the HDMC area. These are:

- Socio-Economic Survey (2006) by HDMC, HDUDA, and CMDR,
- RAY Slum-Free City Report (2012–2015) supported with the AKM data (Asha Kirana Mahithi software, designed for providing the details of the Slum-Socio Economic Survey in Cities/Towns)
- Recent field interviews with local stakeholders including residents, elected representatives, and municipal officials as part of this study.

In addition, primary engagements in the city allowed for critical perspectives that facilitated a comprehensive account of the evolution of slums in the HDMC area.

Socio-Economic Survey by HDMC (2006)

The 2006 survey offered a comprehensive snapshot of slum conditions based on a sample of approximately 15,400 households across 67 wards.

Key Findings:

- Slum population: 25% of the total urban population.
- Poverty incidence: 43% of slum households were below the poverty line.
- Income levels:
  - 18.7% earned less than ₹17,500/year.
  - 50.2% earned between ₹17,500–₹50,000/year.
- Expenditure pattern: Around 60% of income is spent on food.
- Demographics: High concentration of Muslims (43.5%) and SC/ST (36.2%).
- Housing: 48% of houses were kutcha structures.
- Infrastructure access: 87% had electricity; water and sanitation facilities were limited.

RAY Slum-Free City Report (2012–2015)

Based on a population census rather than a sample, the RAY report identified 127 slums (93 notified, 34 non-notified), housing 174,577 individuals (18% of the urban population).

Location and Environmental Risk:

- 54% located in the core city; 46% in peripheral areas.
- 27% situated in unsafe zones (near roads, railways), and 12% on or near water bodies.
- 22% of land tenure deemed insecure.
- Slums like J.P. Nagar and Jagadish Nagar in Hubballi are identified as flood-prone.

Housing Conditions:

- 54% semi-pucca, 28% pucca, 18% kutcha.
- Roofing materials included asbestos, cement slabs, tiles, and 11.5% tarpaulin.
- Though electricity access remained high, other services lagged behind.

Socio-Economic conditions:

- BPL Status: 83.8% of slum households fell below the poverty line.
- Employment:
  - 42% in casual labor.
  - 18% in regular wage jobs (mostly informal sector).
  - 19% in self-employment.
  - 21% unemployed.
- Skill Levels and education:
  - Only 2% had formal training in any skills.
  - 30% had no formal education.
  - Hereditary skills were nearly absent (0.4%).

Infrastructure Deficits:

- Water Supply:
  - 56% had individual connections.
  - Majority depended on public taps, tanks, or handpumps.
  - Supply frequency was poor—many received water only once a week.
- Sanitation and Sewage:
  - 27% of slums connected to city sewage; 42% partially connected.
  - Peripheral slums lagged significantly.
  - Open drainage and disposal into stormwater systems caused major health concerns.
- Road Connectivity:
  - Most slums were within 1–2 km of motorable roads.
  - However, 50% of internal roads were kutcha and poorly maintained.

Community Insights - Recent Improvements (Reconnaissance survey for this study)

Infrastructure and Housing Upgradation:

Over the past decade, substantial progress has been reported, particularly in slums located on government land. Interviews with residents and local elected officials such as MLA Mr. Arvind Bellad and the Assistant Executive Engineer of the Slum Board confirm these improvements. Check out for these detailed conversations in the annexure.

Notable Developments:

- **Roads and drainage systems have been upgraded.**
- **Housing improvements observed under the Pradhan Mantri Awas Yojana (PMAY).**
- **Electricity and basic service coverage has expanded - Such as 24X7 water supply.**
- **Income level has raised significantly during the recent times among specific groups of slum dwellers especially through their involvement in construction laborer sector. (This was observed through survey responses and key informant interviews, though not backed by quantitative data.)**

The table 7 presents a comprehensive overview of critical indicators and its status laid an understanding of the changes in the condition of the slums in HDMC.

Table 7 A overview of the slum development and their evolution in the HDMC

Indicator	2006	2012–15	Recent development (post 2015 to present)
Slum Population Share	25%	18%	30 - 35% (as per the locals)
Below Poverty Line (BPL)	43%	83.8%	Abstract information on upgradation of income and spending power (within a share of population) noted by locals and officials
Formal Education	Not specified	30% had no formal education	No insights
Skill Training	Not specified	Only 2% trained	Skill programs are still limited, and the need is highlighted
Individual Water Connections	Not specified	56%	Achieved 24X7 water supply in the city and majority of the slums
Sanitation (Sewerage Coverage) and Storm water drainage	Not specified	27% fully, 42% partially connected sewerage	A major upgradation happened in many of the slums and are in underway in many
Housing Quality (Pucca Houses)	Low (48% kutcha)	28% pucca, 54% semi-pucca, 18% Kutcha	A major housing upgradation underway under the PMAY, and was witnessed during the reconnaissance survey

Note: This table is a compilation of insights drawn from multiple sources, including the socio-economic survey conducted by HDMC around 2006, the RAY (Rajiv Awas Yojana) Slum-Free City Plan reports published between 2012 and 2015 (exact date not in the report), and reconnaissance surveys carried out during the study giving insights on the past decade.

To conclude, the slums within the HDMC area have undergone significant improvements in recent years, particularly in settlements where land tenure issues are minimal—primarily those located on government-owned lands. These tenure-secure slums have seen more extensive infrastructure development and service delivery. Alongside these physical improvements, there have also been noticeable changes in the livelihood patterns of residents. Stakeholder conversations in the field revealed that income levels in many slums have increased, largely due to the rise in construction-related employment opportunities. However, despite these positive developments, a substantial portion of the slum population continues to face serious livelihood challenges, indicating the need for targeted interventions and support. A detailed account of these stakeholder conversations is provided in the later sections.

8.1.2 Slum Inventory

This section outlines the final list of slums accounted for the study. This includes both notified and non-notified slums, selected based on the integration of multiple data sources.

Different slum-related datasets were used for different components of the study. For instance, the 2019 slum data available on data.gov.in, which provides ward-wise slum population data for HDMC, was specifically used for assessing vulnerability to heat extremes, which was discussed in previous sections.

It became apparent during the initial phase of the study that recent, comprehensive official data on slums in HDMC is lacking. To address this gap, data triangulation was undertaken using both official and unofficial sources to gather information on population, slum locations, and the notified/non-notified status of each settlement.

According to the RAY (Rajiv Awas Yojana) Slum-Free City Plan, HDMC comprises 93 notified and 34 non-notified slums. This report also includes spatial maps outlining the geographic boundaries and extent of these slums, which served as a foundational resource to identify and locate the majority—approximately 99%—of the slums in the area. Additionally, a few more slums were identified and included in the database using unofficial sources and local verification efforts.

When it came to individual slum population data, a significant gap was observed. The Karnataka Slum Development Board had population data for only 36 slums in Dharwad and 32 slums in Hubballi, which is significantly lower than the total slum count reported in the RAY report. This data likely drew from the 2011 Census, although the exact source was not specified.

To supplement this, a publication hosted on ISSUU by an affiliate to the Indian Institute of Science (IISc), Bengaluru provided population figures for most slums in HDMC. Cross-verification of this data with the Slum Board's dataset (where overlaps existed), population figures were found to be consistent. Notably, the publication cited the Karnataka Slum Clearance Board as its source, which added to its credibility. Efforts were made during the preliminary field visits to HDMC offices to obtain updated slum population data directly from the Slum Board's Hubballi-Dharwad division. However, officials confirmed that no recent surveys had been conducted, and no updated population data was available at the local level.

Multiple dataset verification led to a total of 120 slums across Hubballi and Dharwad with identifiable spatial locations (Refer Table 8 and Figure 19)

Table 8 Final list of slums in Hubballi accounted for the study

Sno.	Name	Notification Status	Population	Ward (Old)	Number
1	Assaroni	Notified	1206	41	
2	Bramhapur Doddakeri	Notified	582	67	
3	Bani Oni	Notified	450	45	
4	Barakotrikeshwapur	Notified	1320	46	
5	Chamundeshwari Nagar	Notified	1164	27	
6	Chitaguppi Chawal	Notified	No data	51	
7	Doddakeri east portion	Notified	600	66	
8	Doddakeri Harijanakeri	Notified	300	66	
9	Gandhi Nagar Bengeri	Notified	1655	32	
10	Gandhiwada Station area	Notified	2395	47	
11	Gaval galli	Notified	No data	45	
12	Girni Chawl	Notified	No data	43	
13	Girirajnagar	Notified	625	26	
14	Gokul Harijanakeri colony	Notified	175	36	
15	Gollar colony Bengeri	Notified	552	29	

16	Hosur Plot	Notified	1260	43
17	Jagadeesh Nagar Shikkaligarta	Notified	No data	38
18	Jannath Nagar	Notified	No data	65
19	Jamesland	Notified	360	30
20	JP Nagar Heggere	Notified	635	38
21	Kanyanagar	Notified	1326	48
22	KCT Mill	Notified	1554	43
23	Karigannavar Hakkal	Notified	No data	66
24	Kolikeri Plot	Notified	3350	60
25	Krishna Colony	Notified	350	36
26	Kulkarani Hakkal	Notified	816	50
27	Kumbar Oni	Notified	1500	60
28	Lokappa Hakkal	Notified	1100	33
29	Madhav Nagar	Notified	2200	28
30	Maralikatti	Notified	500	49
31	Maruthi Nagar Heggere	Notified	4608	38
32	Mayur Nagar Hosur Jopadi	Notified	175	36
33	Mehaboob Nagar	Notified	1400	66
34	Moulalij jopadi	Notified	900	50
35	Murusaviradde	Notified	1050	59
36	Myadaroni	Notified	1500	41
37	NagashettiKoppaAnjaneya Temple	Notified	700	31
38	Nagashetti Koppakeri Tankside	Not notified	No data	31
39	Nanda Gokul	Notified	950	36
40	Nandishwar Nagar	Notified	1600	23
41	Narayan Sofa	Notified	150	41
42	Nava Ananda Nagar	Notified	4620	38
43	Nekar Nagar	Notified	6875	63
44	Pendar Oni	Notified	750	45
45	Ramalingeshwara Nagara	Notified	No data	35
46	Ramnagar	Notified	3300	30
47	RSNO124Krishnapura	Notified	162	62
48	Sadar Sofa	Notified	1100	60
49	Shakthi colony RS	Notified	620	34
50	Shidarameshwar Nagar	Notified	666	26
51	Shivaputra Nagar	Notified	1314	38
52	Sikaligar Lamani Tanda	Non notified	No data	26
53	Station road	Notified	660	46
54	Sudagal Chawal	Notified	1260	49
55	Tarahalla	Notified	2600	36
56	Timmasagar Oni	Notified	750	58
57	Tippunagar Hesigemaddi	Notified	1035	63
58	Toravi Hakkal	Notified	5350	42
59	Udaynagara Bengeri	Notified	222	32
60	Vaddaroni Deahpandenagar	Notified	900	44

61	Walvekar Hakkal	Notified	900	66
62	Veerapur Oni	Notified	1250	54
63	Yellapur Oni	Notified	570	55
64	Yavga plot	Notified	550	43
65	Banatikatti	Non notified	No data	64
66	Dayanada Colony Keshwapur	Non notified	No data	31
69	Sagar Colony	Non notified	No data	47
70	Shabari Nagar	Non notified	No data	30
71	Shiradi Nagar Indira Nagar	Non notified	No data	27
72	Harischandra Colony	Notified	No data	49
73	Mulla Oni	Notified	No data	58

Note:

1. Notification status sourced from RAY slum free city report of HDMC, Population data sourced from Unofficial source cited with Karnataka Slum Clearance Board | Figure 19 shows the geographic location and area of the slums, each marked with a serial number that corresponds to the listed slum names in Table.

2. A few slums were mapped spatially based on data from the RAY report but lacked information regarding their names and population; these are listed below.

Sno.	Name	Notification Status	Population	Ward (Old) Number
67	No data	Non notified	No data	26
68	No data	Non notified	No data	49

Table 9 Final list of slums in Dharwad accounted for the study

Sno.	Name	Notification Status	Population	Ward (Old) Number
1	Anjaneya Nagar	Notified	641	1
2	Attikoll Slum	Notified	1800	18
3	Balaji Mut	Notified	2040	7
4	Barakotri slum	Notified	900	14
5	Bavikatti plot	Notified	641	1
6	Chapparband Colony	Notified	3000	20
7	Danu Nagar	Notified	3000	18
8	Gavaligalli/ Attikolla	Notified	1040	12
9	Gollara Colony/Oni	Notified	1848	7
10	Haveri Peth	Notified	2750	6
11	Hosayallapura	Notified	1230	10
12	Jannath Nagar	Notified	6132	20
13	Krupali Nagar	Notified	280	14
14	Kurubara Oni	Notified	1272	11
15	Lakamanahalli	Notified	1484	18
16	Laxmisinganakeri	Notified	320	16
17	Malamaddi / Gauli Galli	Notified	2004	18
18	Masalagar Oni	Notified	1800	19
19	Mochi society	Notified	822	13

20	Nagarkar colony	Notified	970	16
21	Nehru Nagar	Notified	2045	1
22	Rajivgandhi Nagar	Notified	4794	18
23	Saidapur	Notified	1260	4
24	Saidapur opp masjid	Notified	1290	4
25	Saptapur RS no 57	Notified	328	14
26	Saraswatapura	Notified	500	19
27	Shivashakthi Nagar	Notified	825	1
28	Sriram Nagar 1	Notified	No data	17
29	Sudgadsiddar Samaj	Notified	630	18
30	Tadasinakoppa	Notified	972	22
31	Vaddaronirayapur	Notified	770	22
32	Behind Tapovan	Notified	1825	1
43	Kolikere	Not notified	No data	9
47	Dhobi Ghat	Not notified	No data	10

Note:

1. Notification status sourced from RAY slum free city report of HDMC, Population data sourced from Unofficial source cited with Karnataka Slum Clearance Board | Figure 19 shows the geographic location and area of the slums, each marked with a serial number that corresponds to the listed slum names in Table.

2. A few slums were mapped spatially based on data from the RAY report but lacked information regarding their names and population; these are listed below.

Sno.	Name	Notification Status	Population	Ward (Old) Number
33	No data	Notified	No data	8
34	No data	Notified	No data	10
35	No data	Not notified	No data	10
36	No data	Notified	No data	14
37	No data	Notified	No data	14
38	No data	Not notified	No data	17
39	No data	Not notified	No data	1
40	No data	Not notified	No data	17
41	No data	Not notified	No data	1
42	No data	Not notified	No data	17
44	No data	Not notified	No data	21
45	No data	Not notified	No data	6
46	No data	Not notified	No data	3

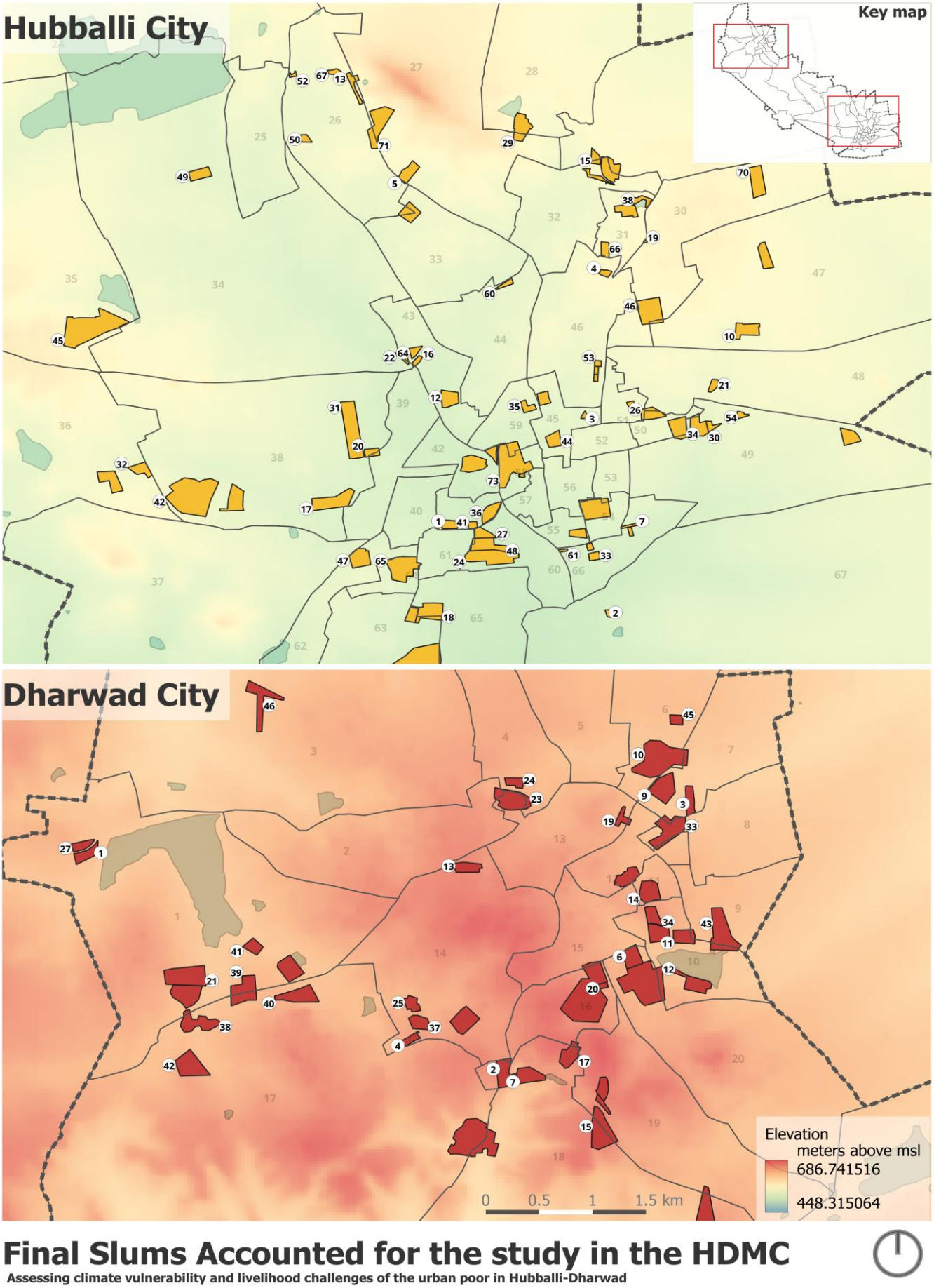


Figure 19 Final list slums accounted for the study

9. Assessment of Climate Vulnerability in Slums: Findings and Insights

9.1 Heat related risk vulnerability in Slums

Based on the vulnerability assessment, slum locations were overlaid to evaluate their level of heat vulnerability. Figure 20 below shows the slum locations, marked with numerals, along with the corresponding heat vulnerability levels they have been assessed with.

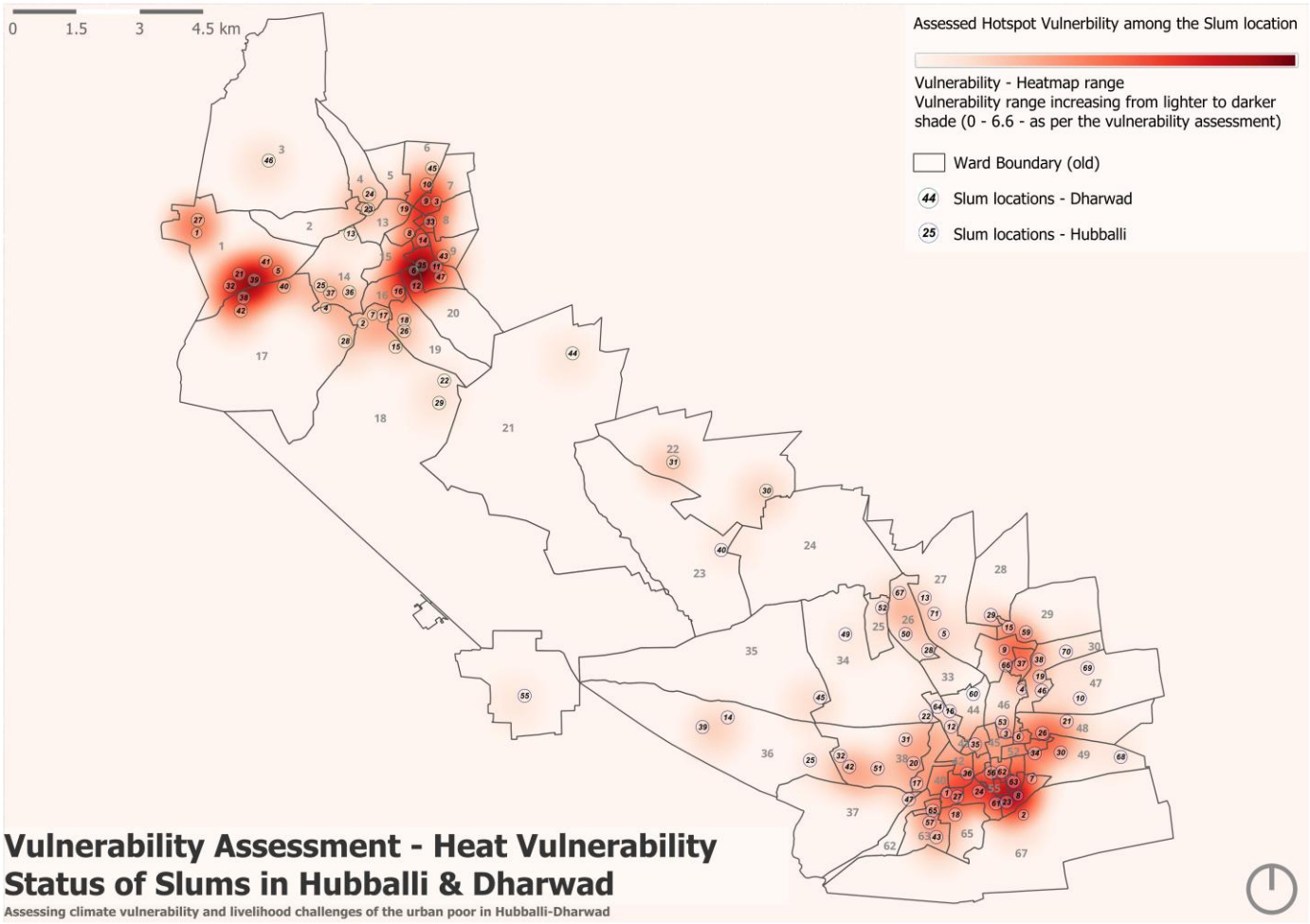


Figure 20 Slum locations and their heat vulnerability levels (refer to the table 8 and 9 for names of the slums numerically coded))

The tables below present the individual heat vulnerability levels assessed for slums in the HDMC. As is evident, Dharwad exhibits comparatively higher levels of heat vulnerability than Hubballi. As shown in the table 10 and 11, none of the slums in Hubballi have a vulnerability value exceeding 4, whereas in Dharwad, some slums reach values as high as 6.6.

While these figures provide a useful comparison, it is important to note that the vulnerability values are relative and context-specific. Given that both cities share a similar geographical and climatic setting, the differences may not be highly significant in practical terms. Nevertheless, this observed variation offered an important insight that was further investigated through primary engagement, which helped validate and contextualize these findings on the ground.

Table 10 Slums and their assessed Heat vulnerability – Hubballi (Colour-Coded: Increasing Vulnerability from Green to Yellow to Red Shades)

Sno.	Name (In red - Vulnerability more than 3)	Notification Status	Ward Number (Old)	Population	Final Assessed Heat Vulnerability
1	Assaroni	Notified	41	1206	3
2	Bramhapur Doddakeri	Notified	67	582	4
3	Bani Oni	Notified	45	450	2
4	Barakotrikeshwapur	Notified	46	1320	0.75
5	Chamundeshwari Nagar	Notified	27	1164	2.25
6	Chitaguppi Chawal	Notified	51	No data	2
7	Doddakeri east portion	Notified	66	600	4
8	Doddakeri Harijanakeri	Notified	66	300	3.2
9	Gandhi Nagar Bengeri	Notified	32	1655	3
10	Gandhiwada Station area	Notified	47	2395	1.5
11	Gaval galli	Notified	45	No data	2
12	Girni Chawl	Notified	43	No data	2
13	Girirajnagar	Notified	26	625	1.5
14	Gokul Harijanakeri colony	Notified	36	175	2.25
15	Gollar colony Bengeri	Notified	29	552	3
16	Hosur Plot	Notified	43	1260	1
17	Jagadeesh Nagar Shikkaligarta	Notified	38	No data	3
18	Jannath Nagar	Notified	65	No data	3
19	Jamesland	Notified	30	360	2.4
20	JP Nagar Heggere	Notified	38	635	3
21	Kanyanagar	Notified	48	1326	3
22	KCT Mill	Notified	43	1554	1.5
23	Karigannavar Hakkal	Notified	66	No data	4
24	Kolikeri Plot	Notified	60	3350	2
25	Krishna Colony	Notified	36	350	1.2
26	Kulkarani Hakkal	Notified	50	816	4
27	Kumbar Oni	Notified	60	1500	2
28	Lokappa Hakkal	Notified	33	1100	1.5
29	Madhav Nagar	Notified	28	2200	3
30	Maralikatti	Notified	49	500	1.5
31	Maruthi Nagar Heggere	Notified	38	4608	4
32	Mayur Nagar Hosur Jopadi	Notified	36	175	1.2
33	Mehaboob Nagar	Notified	66	1400	4
34	Moulalij jopadi	Notified	50	900	3.2
35	Murusaviradde	Notified	59	1050	2.25
36	Myadaroni	Notified	41	1500	2.25
37	NagashettiKoppaAnjaneya Temple	Notified	31	700	2.25
38	Nagashetti Koppakeri Tankside	Not notified	31	No data	1.5

39	Nanda Gokul	Notified	36	950	2.25
40	Nandishwar Nagar	Notified	23	1600	1.8
41	Narayan Sofa	Notified	41	150	3
42	Nava Ananda Nagar	Notified	38	4620	4
43	Nekar Nagar	Notified	63	6875	4
44	Pendar Oni	Notified	45	750	1.5
45	Ramalingeshwara Nagara	Notified	35	No data	3.2
46	Ramnagar	Notified	30	3300	2
47	RSNO124Krishnapura	Notified	62	162	3
48	Sadar Sofa	Notified	60	1100	2
49	Shakthi colony RS	Notified	34	620	1.5
50	Shidarameshwar Nagar	Notified	26	666	2.25
51	Shivaputra Nagar	Notified	38	1314	4
52	Sikaligar Lamani Tanda	Non notified	26	No data	2.25
53	Station road	Notified	46	660	0.75
54	Sudagal Chawal	Notified	49	1260	2
55	Tarahalla	Notified	36	2600	2
56	Timmasagar Oni	Notified	58	750	3
57	Tippunagar Hesigemaddi	Notified	63	1035	4
58	Toravi Hakkal	Notified	42	5350	2
59	Udaynagara Bengeri	Notified	32	222	2.25
60	Vaddaroni Deahpandenagar	Notified	44	900	1.8
61	Walvekar Hakkal	Notified	66	900	3
62	Veerapur Oni	Notified	54	1250	2
63	Yellapur Oni	Notified	55	570	2
64	Yavga plot	Notified	43	550	1.5
65	Banatikatti	Non notified	64	No data	3
66	Dayanada Colony Keshwapur	Non notified	31	No data	2.25
67	No data	Non notified	26	No data	1.5
68	No data	Non notified	49	No data	2
69	Sagar Colony	Non notified	47	No data	1.5
70	Shabari Nagar	Non notified	30	No data	2
71	Shiradi Nagar Indira Nagar	Non notified	27	No data	1.5
72	Harischandra Colony	Notified	49	No data	1
73	Mulla Oni	Notified	58	No data	3

Table 11 Slums and their assessed Heat vulnerability – Dharwad (Colour-Coded: Increasing Vulnerability from Green to Yellow to Red Shades)

Sno.	Name (In red - Vulnerability more than 4)	Notification Status	Ward Number (Old)	Population	Final Assessed Heat Vulnerability
1	Anjaneya Nagar	Notified	1	641	5
2	Attikoll Slum	Notified	18	1800	1.8
3	Balaji Mut	Notified	7	2040	5

4	Barakotri slum	Notified	14	900	1.2
5	Bavikatti plot	Notified	1	641	5
6	Chapparband Colony	Notified	20	3000	5.333
7	Danu Nagar	Notified	18	3000	1.8
8	Gavaligalli/ Attikolla	Notified	12	1040	2.5
9	Gollara Colony/Oni	Notified	7	1848	4
10	Haveri Peth	Notified	6	2750	3.75
11	Hosayallapura	Notified	10	1230	1.5
12	Jannath Nagar	Notified	20	6132	5
13	Krupali Nagar	Notified	14	280	2.25
14	Kurubara Oni	Notified	11	1272	2.5
15	Lakamanahalli	Notified	18	1484	2.4
16	Laxmisinganakeri	Notified	16	320	4
17	Malamaddi / Gauli Galli	Notified	18	No data	1.8
18	Masalagar Oni	Notified	19	1800	2
19	Mochi society	Notified	13	822	2
20	Nagarkar colony	Notified	16	970	4
21	Nehru Nagar	Notified	1	2045	6.667
22	Rajivgandhi Nagar	Notified	18	4794	1.8
23	Saidapur	Notified	4	1260	2.5
24	Saidapur opp masjid	Notified	4	1290	4
25	Saptapur RS no 57	Notified	14	328	3
26	Saraswatapura	Notified	19	500	1.5
27	Shivashakthi Nagar	Notified	1	825	6.25
28	Sriram Nagar 1	Notified	17	No data	4
29	Sudgadsiddar Samaj	Notified	18	630	1.5
30	Tadasinakoppa	Notified	22	972	4
31	Vaddaronirayapur	Notified	22	770	5
32	Behind Tapovan	Notified	1	1825	5
33	No data	Notified	8	No data	5
34	No data	Notified	10	No data	3
35	No data	Not notified	10	No data	3
36	No data	Notified	14	No data	1.8
37	No data	Notified	14	No data	2.25
38	No data	Not notified	17	No data	3
39	No data	Not notified	1	No data	5
40	No data	Not notified	17	No data	3
41	No data	Not notified	1	No data	5
42	No data	Not notified	17	No data	5.333
43	Kolikere	Not notified	9	No data	4
44	No data	Not notified	21	No data	2
45	No data	Not notified	6	No data	3
46	No data	Not notified	3	No data	3
47	Dhobi Ghat	Not notified	10	No data	5

Table 12 Cumulative Population of the slums and their associated heat vulnerability ranges

Assessed Heat Vulnerability values	No. of slums (% of total)		Slum Population as per the data used for the study			
			Hubballi		Dharwad	
	Hubballi	Dharwad	Popn	% total Popn	Popn	% total Popn
less than 2	20 (27.4)	9 (19.14)	14359	19.28	12854	27.22
2 to 3	26 (35.6)	9 (19.14)	27517	36.95	7958	16.85
3 to 4	17 (23.3)	8 (17.12)	10736	14.42	3078	6.51
4 to 5	10 (13.7)	7 (14.9)	21850	29.35	5400	11.5
5 to 6	0 (0)	12 (25.5)	0	0	15049	31.87
6 to 7	0 (0)	2 (4.2)	0	0	2870	6.07

The vulnerability assessment of slums reveals that approximately 28 slums in Hubballi and 22 in Dharwad fall within the medium to high heat risk categories. In Dharwad, the most vulnerable slums are primarily located in the eastern and western parts of the city, while in Hubballi, they are concentrated in the southeastern region. Table 12 highlights a critical finding: in Dharwad, a significant portion of the slum population—37.94%—falls within the highest vulnerability range (scores between 5 and 7), indicating a higher severity of heat-related vulnerability in the city compared to Hubballi.

9.2 Water related risk vulnerability in Slums

This assessment focused on identifying areas with maximum peak flow and potential for water body breaches, as well as areas prone to localized inundation resulting from poor infrastructure and unplanned urbanization. These concerns are discussed separately in two parts in the below sections.

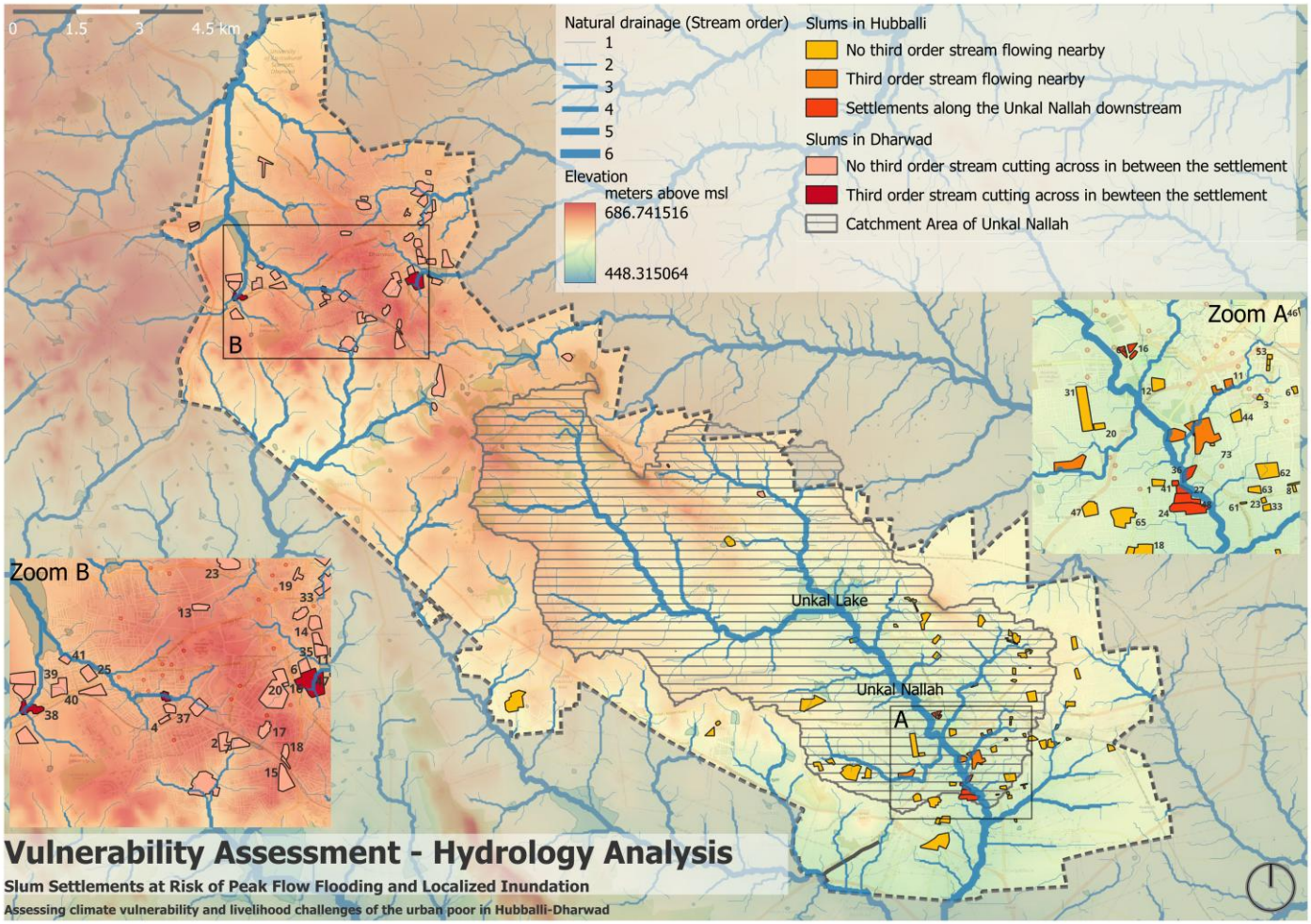


Figure 21 Illustration of the hydrology analysis to assess slums at risk of flooding / inundation

9.2.1 Unkal Nallah and Peak Flow Risk

The potential for water body breach and extreme peak flows is typically limited to higher-order streams that receive runoff from larger catchment areas. Within HDMC, Unkal Nallah is the only major stream of this kind. The hydrological analysis revealed that the catchment area of Unkal Nallah covers approximately 75 square kilometers, accounting for 37 percent of HDMC's total area of 202 square kilometers.

Unkal Nallah originates as the overflow channel of Unkal Lake, a man-made water body located in the northwestern part of Hubballi. The Nallah flows southeast through the urban core of the city before eventually draining into the Bedthi River. The lake itself is fed by several upstream catchments, including rural and semi-urban areas such as Gamangatti, Navanagar, Amaragol, and Gokul. The catchment also extends further to high-altitude areas around Dharwad, including Sattur, Rayapur, Navalur, and Itigatti, which contribute to the lake's inflow.

Overflow from Unkal Lake gives rise to Unkal Nallah, which passes through some of the most densely populated areas of Hubballi. Informal settlements located along this channel include Shakti Colony, KCT Mill, Yavga Plot, Hosur Plot, Heggere, Toravi Hakkal, Myadar Oni, Narayan Sofa, Kumbar Oni, Sadar Sofa, and Kolikeri Plot. These areas are particularly vulnerable during periods of intense rainfall when the combination of lake overflow and urban runoff leads to high flow volumes within the Nallah.

Historical records indicate that the downstream section of Unkal Nallah has experienced the highest number of flood and inundation events in the HDMC region. This vulnerability prompted a detailed assessment of the physiography and landscape surrounding the Nallah, especially where it exits the city near Gabbur.

In response to these recurring flood events, the Smart City Project launched the development of a Green Mobility Corridor along Unkal Nallah. This corridor spans approximately 7.5 kilometers, extending from Unkal Lake to Gabbur. While the primary aim is to promote non-motorized transport (NMT), the initiative also seeks to improve water quality, prevent illegal dumping of waste, and enhance resilience to flooding.

A key component of this project involves the construction of retaining walls along both banks of the Nallah to contain the flow during peak events. However, the project is currently in its second phase, and several sections—particularly in the downstream areas—remain unfinished. Many of the slum settlements most at risk are located along these incomplete stretches, making them highly vulnerable during heavy rainfall and lake overflow events.

Although recent years have not witnessed major flooding, historical events such as the one in 2015 highlight the continuing threat. With increasing rainfall intensity and frequency due to climate change, these areas remain at significant risk.

In addition to hydrological risks, the environmental condition of Unkal Nallah raises serious concerns. Sanitation infrastructure is poor, and many sections—especially upstream and midstream areas without retaining walls—are used as dumping grounds for household waste. In some cases, residents discharge toilet waste, including human excreta, directly into the channel.

This unchecked contamination creates severe public health hazards, particularly for the low-income populations residing along the Nallah. The poor water quality and unhygienic surroundings exacerbate the already precarious living conditions of these communities, making both environmental and health interventions urgently necessary.

Unkal Nallah represents the most critical hydrological vulnerability in HDMC due to its large catchment area, its path through densely populated urban neighborhoods, and the ongoing challenges posed by unregulated urban growth and incomplete infrastructure. The convergence of upstream catchment runoff, lake overflow, and immediate urban stormwater makes this channel a focal point for flood risk within HDMC.

9.2.2 Localized Inundation – Effects in Areas of Haphazard Urbanization

The second key area of focus is the issue of localized inundation resulting from poor infrastructure planning and haphazard urban development, particularly where such development disrupts natural water flow. Such disruptions are commonly observed in urban settings. With the advancement of

urban development, many natural watercourses and streams within city areas are either concretized—primarily to prevent encroachments—or cleared of existing encroachments, allowing at least a minimal runoff flow.

However, the concern extends beyond just the large, higher-order streams. In dense urban environments, lower-order natural drains are equally critical. These are frequently overlooked during urban planning processes and end up flowing through congested built-up areas—or disappearing altogether. In such cases, artificial stormwater drainage systems are expected to carry runoff, but they often fail during severe rainfall. This failure is usually due to blocked or bottlenecked natural lower order drainage paths, which results in water backing up into residential areas, and causing inundation.

To identify locations prone to such local flooding, a spatial overlay analysis was conducted across the HDMC area (shown in the figure 21). Stream networks derived from hydrological analysis were overlaid alongside slum settlement data to locate streams, especially those of lower order (3rd and 4th), that pass through or near informal settlements. Higher-order streams—such as the five i.e., the Unkal Nallah—were excluded from this analysis, as they are less susceptible to encroachment due to their size and visibility, making localized inundation from these sources less likely.

The analysis therefore concentrated on 3rd and 4th order streams, which are more easily obstructed or lost through the high-density areas. Several slum settlements were identified as being intersected or bordered by such streams. In Dharwad, the identified settlements include Jannath Nagar, and Saptapur RS. In Hubballi, while no slum was found to be directly intersected by a 3rd order stream, several areas were identified as being near such drains, including Jagadeesh Nagar Heggere, Toravi Hakkal, Mulla Oni, Gaval Galli, and Murusaviradde.

It is important to recognize that these drainage lines and vulnerability assessments are based on hydrological analysis using satellite-derived imagery and digital elevation data, which, while highly informative, come with certain limitations in accuracy. As a result, the findings from this preliminary analysis were not considered definitive. To validate the results and ensure ground-level relevance, consultations were held with local stakeholders who possess local knowledge of the area's hydrology and community vulnerabilities.

The following table 13 and 14 present a compilation of the contextual analysis results regarding the potential for water-related extreme events. The columns represent various assessment criteria previously discussed, used to evaluate the vulnerability of slum settlements. Additionally, the distance from each slum to the location of a historic flood event has been included as another factor in the analysis.

Table 13 Slums and their assessed potentials for flooding / localised inundation – Hubballi (Colour-Coded: Increasing Vulnerability from Green to Yellow to Red Shades)

Sno.	Name (In red - having potential flood / inundation risk)	Distance from the Historic (2015, 2024) flood / inundation occurred locations (meters)	Slums along the Unkal Nallah, with their downstream distance from the Unkal lake	Slums with 3rd order stream passing along
1	Assaroni	102	NA	No
2	Bramhapur Doddakeri	1095	NA	No

3	Bani Oni	61	NA	No
4	Barakotrikeshwapur	1087	NA	No
5	Chamundeshwari Nagar	372	NA	No
6	Chitaguppi Chawal	132	NA	No
7	Doddakeri_east_portion	807	NA	No
8	Doddakeri_Harijanakeri	860	NA	No
9	Gandhi Nagar Bengeri	1442	NA	No
10	Gandhiwada	1240	NA	No
11	Gaval galli	59	NA	Yes
12	Girni Chawl	649	NA	No
13	Girirajnagar	1008	NA	No
14	Gokul Harijanakeri colony	3026	NA	No
15	Gollar colony Bengeri	1532	NA	No
16	Hosur Plot	350	3218	No
17	Jagadeesh Nagar Shikkaligarta	1042	NA	Yes
18	Jannath Nagar	447	NA	No
19	Jamesland	1548	NA	No
20	JP Nagar Heggere	777	NA	No
21	Kanyanagar	674	NA	No
22	KCT Mill	257	3075	No
23	Karigannavar Hakkal	681	NA	No
24	Kolikeri Plot	0	5142	No
25	Krishna Colony	450	NA	No
26	Kulkarani Hakkal	125	NA	No
27	Kumbar Oni	145	4963	No
28	Lokappa Hakkal	130	NA	No
29	Madhav Nagar	1018	NA	No
30	Maralikatti	324	NA	No
31	Maruthi Nagar Heggere	364	NA	No
32	Mayur Nagar Hosur Jopadi	154	NA	No
33	Mehaboob Nagar	767	NA	No
34	Moulalij jopadi	163	NA	No
35	Murusaviradde	89	NA	Yes
36	Myadaroni	155	4832	No
37	NagashettiKoppaAnjaneya Temple	1680	NA	No
38	Nagashetti Koppakeri Tankside	1853	NA	No
39	Nanda Gokul	3084	NA	No
40	Nandishwar Nagar	2290	NA	No
41	Narayan Sofa	132	4881	No
42	Nava Ananda Nagar	0	NA	No
43	Nekar Nagar	0	NA	No
44	Pendar Oni	107	NA	No
45	Ramalingeshwara Nagara	1543	NA	No
46	Ramnagar	785	NA	No
47	RSNO124Krishnapura	825	NA	No
48	Sadar Sofa	15	5047	No
49	Shakthi colony RS	1017	638	No
50	Shidarameshwar Nagar	879	NA	No

51	Shivaputra Nagar	278	NA	No
52	Sikaligar Lamani Tanda	477	NA	No
53	Station road	116	NA	No
54	Sudagal Chawal	794	NA	No
55	Tarahalla	6684	NA	No
56	Timmasagar Oni	226	NA	No
57	Tippunagar Hesigemaddi	633	NA	No
58	Toravi Hakkal	31	4295	Yes
59	Udaynagara Bengeri	1610	NA	No
61	Walvekar Hakkal	626	NA	No
62	Veerapur Oni	333	NA	No
63	Yellapur Oni	475	NA	No
64	Yavga Plot	370	3107	No
65	Banatikatti	406	NA	No
66	Dayanada Colony Keshwapur	1257	NA	No
67	No data	833	NA	No
68	No data	1728	NA	No
69	Sagar Colony	1967	NA	No
70	Shabari Nagar	2416	NA	No
71	Shiradi Nagar Indira Nagar	809	NA	No
72	Harischandra Colony	495	NA	No
73	Mulla Oni	82	NA	Yes

Notes:

- The location of historic flood/inundation events is used as a reference point for general flood / inundation risk.
- Slums situated along the Unkal Nallah are evaluated based on their downstream distance from Unkal Lake to estimate peak overflow risk.
- Presence of a 3rd order stream near a slum is used to assess the potential for localized inundation due to infrastructure issues or disrupted stream flow.
- The slum names highlighted in red are those deemed most vulnerable overall. This determination is based on how each slum scores across the three criteria. For example:
  - Some slums appear in the red category for all three criteria, making them the most vulnerable.
  - Others, like Nava Anand Nagar and Nekkar Nagar, may fall into lower risk categories for two of the criteria but are marked red due to their immediate proximity (0 m) to locations of past flood events—significantly increasing the probability of their overall flood risk. (This comprehensive approach helps to identify slums most at risk of flooding and localized inundation)

Table 14 Slums and their assessed potentials for flooding / localised inundation – Dharwad (Colour-Coded: Increasing Vulnerability from Green to Yellow to Red Shades)

Sno.	Name ((In red - having potential flood / inundation risk))	Distance from the Historic (2015, 2024) flood / inundation occurred locations (meters)	Slums with 3rd order stream passing through
1	Anjaneya Nagar	5389	No
2	Attikoll Slum	1636	No
3	Balaji Mut	410	No
4	Barakotri slum	2335	No

5	Bavikatti plot	3324	No
6	Chapparband Colony	169	No
7	Danu Nagar	1492	No
8	Gavaligalli/ Attikolla	419	No
9	Gollara Colony/Oni	544	No
10	Haveri Peth	834	No
11	Hosayallapura	302	No
12	Jannath Nagar	0	Yes
13	Krupali Nagar	1855	No
14	Kurubara Oni	343	No
15	Lakamanahalli	1468	No
16	Laxmisinganakeri	502	No
17	Malamaddi / Gouli Galli	1040	No
18	Masalagar Oni	1164	No
19	Mochi society	573	No
20	Nagarkar colony	506	No
21	Nehru Nagar	4249	No
22	Rajivgandhi Nagar	1845	No
23	Saidapur	1489	No
24	Saidapur opp masjid	1626	No
25	Saptapur RS no 57	2273	Yes
26	Saraswatapura	1349	No
27	Shivashakthi Nagar	5444	No
28	Sriram Nagar 1	2220	No
29	Sudgadsiddar Samaj	2140	No
30	Tadasinakoppa	2361	No
31	Vaddaronirayapur	3508	No
32	Behind Tapovan	4284	No
33	No data	187	No
34	No data	443	No
35	No data	281	No
36	No data	1750	No
37	No data	2223	No
38	No data	4152	Yes
39	No data	3784	No
40	No data	3201	No
41	No data	3716	No
42	No data	4333	No
43	Kolikere	514	No
44	No data	1014	No
45	No data	1320	No
46	No data	4029	No
47	Dhobi Ghat	123	No

Notes:

- The location of historic flood/inundation events is used as a reference point for general flood / inundation risk.

- Passing of a 3rd order stream across a slum is used to assess the potential for localized inundation due to infrastructure issues or disrupted stream flow.
- The slum names highlighted in red are those deemed most vulnerable overall. This determination is based on how each slum scores across the two criteria. For example:
  - Some slums appear in the red category for both two criteria, making them the most vulnerable.
  - Others, like Dhobi Ghat and Chaparband colony, may fall into lower risk categories for one of the criteria but are marked red due to their immediate proximity (less than 150 m) to locations of past flood events—significantly increasing the probability of their overall flood risk. (This comprehensive approach helps to identify slums most at risk of flooding and localized inundation)

The vulnerability assessment of slums shows that approximately 14 slums in Hubballi and 4 in Dharwad fall within the risk categories for flooding and inundation. In Dharwad, the most vulnerable slums were primarily identified based on the presence of third-order streams passing through the settlements—often now functioning as narrow, man-made drains or degraded natural channels. In Hubballi, slum vulnerability to flooding was assessed using both this criterion and proximity to the Unkal Nallah, a major drainage channel. Given these conditions, Hubballi is comparatively more prone to water-related risks and exhibits higher overall vulnerability. The population share of the identified vulnerable slums is given in Table 15.

Table 15 Total identified slums as having vulnerability to water related risks

City	No. of slums identified as having vulnerability to water related risk (% of total slums)	Total Population of the slums identified
Hubballi	14 (19.2 %)	28350
Dharwad	4 (8.5 %)	9460

It is important to note that these findings are predictive in nature. They are based on a limited set of spatial and environmental data, combined with a logical understanding of hydrological flow principles. However, flooding and inundation in urban areas are highly localized phenomena, often influenced by micro-level factors such as blocked drains, informal waste dumping, or unplanned constructions—factors that are difficult to capture at this scale of analysis. Therefore, while the assessment may not capture every nuance, it provides a useful basis for identifying slums that are potentially vulnerable to water-related risks.

The insights gained from the preceding assessments—related to both heat risk and water related risk—have guided the selection of slum settlements for more detailed livelihood study. The following section presents the final list of selected slums along with approach taken for it.

10. Slum selection – At the intersection of Livelihoods and Climate Vulnerability

Based on the insights and findings from the vulnerability assessment presented in the previous section, a few settlements have been identified for undertaking the primary objective of the study, i.e., to understand livelihood vulnerabilities at the intersection of climate-induced extreme events.

While the vulnerability assessment played a key role in highlighting certain slums—both those affected by heat extremes and those impacted by water-related disasters—it was not the sole

criterion for slum selection. The central goal of this study is to examine the livelihoods of urban poor communities (particularly under HDMC jurisdiction) and how they are shaped by, and respond to, climate extremes. Therefore, a combination of vulnerability insights and contextual livelihood dynamics was considered in the selection process.

10.1 Livelihood and Employment

According to the UNDP's 4th National Human Development Report, a livelihood encompasses the entire process by which households sustain themselves. This includes not only income from primary occupations but also self-provisioning, shared community resources (commons), remittances, and other support mechanisms from household members. While the term "livelihood" is traditionally associated with agrarian settings, its relevance extends to urban contexts as well—particularly informal and vulnerable communities.

Furthermore, the Post-Disaster Needs Assessment Guidelines: Volume B (Employment, Livelihood & Social Protection) by UNDP defines livelihoods as a set of activities and strategies that household members pursue using their various assets—physical, natural, human, social, and financial—to make a living. Among these, labor is often the most significant asset for most countries.

In urban slums, there is a high likelihood that livelihoods are based on informal employment or self-employment. These activities are often precarious, unregulated, and vulnerable to disruption by climate shocks such as heatwaves, floods, or water scarcity.

Employment, as defined in the same UNDP report, refers to a person's participation in economically meaningful activities, either as a wage worker or through self-employment. The terms 'job' and 'employment' are often used interchangeably in this context.

10.1.1 Distinction Between Livelihood and Employment

Understanding the distinction between livelihood and employment is crucial for this study:

- Livelihoods are broader, often rooted in tradition, culture, or communal practices. They include not just financial and human assets but also social assets—such as indigenous knowledge systems, community networks, and traditional skills. These can either provide resilience or become barriers when communities struggle to adapt to modern economic shifts.
- Employment, on the other hand, typically refers to structured economic engagement—more likely to be formal, though not always stable.

Livelihoods in urban slums are especially susceptible to external shocks. Many income-generating activities are unstable due to weak infrastructure, informal arrangements, and limited adaptive capacity. Climate change exacerbates these vulnerabilities, making it even more essential to examine and support livelihoods that are sustainable, resilient, and contextually appropriate.

10.2 Slum Selection - Criteria and the final List

Considering the study's objective and the nuanced understanding of livelihoods, the slum selection process was designed by overlaying existing livelihood patterns within the HDMC on the climate vulnerability insights generated earlier. This integrated approach allowed for a more targeted and meaningful selection of settlements. Rather than choosing slums solely based on the highest levels of vulnerability, the approach prioritized those that fell within a broader range of moderate to high

vulnerability, while also possessing livelihood systems that demonstrated potential for development interventions. This ensured that the selected slums not only required urgent attention due to climate risks but also offered viable opportunities for livelihood strengthening.

The identification process drew on both secondary data and qualitative insights gathered through Key Informant Interviews (KIIs) with stakeholders familiar with the local socio-economic landscape. The KIIs were essential in identifying existing livelihood patterns, especially those rooted in traditional practices, as well as identifying communities currently struggling to adapt to urban economic changes or those that have transitioned into new urban livelihood models. Refer to the annexure for the list of stakeholders consulted and details of those discussion.

HDMC, with its blend of historical significance and rapid urban growth, presents a diverse livelihood landscape—ranging from culturally entrenched occupations to emerging forms of urban informal work. Understanding this diversity was critical in selecting slums that reflect different stages and types of livelihood adaptation. Based on this approach—merging climate vulnerability data with livelihood insights—the final list of slum settlements was selected. Details of each slum's livelihood profile and the detailed rationale for its selection are presented in the following section.

10.2.1 Selected Slum settlements and the Rationale

Based on the climate vulnerability assessment and livelihood-related insights within the HDMC area, the following slum settlements have been selected for further livelihood-focused study. The selection is primarily informed by the earlier analysis, complemented by inputs from key informants. Most of the selected slums exhibit either potential flood/inundation risk or significant heat vulnerability. One exception is Gauli Galli and Saraswatapura in Dharwad, which does not fall under either climate vulnerability category. However, it has been included due to the presence of a significant livelihood group facing distinct challenges, making it important to study from a socio-economic and cultural perspective. The final selected slums are given in the table 16 and 17.

Table 16 Selected slums and the rationale in Hubballi

Slum Name	Heat Vulnerability (Score + Description)	Flood/Inundation Vulnerability (Based on the location)	Livelihood Type	Livelihoods	Selection Reason
Jagadeesh Nagar Shikkaligarta (Ward - 38)	3 – Medium heat vulnerability	Located along a 3rd order stream and approximately 1 km from a historical flood/inundation site	Emerging urban informal work	Construction labourers	Medium heat vulnerability and potential flood/inundation risk
Myadar Oni (Ward - 41)	2.25 – Less heat vulnerability	Located along the Unkal Nallah at its most downstream point, approximately 155 m from a historical flood/inundation site	Culturally entrenched work	Bamboo craftsmen	Flood/inundation risk; culturally significant livelihood
Kumbar Oni (Ward - 60)	2 – Less heat vulnerability	Located along the Unkal Nallah at its most downstream point, approximately 145 m from a historical flood/inundation site	Mixed (Urban informal + Culturally entrenched)	Small industries, household industries, construction labourers	High flood/inundation risk; culturally significant livelihood
Sadar Sofa (Ward - 60)	2 – Less heat vulnerability	Located along the Unkal Nallah at its most downstream point, approximately 15 m from a historical flood/inundation site	Mixed (Urban informal + Culturally entrenched)	Small industries, household industries, construction labourers	High flood/inundation risk; culturally significant livelihood

Table 17 Selected slums and the rationale in Dharwad

Slum Name	Heat Vulnerability (Score + Description)	Flood/Inundation Vulnerability (Based on the location)	Livelihood Type	Livelihoods	Selection Reason
CBT Area (Market, not a slum) (Ward - 12)	2.5 – 4 – Medium to high heat vulnerability	Located approximately 298 m from a historical flood/inundation site; no other criteria observed	Mixed (Urban informal + Culturally entrenched)	Vegetable vendors, bamboo craftsmen	Medium to high heat vulnerability; market case add value to study
Malamaddi / Gouli Galli (Ward - 18)	1.8 – Low heat vulnerability	Does not exhibit any flood/inundation-related vulnerability	Culturally entrenched, struggling to adapt	Cattle rearing	Culturally significant livelihood
Dhobi Ghat (Ward - 10)	5 – High heat vulnerability	Located approximately 123 m from a historical flood/inundation site and near the lake; prone to inundation if drainage fails	Culturally entrenched, struggling to adapt	Cloth washing	High heat vulnerability and potential flood/inundation risk; culturally significant livelihood
Jannath Nagar (Ward - 20)	5 – High heat vulnerability	A 3rd order stream passes through the settlement, located exactly at a historical flood/inundation site	Emerging urban informal work	Construction labourers	High heat vulnerability and highest flood/inundation risk
Laxmisinganakeri (Ward - 16)	4 – High heat vulnerability	Does not exhibit any flood/inundation-related vulnerability	Emerging urban informal work	Domestic workers, construction workers	High heat vulnerability
Churmuri Bhatti (Ward - 10)	5 – High heat vulnerability	Located approximately 364 m from a historical flood/inundation site and near the lake; prone to inundation if drainage fails	Culturally entrenched, struggling to adapt	Puffed rice makers	High heat vulnerability and potential flood/inundation risk; culturally significant livelihood
Saraswatapura (Ward 19)	1.5 - Low heat vulnerability	Does not exhibit any flood/inundation-related vulnerability	Traditional but most informal, struggling to adapt	Scrap collectors	Most significant livelihood in terms of informality

11. Selected Slum's Profile

The slum profiles highlight key aspects and concerns identified primarily through the reconnaissance survey. Premised on geographical proximity and commonality in landscapes, slums clusters are identified and discussed in this section. The cluster and individual profiles inform the livelihood-specific questionnaire.

11.1 Jagdeesh Nagar Shikaligarta – Hubballi

Overview, Area and Population

Jagdeesh Nagar Shikaligar, was selected for this study due to its history of flooding / inundation and given its proximity to a third-order stream. In terms of heat vulnerability, the area is assessed under medium vulnerability.

The slum covers approximately 0.47 sq. km and consists of 300–400 households with an average family size of 5 members, indicating a rough population estimate of 1,500–2,000 residents.

Location and the Community

This slum is a linear settlement developed along the stream in the southwestern part of Hubballi's core city area, in Heggere. The settlement is approximately 0.34 km from the Hubballi-Karwar road and is surrounded by key commercial and industrial establishment, as well as major transportation routes. Locally, the slum is referred to as Jagdeeshnagar Heggere, along with it are the other informal settlements such as Maruthi Nagar Heggere and JP Nagar Heggere.

The slum primarily houses the Shikaligar community, along with other, SC, ST, and Hindu households. The Shikaligars are a traditional artisan group known historically for blacksmithing and weapon crafting, particularly in states like Rajasthan, Gujarat, Punjab, and Haryana. The Shikaligars in this settlement migrated from Rajasthan around 50–60 years ago. Today, the community is no longer engaged in their traditional crafts. Instead, residents are mostly involved in occupations such as auto driving, vegetable vending, operating small kirana shops, and construction labor, especially painting.

Figure 22 Section illustrating the Heggere tank and the current location of the settlement (refer to section mark in Figure 23)

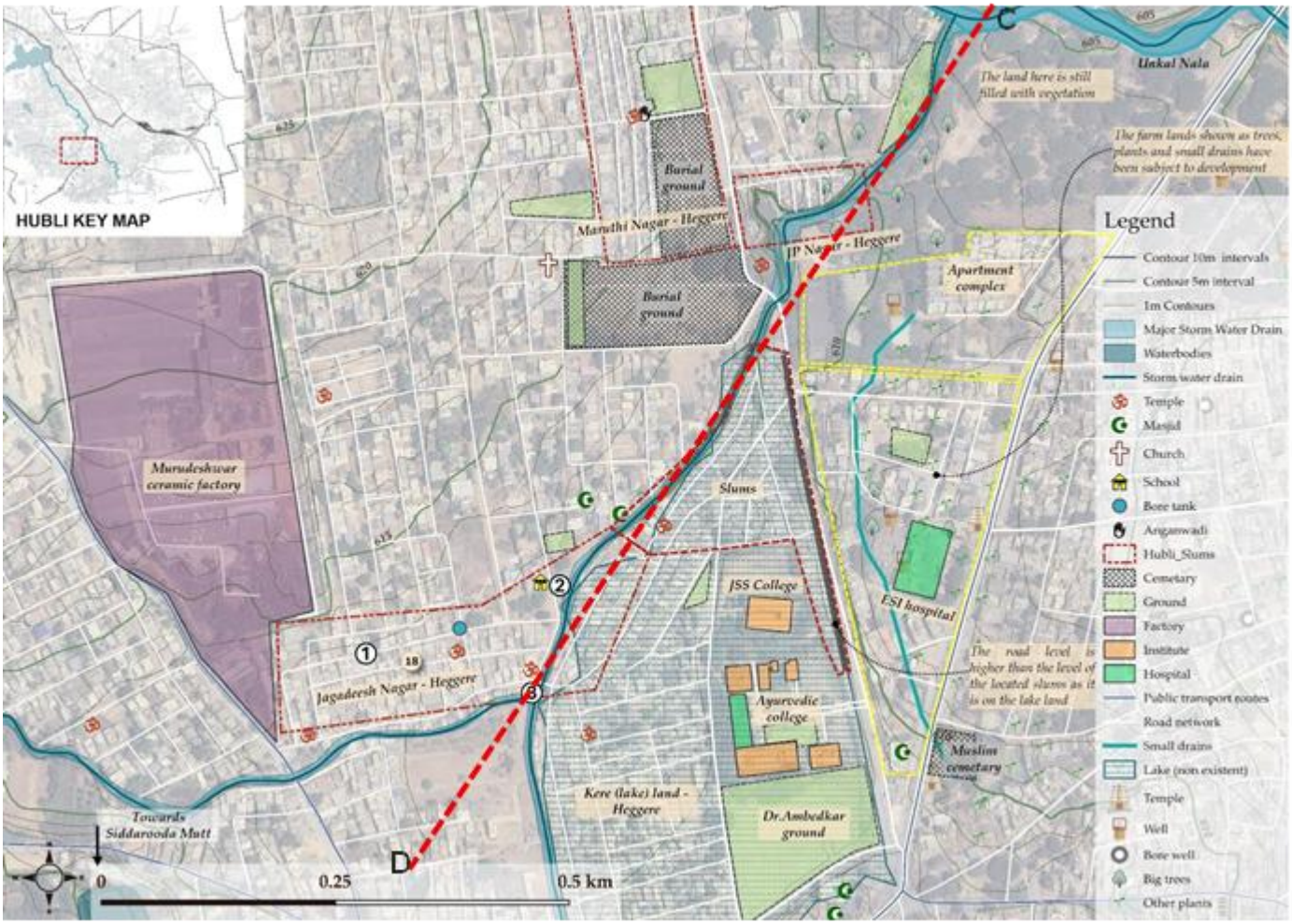


Figure 23 Illustration of data collected during the reconnaissance survey of the Heggere locality, showing the location of the now-lost Heggere tank

Urban Issues

The settlement faces several persistent urban challenges. Due to its low-lying topography and poorly developed stormwater infrastructure, the area frequently experiences drainage issues. Water supply remains irregular, even though HDMC have made access to a 24x7 water system in major part of the city. Waste management is inadequate, with municipal collection occurring only 4–5 times a month, leading to frequent drain blockages and stagnant water accumulation. Additionally, the area suffers from insufficient street lighting, further impacting the quality of life and safety for residents.

Critical Concerns

The slum is prone to waterlogging, primarily due to its location adjacent to a stream that serves as a tributary to the Unkal Nala. This area lies at one of the lowest elevations in Hubballi, increasing its vulnerability during heavy rains.

Historically, the locality had a lake known as Heggere—believed to be derived from the term "Hegga Kere", meaning "big lake"—which once supported agricultural land and numerous wells in this landscape. (Refer to figure 24 and 25) However, over time, this water body has been encroached upon and now shows no visible traces. Archival images from an Anganwadi in the area show that it was once open grassland with minimal development (huts). (Refer to figure 26)

Figure 24 The situation of the stream passing along the settlement, and the storm water drain

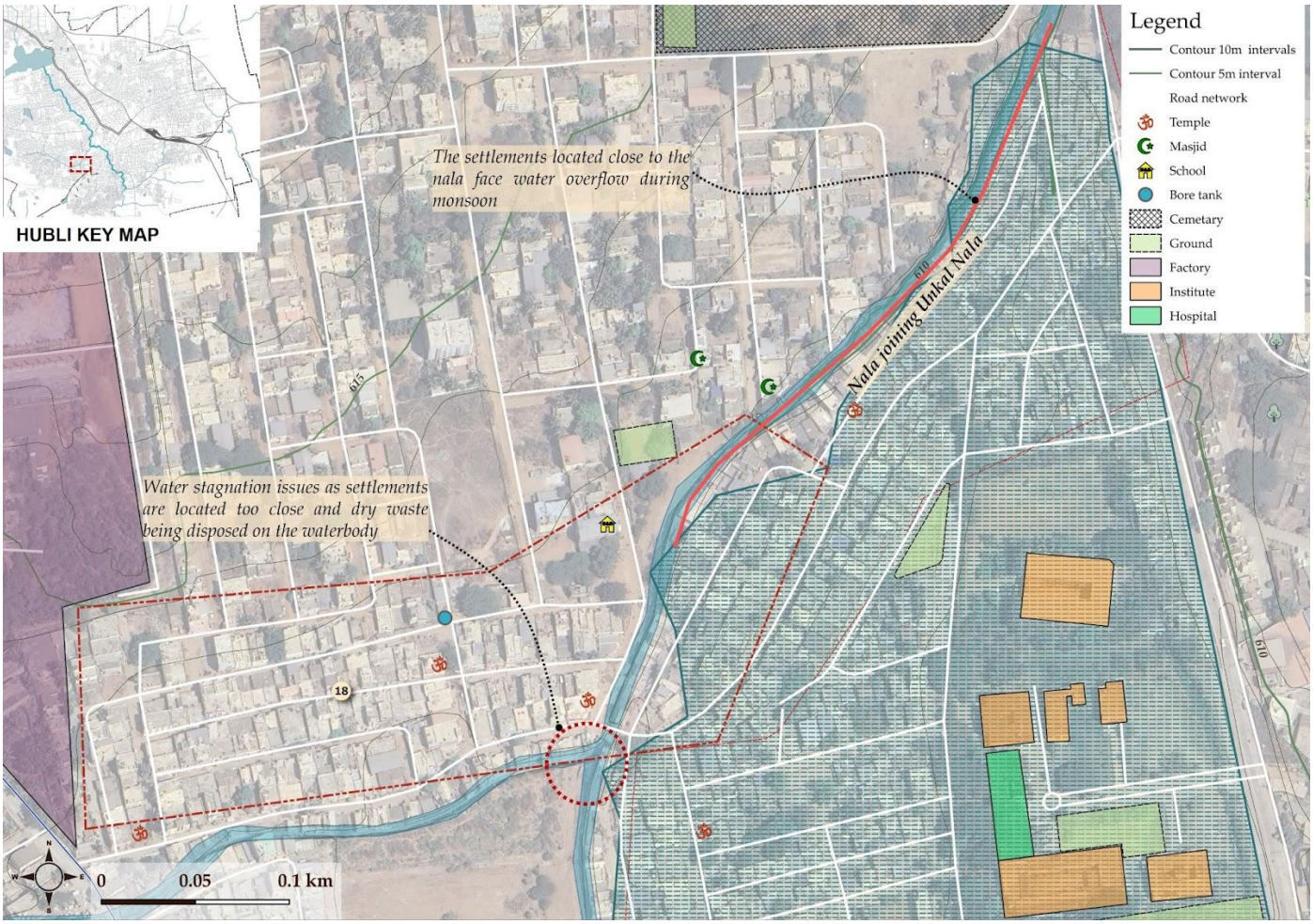


Figure 25 Heggere lake (as per old revenue records) and the stream flowing alongside the slum

Today, several houses are built very close to the stream, especially near the point where it merges with another tributary. (Refer to figure 26) This has resulted in frequent dumping of solid waste,

causing blockages, stagnant water, and a rise in mosquito-borne health concerns. These issues are particularly severe during the monsoon season when the settlements near the nala face repeated incidents of inundation.

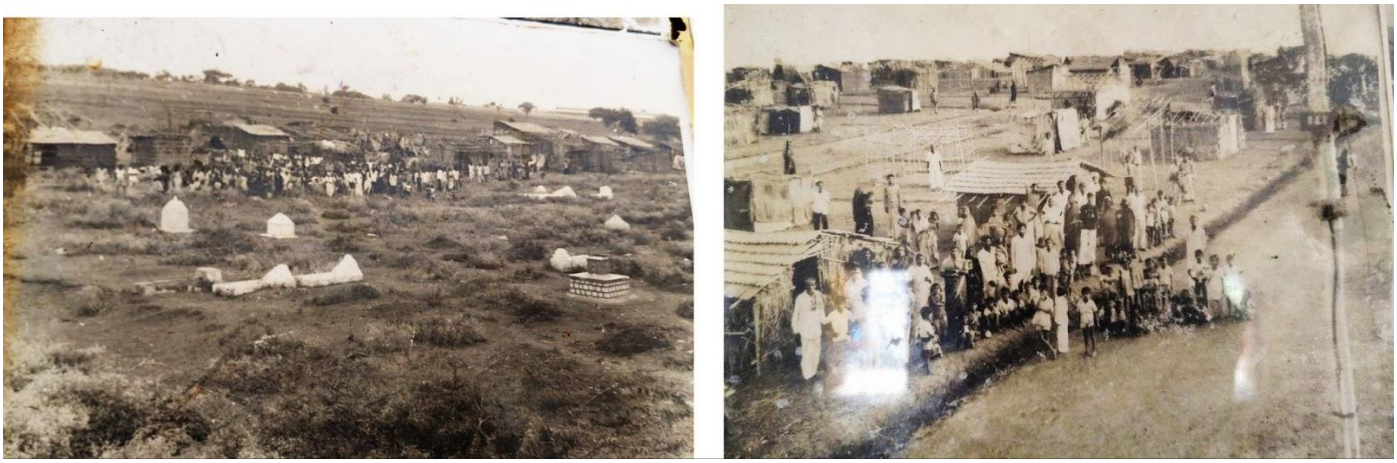


Figure 26 Images of the Heggere area collected from the Anganwadi

11.2 Sadar Sofa, Kumbar Oni, and Myadar Oni – Hubballi

Overview, Area, and Population

The slums of Sadar Sofa, Kumbar Oni, and Myadar Oni are situated downstream along the Unkal Lake's outflow, the Unkal Nallah, and fall within the southern part of Hubballi city. These settlements are of particular interest due to their potential vulnerability to peak overflow risks as they are located in the extreme downstream zone of the nallah.

In terms of heat vulnerability, Sadar Sofa, Kumbar Oni, and Myadar Oni are all assessed as having low heat vulnerability, while Jagadeesh Nagar is rated as having medium heat vulnerability.

The slums Sadar Sofa, Kumbar Oni, and Myadar Oni are located in the Old Hubballi area, a historically significant part of the city dating back to the 11th century. Known for its cultural landmarks and past as a key trade center, Old Hubballi still reflects its legacy through its built environment and socio-economic fabric. These slums, believed to have pre-independence origins, lie near a British-era bridge, indicating their long-standing presence. The communities of these slums are inhabiting in these areas around 50 – 60 years.

In terms of spatial extent and population:

- Myadar Oni covers 0.02 sq. km with a rough population estimate of 1,500–2,000 residents.
- Sadar Sofa covers 0.31 sq. km with a rough population estimate of 1,500 residents.
- Kumbar Oni covers 0.15 sq. km with a rough population estimate of 2,000 residents.

Location and the Community

These slum settlements are located in the heart of Old Hubballi and are well-connected to key transport routes, including the Hubballi-Dharwad Road (0.25 km away), National Highway 48, and State Highway 67 via a nearby connector road. The Hubballi Railway Junction, a major transit hub, is about 3 km from the area. Though centrally located, the settlements are close to the urban

periphery, where built-up areas transition into agricultural land, with the Unkal Nallah forming a natural barrier to further urban expansion.

The Muslim community constitutes the majority population in these settlements, which also host multiple mosques serving as important social and cultural hubs. Along with them are the Myadar community, Maratha Muslims, Hindus (Kumbar Oni), and various SC ST groups.

In general, residents are engaged in a diverse range of informal economic activities, including supari (betel nut) processing and trading, industrial products like aluminum fabrication for windows and doors, construction labourers and the production of food items such as *churmuri, avalakki*, and soaked rice *girmit*—often carried out in small-scale units within or near their homes. Some community members are also involved in traditional occupations like wool weaving and agarbatti (incense stick) making. Women were involved in local economy, particularly through mehendi (henna) art, supari sorting, and operating home-based food businesses, preparing items like samosas and vadas for sale in nearby markets. This variety of livelihoods highlights the strength of the local informal economy, supported by the area's proximity to small and medium-scale industries and consistent local demand.

Notably, in Myadar Oni, a significant portion of the population is engaged in their traditional community occupation of bamboo crafting and the production of bamboo-based goods.

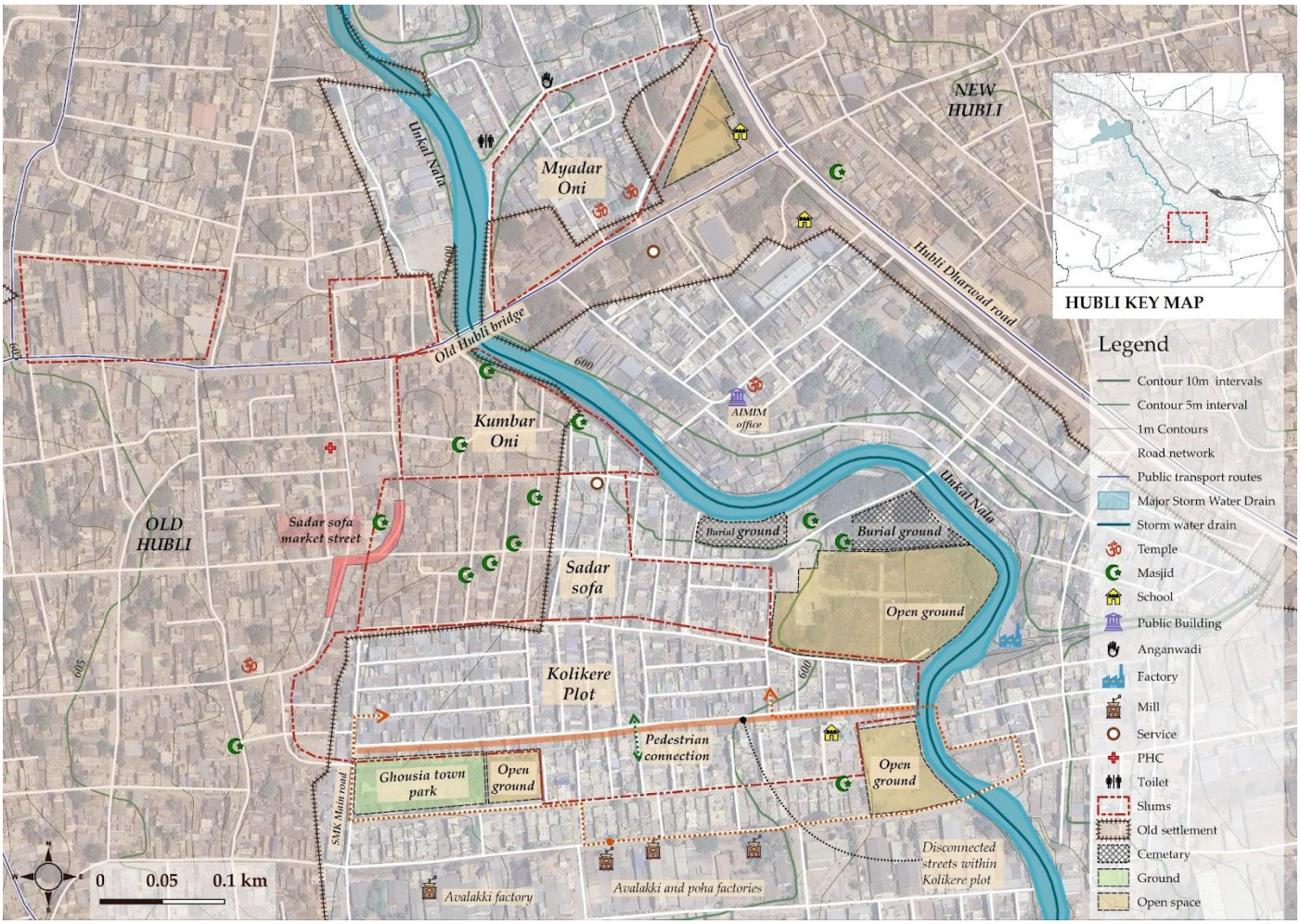


Figure 27 Illustration of data collected during the reconnaissance survey of slums located downstream of the Unkal Nallah

Urban Issues

The fine-grained built form of these slums reflects their gradual development as residential areas for migrants. This has led to a densely packed urban fabric. While the settlements are now largely composed of pucca (permanent) houses—many of which are multi-storied—a review of historical satellite imagery from over a decade ago reveals that the area was once dominated by kutcha (temporary) structures. This stark contrast highlights the significant transformation that has taken place over the past 10 to 15 years, illustrating the dynamic nature of urban change here. The emergence of high-rise buildings within these informal settlements also points to the influence of rising land values and market-driven development, suggesting some level of physical and infrastructural improvement.

Despite having a reasonably well-laid internal road network and a relatively organized layout, the settlements face several critical infrastructure challenges. All three slums experience irregular water supply, with drinking water provided only once every 8 to 9 days. In Myadar Oni, some houses are in poor structural condition, suffering from leakage during heavy rains. Additionally, solid waste management and sanitation remain problematic across all three slums, further contributing to environmental and health concerns. In Sadar Sofa, the issue is compounded by frequent inundation, caused by inadequate stormwater drainage systems.

Critical concerns

Among the transforming slums, Myadar Oni stands out due to significant livelihood challenges, particularly the lack of access to raw bamboo, which is essential for the community's traditional craft. This concern was repeatedly raised during reconnaissance surveys in Hubballi and Dharwad, indicating the need for focused intervention.

Figure 28 Bamboo products and their markets along the road in Myadar Oni

The reconnaissance survey indicated that these slums have not recently experienced severe inundation, which may be attributed to the ongoing interventions along the Unkal Nallah under the Green Mobility Corridor Project. However, since the project is still underway, and given the increasing frequency and intensity of rainfall across various parts of India, these low-lying settlements remain highly vulnerable to future flooding and waterlogging.

Figure 29 The Unkal Nallah with adjacent residential structures (left) | Housing conditions and internal road infrastructure in Sadar Sofa (right).

11.3 Jannath Nagar, Dhobi Ghat, Churmuri Bhatti, and Laxmisinganakeri – Dharwad

Overview, Area, and Population

This group of settlements is located along the southeastern periphery of Dharwad city, in a landscape shaped by Herekeri Tank, a major water body in the region. While much of Dharwad's high-altitude terrain has historically seen minimal flooding, localized inundation risks have been identified in and around these settlements due to their proximity to natural drainage paths and runoff accumulation zones (the nearest catchment areas of the Herekeri Tank).

The settlement pattern follows the natural terrain sloping from the west to the east where the Herekeri Tank is located, starting from Laxmisinganakeri in the east—followed by Jannath Nagar, which has a by a third-order stream passing by, and then Dhobi Ghat and Churmuri Bhatti, which are situated closer to the tank. The location of these slums along drainage lines and near the tank increases their vulnerability to flooding / inundation, particularly if natural drainage pathways are disrupted or stormwater infrastructure fails.

Figure 30 Section illustrating the Herekeri tank and the current location of the slum settlements (refer to section mark in Figure 31)

In addition to inundation vulnerability, these settlements also face high levels of heat vulnerability. Jannath Nagar, Churmuri Bhatti, and Dhobi Ghat are assessed to be in the high heat vulnerability category, with Laxmisinganakeri following closely behind.

In terms of spatial extent and population:

- Jannath Nagar covers 0.12 sq. km with a rough population estimate of 3000 – 3500 residents.
- Dhobi Ghat covers 0.05 sq. km with a rough population estimate of 250 residents.
- Churmuri Bhatti covers 0.027 sq. km with a rough population estimate of 450 - 500 residents.
- Laxmisinganakeri covers 0.15 sq. km with a rough population estimate of 1000 -1500 residents.

These settlements were established at different times, reflecting varying histories of urban growth. Laxmisinganakeri is the oldest, with a history of over 70 years. Jannath Nagar has been inhabited for around 50–60 years, Churmuri Bhatti for 20–25 years, while Dhobi Ghat was developed as a government-allocated settlement for the Dhobi community roughly 20 years ago.

Location and the Community

These slums are situated near the Hubballi-Dharwad BRTS corridor, around the Toll Naka junction, placing them in a zone of better economic activity despite being on the periphery of Dharwad city. The settlements lie along a transitioning slope—from the higher elevations in the west toward the Herekeri Lake in the east—making them naturally areas of runoff accumulation to the lake. While they are in this landscape the BRTS corridor, segregates Laxmisinganakeri (to the west) and the Jannath Nagar, Dhobi Ghat, and Churmuri Bhatti (to the east). The combination of poor drainage infrastructure, dense urban development, and natural topography contributes significantly to inundation risks, while heat vulnerability remains another concern.

In terms of community composition, Jannath Nagar is predominantly inhabited by Muslim residents, while Laxmisinganakeri has a mixed population, including Kurubas, Gaulis, Kamars, Punjabis, Vadars, and Muslims. Dhobi Ghat has both Hindu and Muslim population, and Churmuri Bhatti similarly includes a mix of Hindu and Muslim population. Across all four settlements, a significant portion of the population belongs to Scheduled Castes (SC) and Scheduled Tribes (ST).

Livelihood patterns are primarily rooted in informal, urban occupations. In Jannath Nagar, residents are largely employed as construction laborers, with some engaged in home-based food preparation and petty shops. The population in Laxmisinganakeri also includes many construction and domestic workers, along with individuals involved in metal utensil production and roti making. Dhobi Ghat continues to involved in its community's traditional occupation of cloth washing, while Churmuri Bhatti residents are involved in the home-based production of churmuri (puffed rice), which is also a traditional livelihood activity.

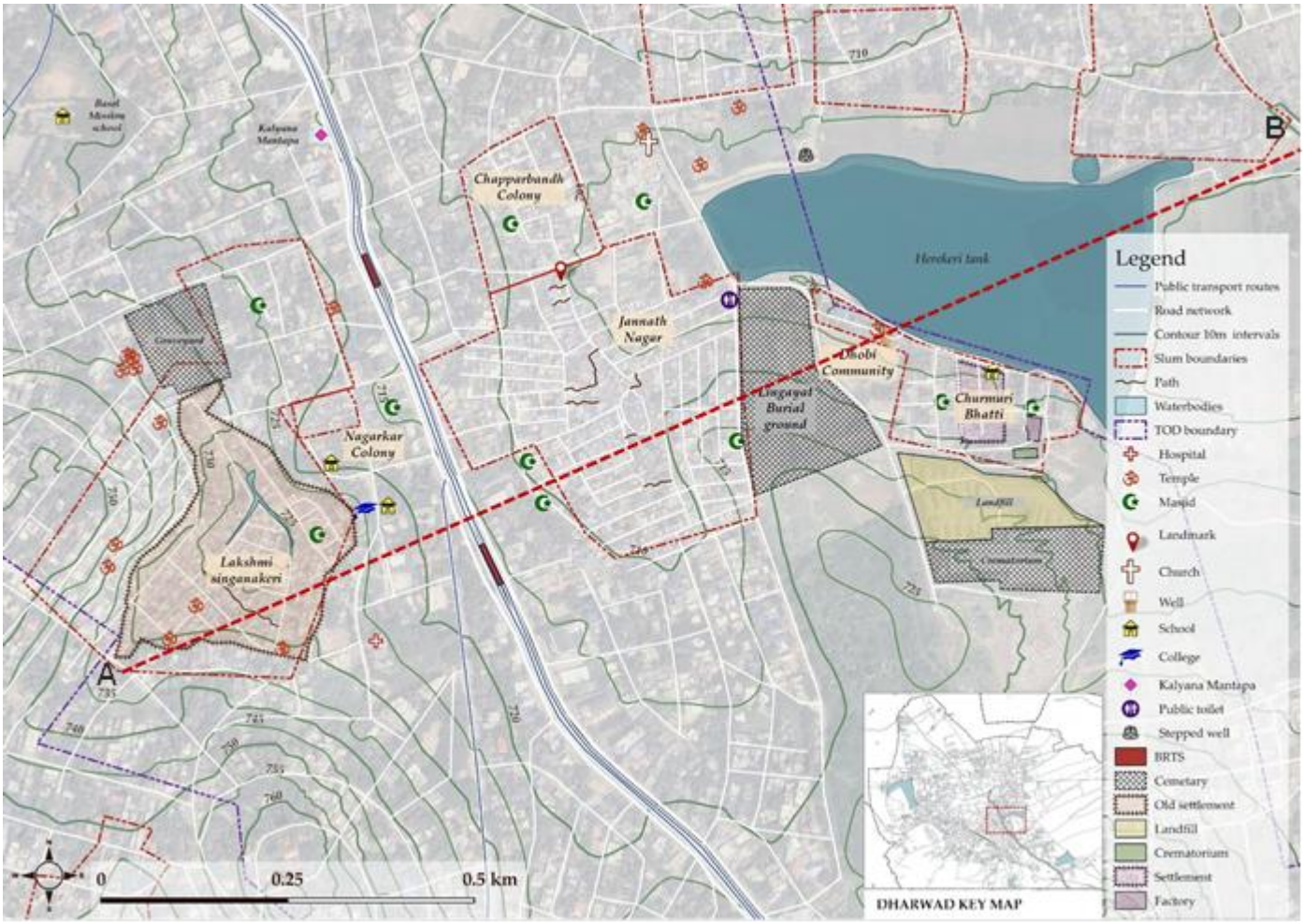


Figure 31 Illustration of data collected during the reconnaissance survey of slums near Herekeri Lake in Dharwad

Figure 32 Traditional livelihoods: Cloth washing by residents of Dhobi Ghat (left) and churmuri (puffed rice) preparation in Churmuri Bhatti (right).

Urban Issues and Critical concerns

A major concern in Jannath Nagar and Laxmisinganakeri is the high built-up density combined with organically developed layouts. This unplanned growth has led to disruption of natural runoff pathways and the formation of narrow lanes and gullies. In several cases, these narrow lanes are densely populated, with homes that have increased in floor height over time. Additionally, poor drainage design contributes significantly to water stagnation and localized inundation. Field

observations revealed that many stormwater drains are clogged, and in some areas, the topography flow is opposite to the intended design of storm water drainage flow, resulting in backflow of stormwater during heavy rainfall.

Figure 33 Narrow alleys and encroached natural drains in Jannath Nagar; existing artificial stormwater drains are inadequate during heavy rains.

In Laxmisinganakeri, the settlement is originally developed in a low-lying area once part of a tank (referred to as the Laxmisinganakeri lake). Recent stormwater drains upgradation directing runoff toward the Herekeri Lake has helped the reducing the inundation problem to an extend which was faced in the past.

Figure 34 Conceptual representation of the development of the Lakshmisinganakeri settlement over the lake

Another critical issue observed across many of these slums is the difference in elevation between houses and roads. Where houses or their entrances sit at a lower level than the street, rainwater runoff often flows directly into homes during heavy rainfall events. One such case is illustrated conceptually in Figure 35.

These urban issues lead to localized inundation in densely built areas—creating flood-like conditions even without any breach or overflow from nearby water bodies or drainage systems. Poor drainage, narrow lanes, and unplanned construction exacerbate the risk, making these settlements areas of critical and recurring concern during heavy rainfall.

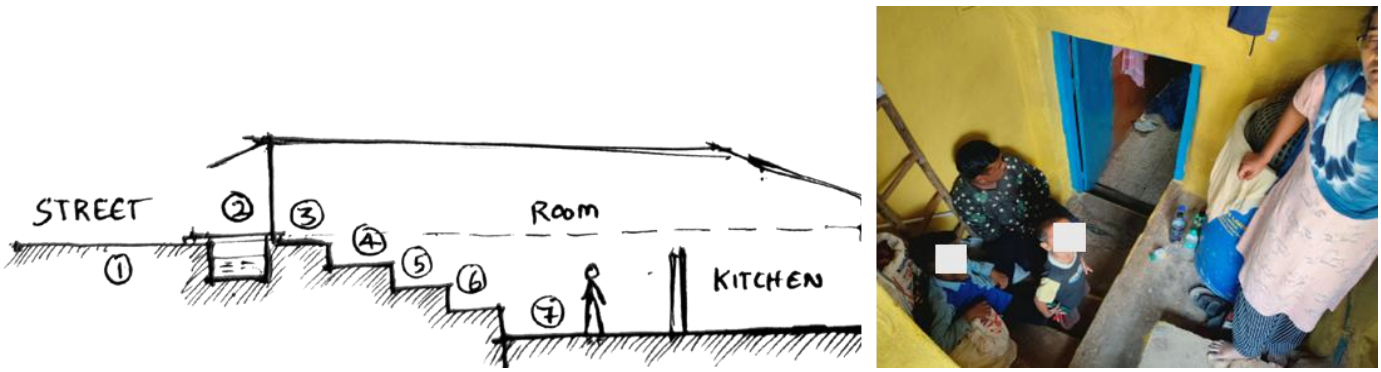


Figure 35 Conceptual section of a house showing level difference from the road, causing inundation during heavy rainfall; photo on the left taken from road level

In Churmuri Bhatti and Dhobi Ghat, reconnaissance surveys highlighted basic services challenges—specifically inadequate water supply and poor waste collection systems, which exacerbate overall environmental and health vulnerabilities in these communities.

In such a vibrant and densely populated urban informal economy, the problems of inundation, along with rising heat risks, create significant challenges for residents. These issues not only disrupt daily life but also threaten the stability and sustainability of their livelihoods, making it increasingly difficult for population to maintain economic security and overall well-being.

11.4 Gauli Galli – Dharwad

Overview, Area, and Population

Gauli Galli is a small, individual slum settlement located on the southern edge of the core of Dharwad city. It is one of the older settlements in Dharwad, inhabited primarily by the Gauli community, a group traditionally engaged in cattle rearing—mainly buffaloes and cows.

While this settlement has not been assessed with high heat or water-related vulnerabilities, it was selected for study due to its historical significance and the challenges faced by a traditional occupational group in a rapidly urbanizing environment.

The settlement covers approximately 0.02 square kilometers and is home to an estimated 1,500 to 2,000 residents.

Location and the Community

Situated in a prime urban area surrounded by commercial development, Gauli Galli lies just 0.15 kilometers north of the Dharwad Railway Station, within the Malmaddi area. This settlement has existed for over 90 years, with the Gauli community as its primary residents, along with a few Muslim residents.

Historically, the community relied heavily on surrounding grazing lands and a nearby water body known as Ammikere. However, these natural resources have been completely overtaken by built-up urban infrastructure, severely impacting the community's traditional livelihood. The Gaulis primarily engaged in milk production, sold in the informal local market. While demand for their products still exists, their ability to sustain this occupation has diminished due to a lack of necessary resources and space.

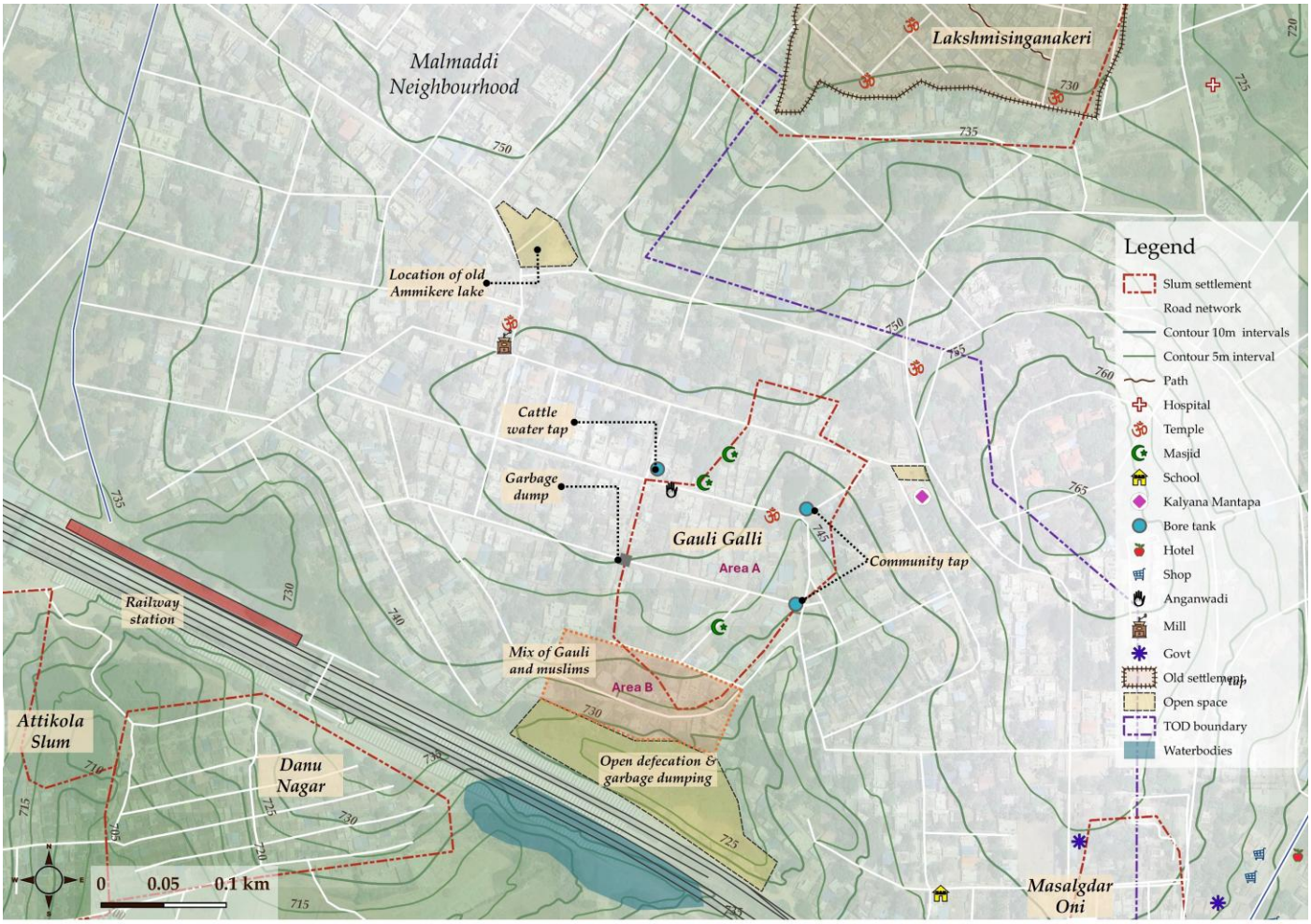


Figure 36 Illustration of data collected during the reconnaissance survey of the Gauli Galli slum

Urban Issues and Critical concerns

Gauli Galli faces a range of urban challenges that reflect the deep feedbacks between traditional livelihoods and rapid urbanization. As the settlement becomes increasingly surrounded by dense urban development, the community's age-old occupation of cattle rearing has become extremely difficult to sustain. This practice, which depends on access to open spaces, water, and grazing land, is now constrained by the complete loss of such natural resources. The disappearance of the Ammikere water body, once central to the community's livelihood, has further undermined their ability to maintain milk production and cattle-based activities.

In this cramped urban environment, basic needs like space for cattle, adequate sheds, proper waste disposal, and fodder storage are all severely compromised. The community also faces difficulties in accessing urban markets due to a lack of awareness and limited formal support, which restricts their ability to adapt their traditional practices to the changing economic context. Hygiene and public health conditions are serious concerns, further exacerbated by poor sanitation and irregular water supply. The reconnaissance survey confirmed these issues, identifying waste management as a particularly pressing problem.

Figure 37 Small, cramped sheds in residential areas and accumulated dung waste leading to severe space and hygiene issues

Although LPG connections are available in the area, a significant number of residents continue to depend on firewood and cow dung cakes for cooking. This points to poor economic conditions and highlights their ongoing struggle for subsistence. Compared to other slums in the city, the reliance on such fuels in Gauli Galli is disproportionately high, reflecting both economic hardships.

The vulnerability of this community shaped by these socio-economic and urban conditions which lack critical safety nets. In the face of climate-related risks, the residents of Gauli Galli are at high risk of displacement and livelihood collapse. Without targeted interventions focused on livelihood diversification, education, and integration into the formal urban economy, the community remains trapped in a cycle of poverty and exclusion.

11.5 CBT Market (Vendors and Bamboo craftsmen) – Dharwad

Overview

The CBT Market area is not a residential settlement but a vibrant commercial street located in the Central Bus Terminal (CBT) zone of Dharwad. Despite its primary function as a market space, many residents have lived here for a long time and are actively engaged in vending, shop ownership, and small-scale production. Notably, members of the Myadar community, also reside and work in this area, selling bamboo products as part of the market economy.

Located in the Hosayellapur locality, this central market street benefits from high foot traffic and commercial activity. However, the area also faces environmental challenges, particularly related to climate risks such as local inundation and moderate to high levels of heat vulnerability, which impact both residents and street vendors.

Urban Issues and Critical concerns

Being centrally located, the CBT Market area is relatively well-served in terms of basic infrastructure. It has access to regular water supply, good road connectivity, and an effective waste collection system. However, the informal and livelihood-based nature of this community brings its own set of challenges. While the central location offers economic opportunities, it also has livelihood insecurity, especially for informal workers with limited socio-economic support. The Myadar community, in particular, faces issues such as shortages of raw materials like bamboo, which hampers their traditional craft-based income.

Additionally, the area frequently experiences water logging, further complicating day-to-day activities and adding to public health concerns. Many vendors operate in exposed, heat-prone conditions, putting them at risk of heat-related health issues, particularly during peak summer months. Despite its centrality and infrastructure, the CBT Market exemplifies the precarious balance between opportunity and vulnerability.

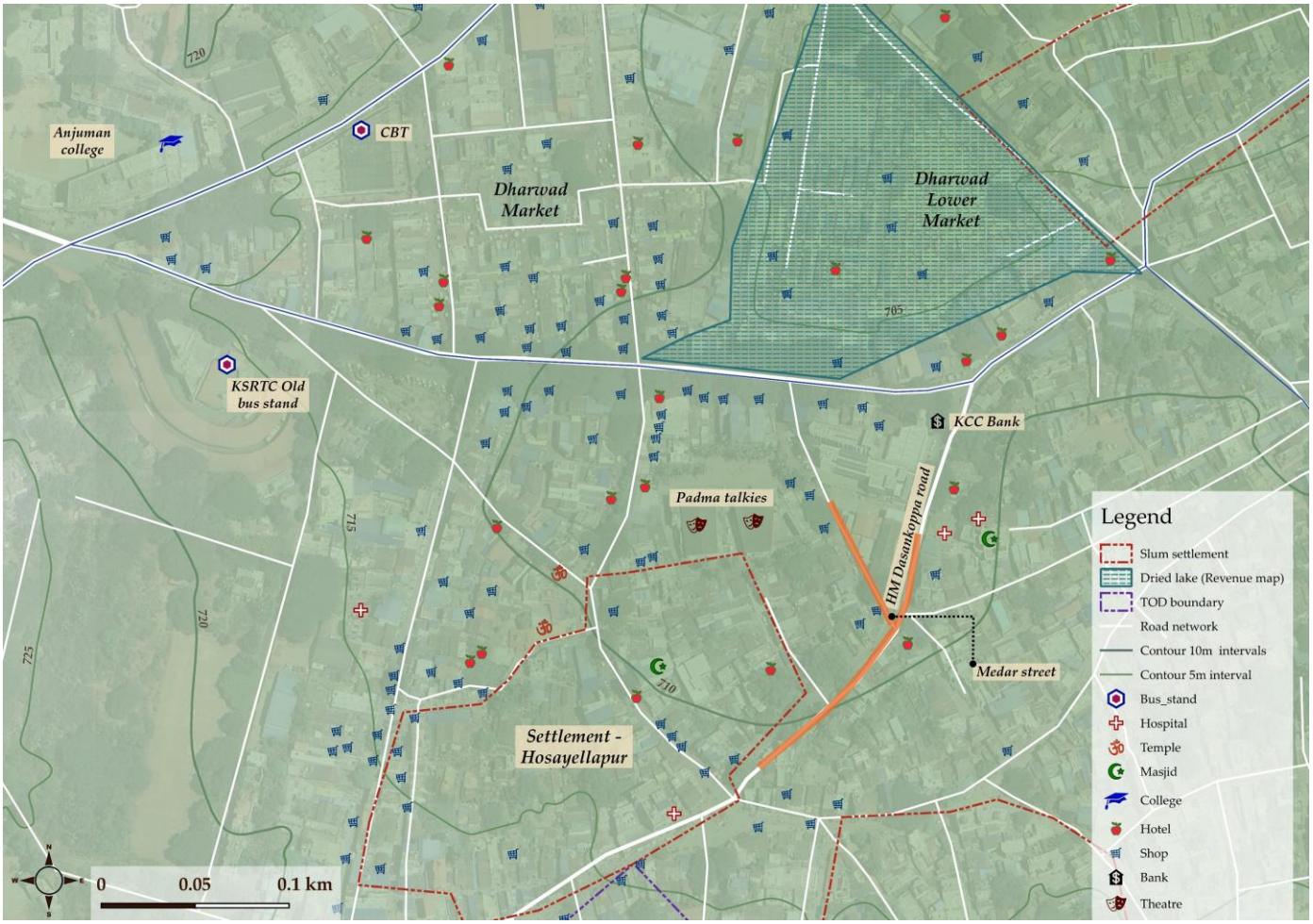


Figure 38 Illustration of data collected during the reconnaissance survey of the CBT area, with the surveyed street of households marked in orange

Figure 39 Bamboo artisans living and selling from the same space (the house fronts used for selling) (left), and metalworkers engaged in iron product fabrication (right)

11.6 Masalagar Oni and Saraswatapura - Dharwad

Overview, Area, and Population

The Saraswatapura settlement is a linear strip of small dwellings (~500-600 households) located alongside the Dharwad railway line. The houses along the street are primarily *kutcha* and semi-*pucca* in nature. Most residents work as scrap collectors, and scrap materials are typically stored in front of their houses for later sale. The settlement includes a small Durga temple and an open space that is used for parking and other miscellaneous activities. Kalghatagi Road connects Saraswatapura to a nearby settlement called Masalagar Oni, where the junction and roadside edges are lined with additional scrap dealers.

This other settlement, Masalagar Oni, is small and is around 50 years old. It has a total population of 835, with 157 households and an area of 7776.73 sq. m. Of the 157 houses, 88% *are semi-pucca* and 8% are *kutcha* in nature.

Location and the Community

Saraswatapura hosts an urban poor settlement located south of the city centre in the Malmaddi area. The settlement rests on the slope of the hilly terrain between the railway line on the south and Kalghatagi main road on the east. In entirety, Saraswatapura is a larger area composed of smaller settlement clusters with varied character. There is an affluent area, occupied by Brahmins and other communities, middle-income area, and this informal pocket. The informal settlement cluster is also known as Sikkaliger (a notified slum) and is at least 60-70 years old. Earlier the settlement was a lot greener and had a lot of mature trees which have been cut down due to urbanisation and growth of the settlement. The informal area has become denser over the past 20-30 years. The concretised road has come up in the settlement only after 2016. The major communities living here are Karwar Maratha, Durtumarg Valmiki and Bhaigiri Kannada. Of the three, the Marathas form the majority followed by Durtumarg and then Bhaigiri. The settlement is located on both private and government land. Some of the Marathas have papers to claim tenureship but most don't while the other two communities reported to have means of tenure security.

Masalagar Oni, adjacent to Saraswatapura, is also predominantly occupied by Maratha communities. The communities work as housekeepers, they go out to work in clothes shops, they sell *masalas*, gas repairs, labour, and sell *agarbattis* (joss sticks). They usually buy masala from shops that come from Hubballi and other wholesale shops, and they sell the spices around. The community near Masalagar Oni, known as the Kunchikoravar, is a pig-bearing community that earns a living by raising pigs and selling pork locally. The community has scrap dealers, as a lot of dry waste is collected and stored.

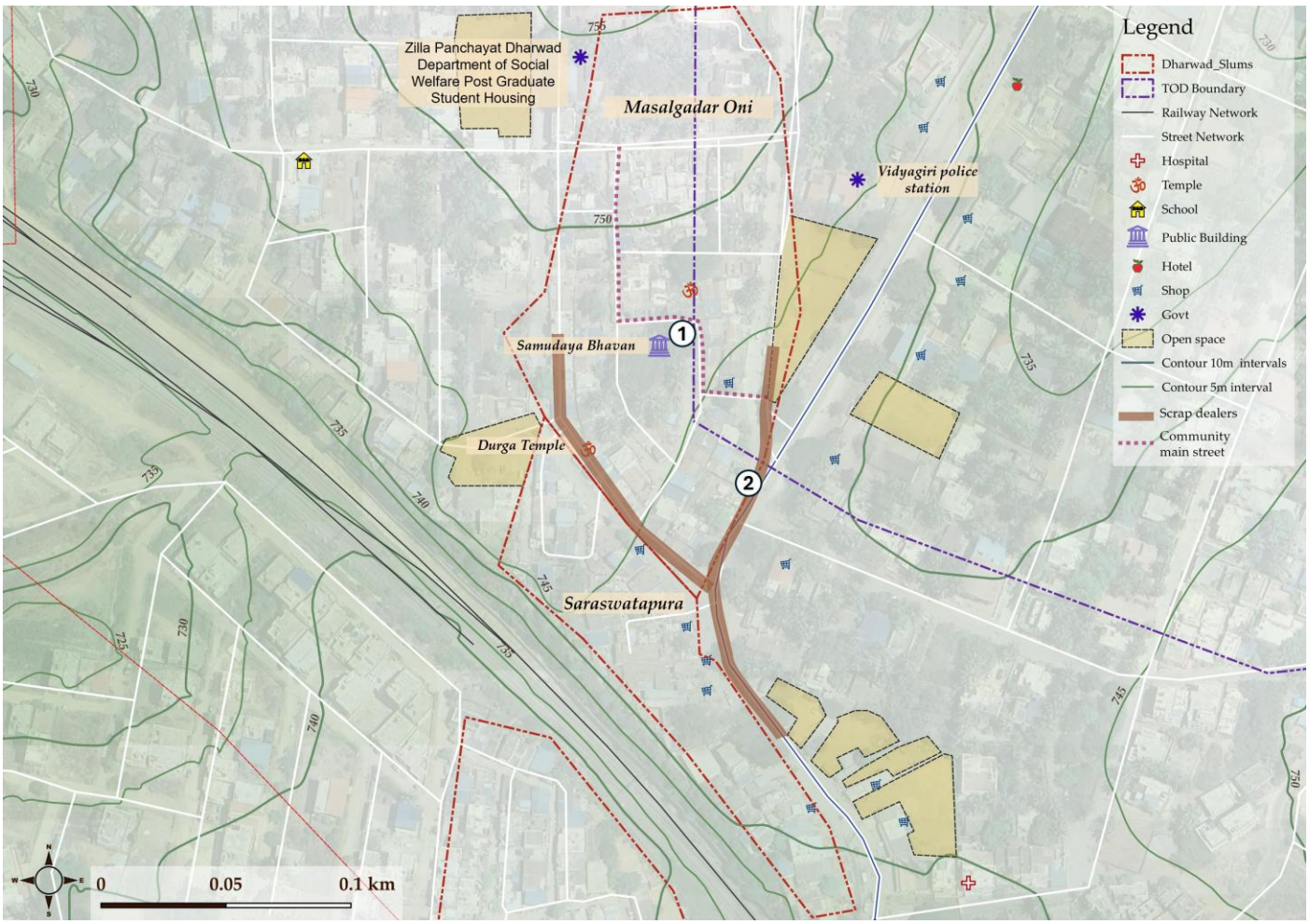


Figure 40 Illustration of data collected during the reconnaissance survey of slums near Saraswatapura and Masalagar Oni

Urban Issues and Critical concerns

The Saraswatapura settlement has two public taps that have been regularly non-functional for years on end. Any grievances from residents have not led to concrete changes. Although on paper most houses have 24x7 water supply, the service tends to be highly unreliable in practice coming once every third day. In Masalagar Oni, the conditions of water supply are even worse as 70% of the slum is not covered (mentioned in R.A.Y SFCPOA). It was mentioned during the interview that water had not been available for months and only came on the day of the survey.

Moreover, many houses in both Saraswatapura and Masalagar Oni are *semi-pucca* or *kutcha,* particularly belonging to the scrap collector livelihood. This leaves their homes extremely vulnerable to climate-related challenges, where rain damages publicly stored scrap, making it unsellable for example. Smaller scale *agarbattis* and *masala* drying similarly have shifted to private spaces exclusively to avoid the rain. Flooding/inundation issues loom large during monsoon - since the settlement is located on a hilly terrain and slopes towards the south, flooding is a major concern raised by the houses especially the ones located on the last lane downhill. While the topography allows the water to flow down to these spaces through drains, the movement is disrupted by the clogging of drains with solid waste and other effluents. This leads to backflow into the houses.

Figure 41 Poor housing conditions for residents of Saraswatapura and Masalagar Oni

Finally, very few houses in these settlements have toilets (mostly outside) and the rest defecate in the open near the railway track. Absence of toilets was noted to be an issue of safety and wellbeing especially for the women in the settlement who need to venture in the dark and odd times to relieve themselves. The solid waste management service by the municipality is irregular, the community usually dumps the waste in the neighbouring large open spaces and area adjoining the railway track. There are some sections where the drains are open leading to flooding and making these areas breeding grounds for mosquitoes. The drains usually get clogged with solid waste which creates a nuisance and leads to issues around hygiene for the households in both the areas. Frequently, the open space along the railway line is as a garbage dump and for open defecation. This is primarily due to the lack of facilities and services within the settlement area.

The profiles of selected slums in Hubballi and Dharwad reveal critical patterns of spatial and socio-economic vulnerability. Slums located near major drainage channels—such as Jagdeesh Nagar and those near the Unkal Nallah—show a higher susceptibility to waterlogging and flooding, primarily due to low-lying topography and inadequate stormwater infrastructure. In contrast, settlements like those near Herekeri Tank in Dharwad face compounded risks, where both heat and flood vulnerabilities intersect, especially in high-density areas like Jannath Nagar.

Livelihood-linked vulnerabilities also vary. Gauli Galli illustrates how traditional occupations struggle under urban pressures, whereas slums like Myadar Oni and CBT Market's bamboo craftsmen show adaptation through informal economic diversification, despite persistent challenges like raw material shortages and insecure work environments.

While urban integration and infrastructure upgrades are evident in some slums, many still lack basic services such as regular water supply and effective waste management. The analysis underscores that vulnerabilities are highly localized and multifaceted—which are detailed in the later sections of the livelihood vulnerability study.

12. Livelihood Vulnerability Assessment – Introduction

12.1 Primary Engagement

To assess the intersection of climate stressors and livelihood vulnerabilities among the urban poor in Hubballi-Dharwad, the study undertook an extensive primary engagement process. This involved conducting 180 detailed household surveys and 13 focus group discussions (FGDs) across selected slum settlements.

The objectives of this primary engagement were threefold:
a) To capture the demographic and socio-economic profile of residents—including aspects such as gender, age, education levels, type of livelihood, and housing conditions.
b) To identify and understand the impacts of climate stressors—particularly heat and flooding / inundation—on various aspects of livelihoods such as employment availability, work conditions, health, and income stability.
c) To evaluate access to basic services (like water, electricity, and sanitation), uptake of government welfare schemes, and any adaptation strategies adopted by communities in response to climate-related challenges.

The surveys were conducted in May-June 2025, a period of high temperatures and intense rain, in order to better capture the immediate effects of heat-related and rain-related stress on daily life and work. In addition to structured questions, respondents were encouraged to share their personal experiences and perspectives, allowing for a more nuanced understanding of their vulnerabilities. Photographs (with consent), audio recordings, and observations of workspaces and homes were also collected to add contextual depth to the quantitative findings.

The FGDs brought together a range of community stakeholders from diverse socio-economic and occupational backgrounds across different slum areas. These discussions were designed to complement the surveys by surfacing collective insights, shared concerns, and lived experiences related to climate vulnerability. Special attention was paid to ethical conduct—ensuring inclusive participation, cultural sensitivity, and confidentiality. The qualitative richness from these sessions strengthened the reliability of findings and laid the groundwork for informed and responsive recommendations.

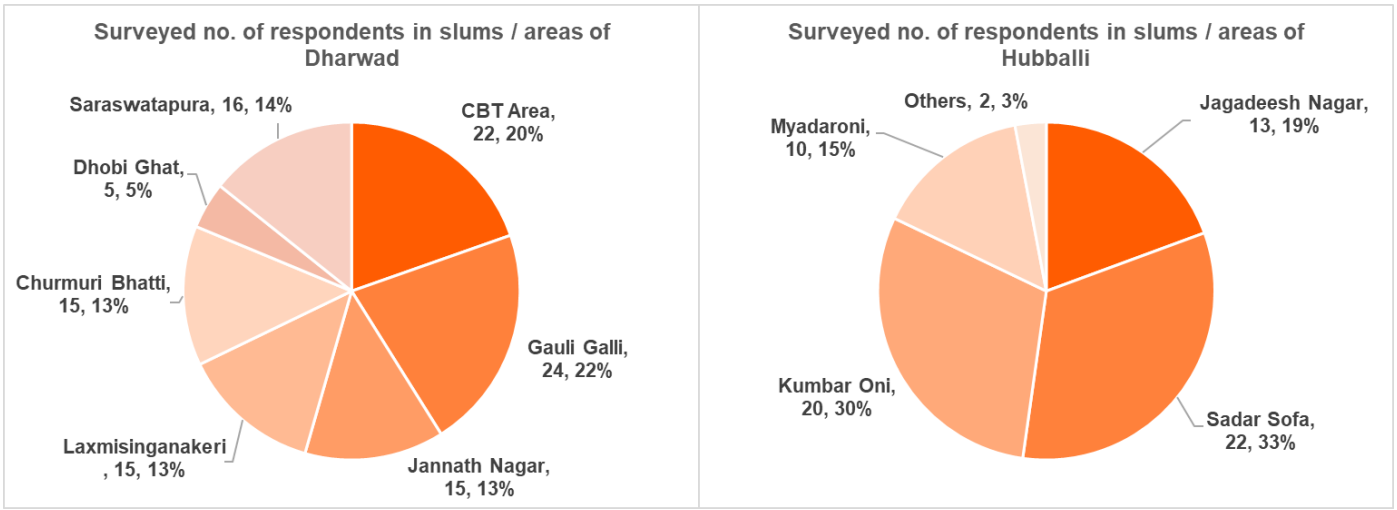


Figure 42 Surveyed samples from different slums in Hubballi and Dharwad

The figure 42 and table 18 below present an overview of the survey sample. The figure illustrates the distribution of surveys across different slum settlements, while the table introduces the livelihood-wise composition of respondents surveyed. The following sections delve into key general insights gathered across different slums and livelihood groups—beginning with an overview of observed climate change impacts, livelihood-based income levels, and living conditions, including housing quality. This is followed by a detailed, livelihood-specific analysis highlighting key findings and insights that emerged from the study.

Table 18 Livelihoods wise surveyed samples

Sno.	Name of Livelihood	Frequency	Percentage to the total
1	Construction Worker	35	19.23%
2	Cattle Rearer (Gauli)	20	10.99%
3	Scrap Worker	15	8.24%
4	Bamboo Craftsperson	14	7.69%
5	Street Vendor	14	7.69%
6	Auto Driver	13	7.14%
7	Churmuri Bhatti	12	6.59%
8	Small and Home-Based Industry Worker	8	4.40%
9	Kirani Shop	5	2.75%
10	Private Employee	5	2.75%
11	Dhobi	4	2.20%
12	Mechanic	4	2.20%
13	Domestic Worker	3	1.65%
14	Tiles and Paintwork	3	1.65%
15	Government Employee	2	1.10%
16	Remaining	26	14.29%
	Total	182	100.00%

The gender distribution of the overall survey sample consists of 43.75% female and 56.25% male respondents. Data on monthly household incomes across different livelihood groups reveal notable variations. On average, dhobis (cloth washers) represent the lowest-earning group, while cattle rearers report the highest average incomes. For all respondents combined, the first quartile monthly income is Rs 6,000, the median is Rs 10,000, and the third quartile is Rs 15,000.

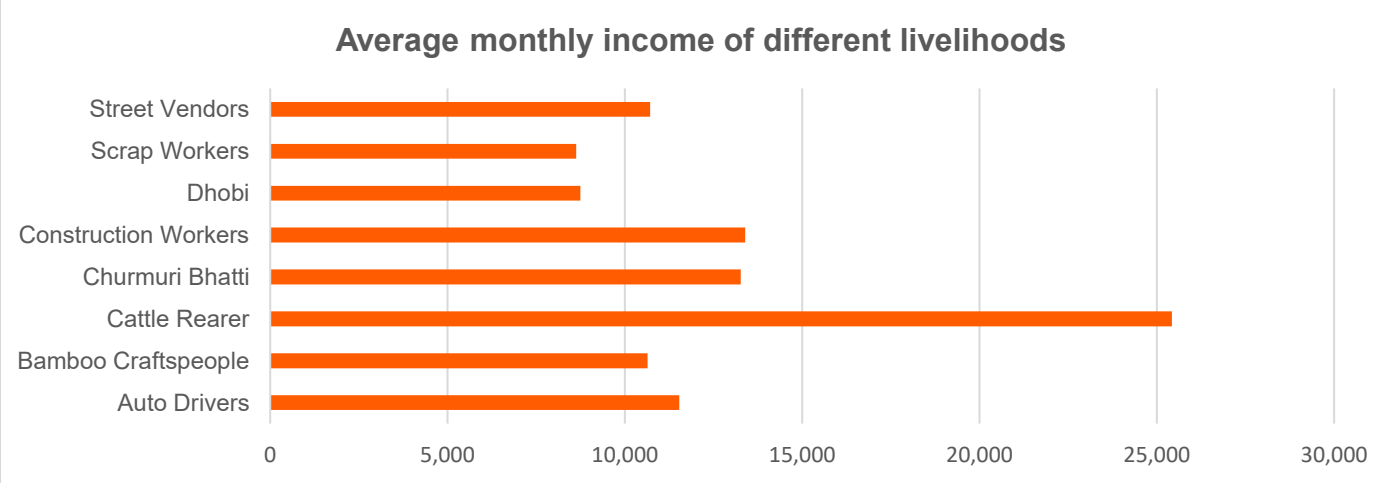


Figure 43 Average monthly income of different livelihoods surveyed

In addition to livelihoods, the living conditions of respondents were also surveyed to better understand the overall socio-economic status of the population residing in slum areas. Most dwellings were pucca structures, followed by semi-pucca and kutcha houses. Kutcha houses, often in poor condition, were particularly vulnerable to waterlogging. Residents of kutcha and semi-pucca homes reported significantly higher instances of waterlogging—90% and 88% respectively—compared to only 48% in pucca houses. These findings underscore the increased climate-related risks faced by those living in less durable housing. The distribution of housing types and conditions is shown in Figure 44.

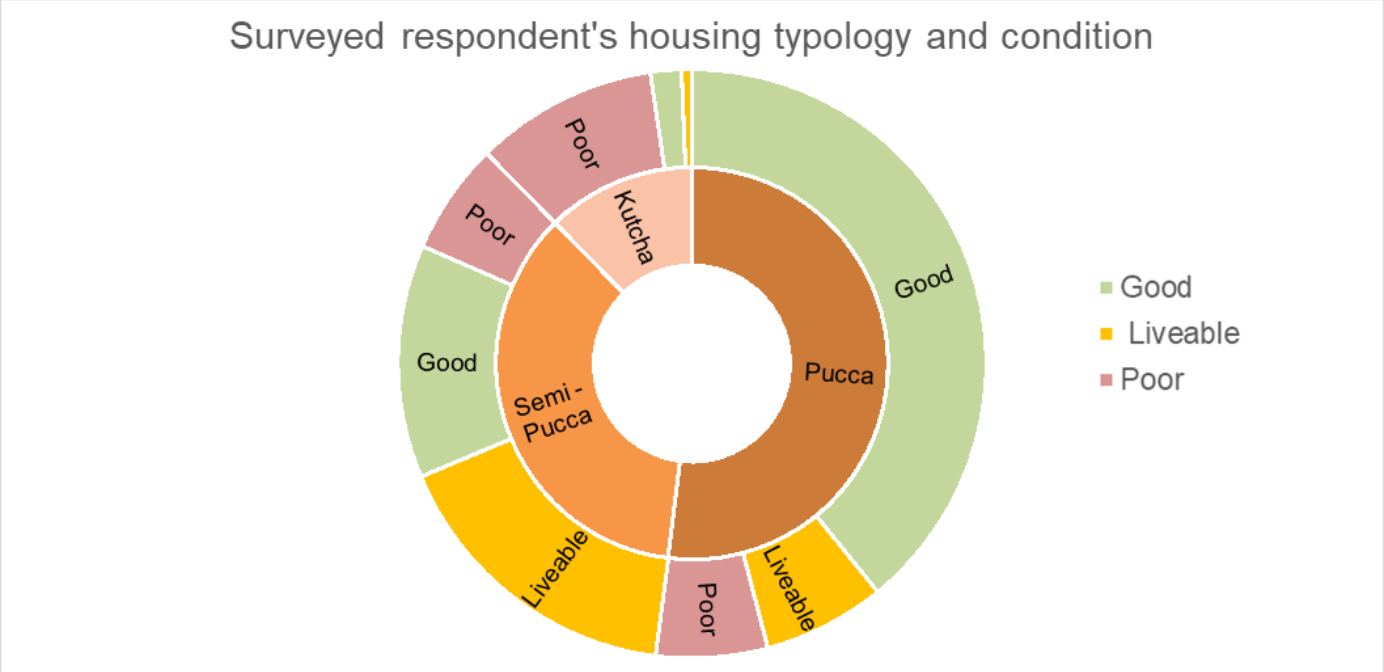


Figure 44 Housing typology and condition of the surveyed houses

Table 19 Responses for the question regard to observed Weather changes by the respondents?

Sno.	Noticed Changes in Weather	Frequency	Percentage to the total
1	Longer duration of heatwaves	155	86.59%
2	Increase in summer temperatures/hotter than usual	119	66.48%
3	Increase in humidity/discomfort during work	56	31.28%
4	Unpredictable rainfall	48	26.82%
5	Intense downpours	28	15.64%
6	Reduced total rainfall in monsoon	25	13.97%
7	Winters warmer/shorter	20	11.17%
8	Delayed monsoon	14	7.82%
9	Early withdrawal of monsoon	6	3.35%
10	No changes observed	3	1.68%
11	Others	3	1.68%

While the overall climate change and impacts in the HDMC area recorded is minimal compared to other regions as discussed in the introduction, the perception of change among local residents is notably evident. Table 19 presents the climate-related changes observed by the respondents. Survey responses indicate that a majority of respondents have experienced and reported noticeable

shifts in weather patterns with a majority reporting clear shifts in weather patterns, particularly heat-related effects.

During the survey period, the average outdoor temperature recorded in May was 36.75°C. This dropped to an average of 29.94°C in early June with the onset of the monsoon. Meanwhile, average indoor temperatures across surveyed households were recorded at 29.16°C (during may). Although this falls within the thermal comfort range for semi-arid regions with low humidity (typically 24°C to 32°C), the condition of the housing stock raises important concerns.

Thermal comfort standards, such as those set by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and the National Building Code of India—which draws from ASHRAE guidelines—defined these acceptable temperature ranges for buildings having good natural ventilation and adequate airflow. However, these conditions are often not met in semi-pucca and kutcha houses, which are common in slum settlements. These structures typically lack proper ventilation and insulation, meaning that actual heat discomfort can be more severe than what instrument readings suggest.

It is also worth noting that the peak summer temperatures in Hubballi-Dharwad this year were lower than those recorded in previous years. Yet, with future climate change situations, it is likely that indoor temperatures in such vulnerable homes will exceed comfort levels more frequently.

Despite some progress in housing improvements—supported by government schemes—a significant number of households still reside in semi-pucca or kutcha homes. This underscores the need to prioritize housing upgrades and climate-responsive design in adaptation planning, particularly for communities already facing compounded socio-economic vulnerabilities.

The rest of this discusses climate change-associated vulnerabilities as gathered through household surveys and the FGDs. In line with the objectives of this study, the unit of analyses is livelihoods as against the slum settlement. As will be revealed, climate challenges are commonly experienced by individual livelihoods regardless of which slum the respondent resides in. This study, therefore, provides a cross-sectional understanding of different livelihoods' lived experiences with climate change across several slums. Purposive sampling with long-form interviews allows for this, enabling the exploration of specificities about the urban poor's livelihood vulnerabilities; and how climate is actively impacting job outcomes and health of the urban poor.

13. Individual Livelihood Vulnerability Assessment – Insights and Findings

In line with the study's objective of understanding how climate stressors exacerbate livelihood challenges among the urban poor in Hubballi-Dharwad, the following livelihood groups were selected for detailed assessment. The outcomes of this analysis are discussed in the subsequent sections[2] :

- **Construction Workers**
- **Cattle Rearers**
- **Bamboo Craftspeople**
- **Churmuri Bhatti**
- **Dhobis (Cloth washers)**
- **Street Vendors**
- **Scrap Collectors**

The following section presents the findings and insights related to each of the selected livelihoods. Each part begins with key highlight information about the respective livelihood, followed by a detailed discussion of its specific challenges, vulnerabilities, and climate-related impacts.

[2] This is also based on applying our discretion about the availability and quality of survey/FGD data from this Hubballi-Dharwad study. For instance, government and private employees experience security of tenure other informal livelihoods may not face; hence, these livelihoods are omitted. Meanwhile, difficulties in survey data collection with small and home-based industries (such as miscategorising them) meant that we could not make any strong analysis for this livelihood group. Overall, the rule of thumb used for the primary engagement's selection of the six major livelihoods is having access to both high amounts of survey data and FGD-related insights, mostly relying on the former. Other relevant livelihoods' climate-related income vulnerabilities have briefly been explored in the conclusion.

13.1 Construction Workers

Key Facts

- Most frequently occurring livelihood surveyed - many men leaving traditional occupations towards construction
- Three quarters belong to three settlements – Laxmisinganakeri (Dharwad), Kumbar Oni (Hubballi) and Sadar Sofa (Hubballi)
- Most find work either directly from site owners or through contractors at construction sites.

Climate-Led Livelihood Vulnerabilities

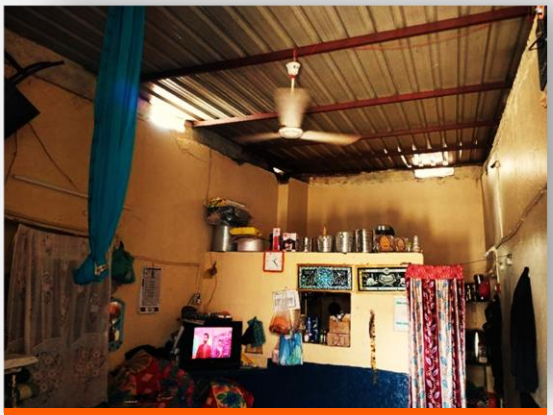
- Unavailability of construction jobs during monsoon (June to September)
- Every respondent cited at least either one of 'Higher Temperatures' or 'Longer Heatwaves' as an observable climate change
- Major Livelihood Challenges - increased physical strain due to heat, less work days due to heat or rains, safety concerns and lack of proper equipment
- Primary Health Issues Faced - heat-related Illnesses, skin-illnesses, mental health issues.

Barrier faced and the way forward

- Frequent job unavailability means construction workers refuse take breaks, even when health is at risk
- This Livelihood primarily seeks better access to safety gear, first aid insurance and other health support
- Majority are willing to train on advanced construction techniques

Problem statement

The proliferation of urbanisation has made construction labour a popular livelihood for many in Hubballi-Dharwad's slum settlements, whose arduous labour under high temperatures and rain-disrupted job availability are major climate challenges.



Tin-sheet roofed interior of a construction worker's house in Laxmisinganakeri

Kutcha-roofed house of a construction worker in Sadar Sofa

As Hubballi-Dharwad has rapidly urbanised, so has the need for construction workers. The KIIs also revealed that construction work's growth has been a transformatory livelihood for Hubballi-Dharwad's urban poor, where males have moved away from traditional and other informal livelihoods towards higher-paid construction labour jobs. Considering that this livelihood is closer to a source of formal employment too, construction workers are believed to face relatively less uncertainty in their income-earning activities. Approximately, 20% of surveyed households' primary livelihood is construction labour. Within this livelihood, 75% come from three settlements - Laxmisinganerakeri (Dharwad), Kumbar Oni (Hubballi) and Sadar Sofa (Hubballi).

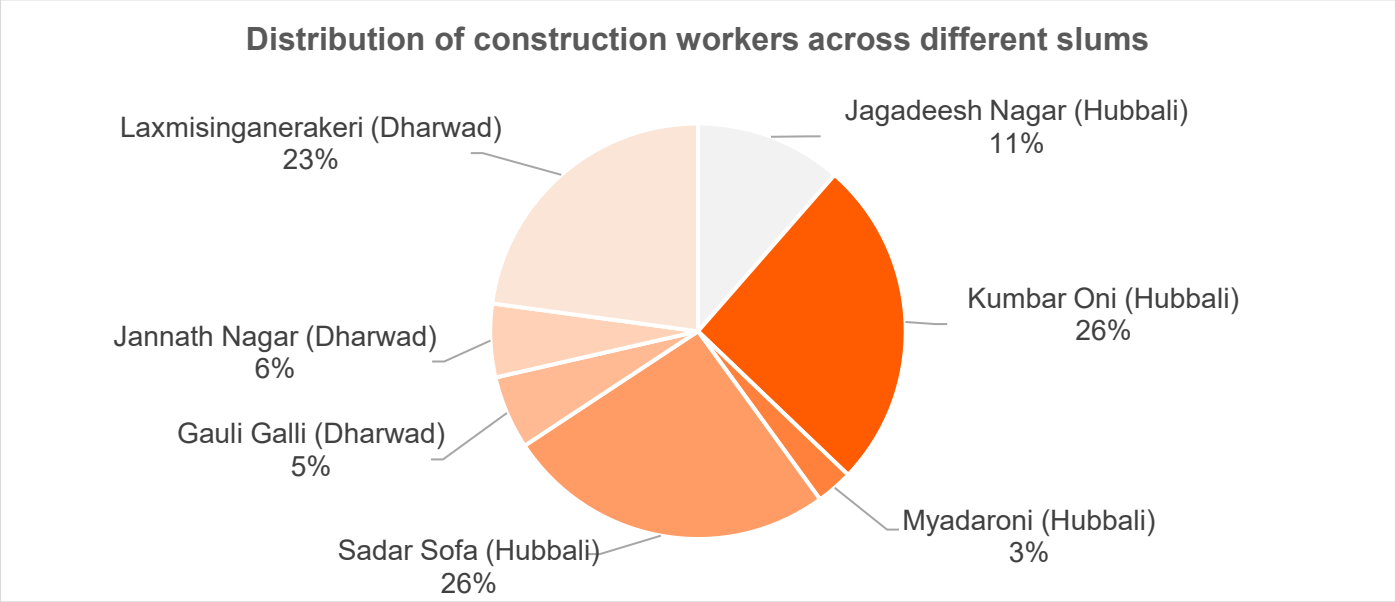


Figure 45 Distribution of Construction Workers surveyed in slums of HDMC

Both Kumbar Oni and Sadar Sofa are similar in terms of size, livelihoods, access to basic services as well as in climate vulnerability assessment scores. Both settlements have been inhabited for between forty to sixty years, migration is said to be driven by proximity to livelihood opportunities in construction. Homes tend to be small, overcrowded and vulnerable to water-logging during the monsoon in these areas — with residents citing regular unsanitary conditions and damage to personal belongings as outcomes of poor sewerage. Meanwhile, Laxmisinganerakeri generally sees women working as domestic workers, while men take up jobs in construction. Both men and women are deeply entrenched in manual and unorganized labour. Relative to other settlements, Laxmisinganerakeri has better roads, drainage and presence of public institutions; but still faces problems of heat and waterlogging.

13.1.1 Key Livelihood related insights – Construction Workers

- 96.55% of construction workers reported at least either 'higher temperatures' or 'longer heatwaves' as an observable climate change.
- Nearly 80% explain that they sign informal contracts either with the site owner or through contractors — tools are provided (the costs are deducted from wages).
- Work occurs between 8:00 a.m. to 5:00 p.m., earning about 300 to 500 INR daily as profits.
- Over 90% cited that jobs are not available throughout the year.
- Job unavailability peaks during monsoon months (over 70% of construction workers quoting jobs being unavailable between July and August).

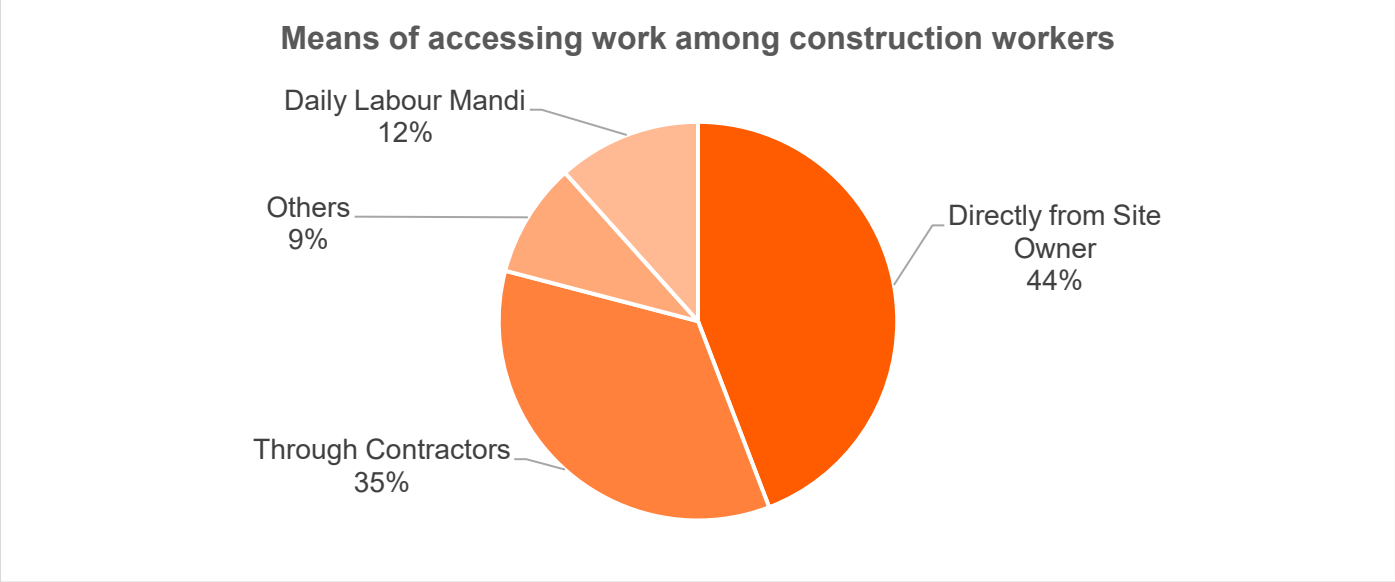


Figure 46 Means of accessing work among construction workers

Figure 47 Months of the year where construction workers struggle to find jobs

13.1.2 Major issues emerging due to climate stressors among the Construction workers

- Fewer work days caused by rain-induced project delays and intense heat (expressed by 40% of construction workers).
- Materials left in open construction zones are often washed away or spoiled during heavy rains.
- When work is taking place, the predominant issue is an increased physical strain due to rising heat (revealed by 60% of respondents).
- Over 80% have faced health issues exacerbated by ‘unbearable’ outdoor heat, heavy rains and poor safety gear.
- The major health challenges: heat-related illnesses (heatstroke), body pain (joint pain and slipping during work in muddy grounds), skin illnesses and mental health issues.

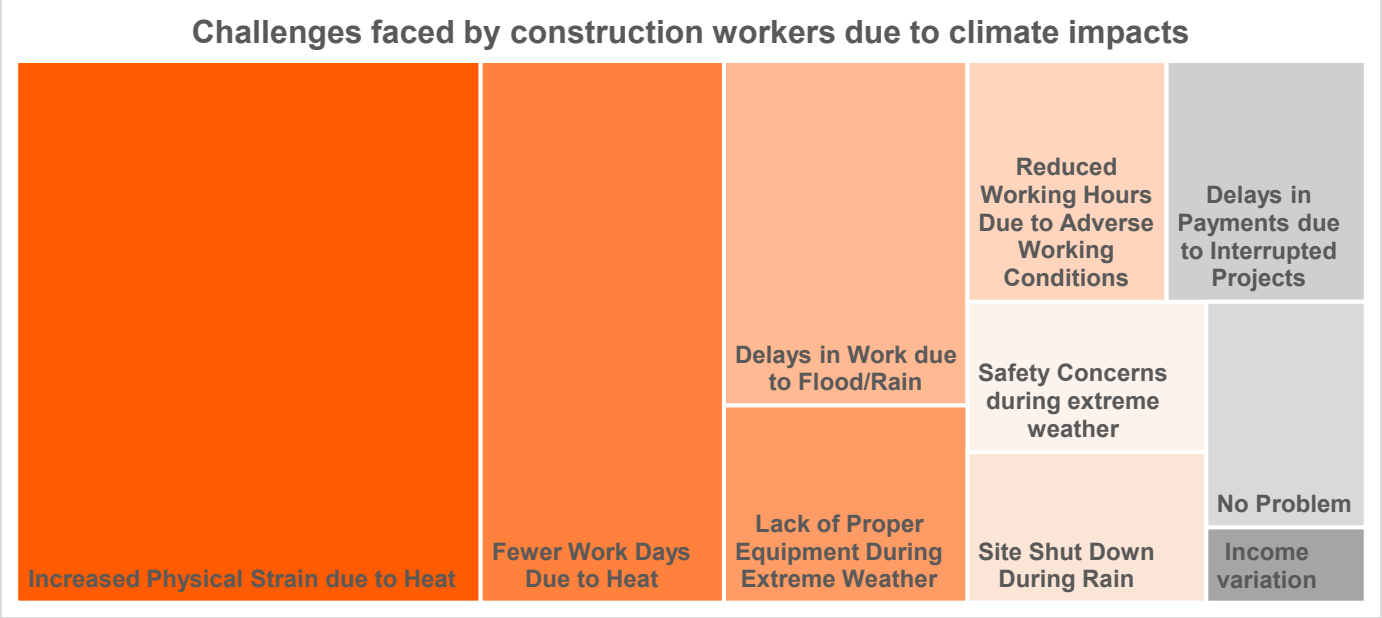


Figure 48 Climate-exacerbated Challenges for Construction Workers

Construction workers as a livelihood have largely emerged as a strong alternative to traditional ones for slum dwellers in Hubballi-Dharwad. While jobs in the construction sector offer income enlargement opportunities, labourers face hampered income and worsening health conditions during heat spells and rain conditions. The fact that 85% of these individuals at best only 'rarely' or 'occasionally' stop work due to climate-related worsening health conditions is not an indication of the non-severity of climate stressors, but rather the precarious financial position of these households who must work whenever jobs are available.

Health-related support is most sought by the Construction Workers. A combined 64% express a desire for better access to safety and protection gear, first aid/accident insurance and a health support system. More than half of respondents seek training-— particularly in further developing skills in advanced construction techniques.

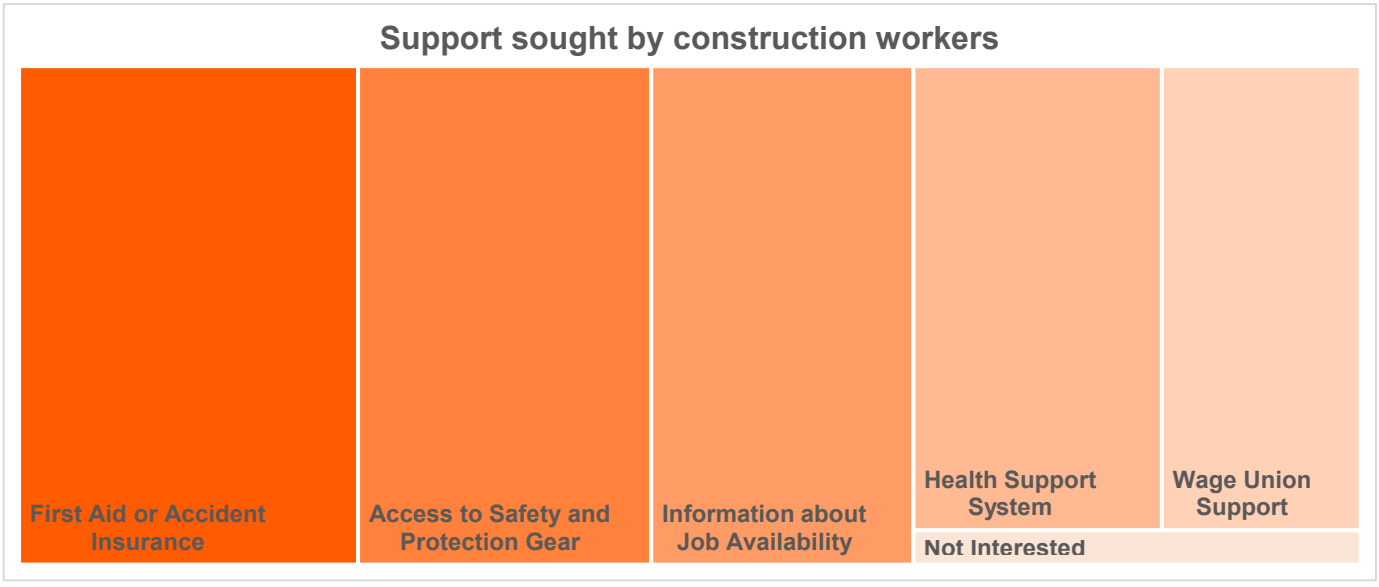


Figure 49 Support Sought by Construction Workers

13.2 Cattle Rearers

Key Facts

- A traditional occupation of Gaulis in Gauli Galli (Dharwad) - century-old settlement
- Olden days - cows could graze comfortably, bathe in a nearby lake
- Now - grazing is increasingly in farther pasturelands, or buying fodder from the local Market
- Lack of space - some cattle tied on the roads, dung waste and water mix leading to sanitation issues due to poor sewerage

Climate-Led Livelihood Vulnerabilities

- Major Livelihood Challenges - rising production costs & lower production due to fodder shortage, water scarcity, diseases among cattle, predominantly due to increasing heat, rapid urbanisation and erratic water supply
- Primary Health Issues Faced - mental health stress, heat-related illnesses, water-borne diseases.

Barrier faced and the way forward

- Cattle rearers earn Rs. 30 - 40/litre - undercut by private companies packaged milk
- Disillusionment with government - lack of public institutions, previous surveys without follow-ups
- This livelihood seeks improved cattle shelters, veterinary visits, improved milk storage facilities and increased fodder cultivation.

Problem statement

A century old livelihood now under intense threat, cattle rearers from Gauli Galli are pinched by both rising production costs and lower market prices arising from increased heat, urbanization and competition with commercial dairy enterprises.

Cattle sheds in Gaulli Galli

Dung cakes laid out on rooftops for drying, later used as fuel for cooking

All twenty surveyed cattle rearers belong to Gauli Galli (Dharwad), a traditional occupation of men from the Gauli community for about a century. Women generally work as housekeepers in nearby neighbourhoods such as Malamaddi. Respondents cite the 'olden days' where a nearby lake was comfortable for grazing and cows could dip in the lake. With increasing urbanisation and depleting open spaces (including grazing spaces), the availability of water and fodder has reduced significantly, while the residents' small-sized landholdings has resulted in tethering the cattle on the street. Fodder is sourced from increasingly distant lands (such as from Someshwar Lake 2.6 km away), or from the local market directly. This renders the fodder process as costly, both in a time and monetary sense. Moreover, on the market, cattle rearers lament the low prices of milk that they can charge — 30 - 40 INR per litre in places such as Yemmekere. They claim to have been undercut by private companies' packaged milk. In addition to milk, cow dung is also marketed - used to make 'dung cakes,' locally known as *kull*, which serve as a source of biogas. Traditionally, some locals also burn cow dung during childbirth as a form of *loban* (incense), primarily for air purification. In addition, cow dung is used as *gobbara* (natural fertilizer) and for making *agarbatti* or *uudkaddi* (incense sticks), which are sold commercially.


Figure 50 Kutcha houses covered with tarpaulin sheets to protect roofs from weather damage

13.2.1 Key livelihood related insights – Cattle Rearers

- All respondents of Gauli Galli express at least either 'longer heatwaves' and 'higher temperatures' occurring as a weather change from recent years.
- Only 11% of cattle rearers source fodder from their own land, while 85% comes from either nearby pasturelands or the local market.
- Over 80% of sales are to local consumers (households and sweet shops), with private milk companies and cooperatives collectively comprising the rest.

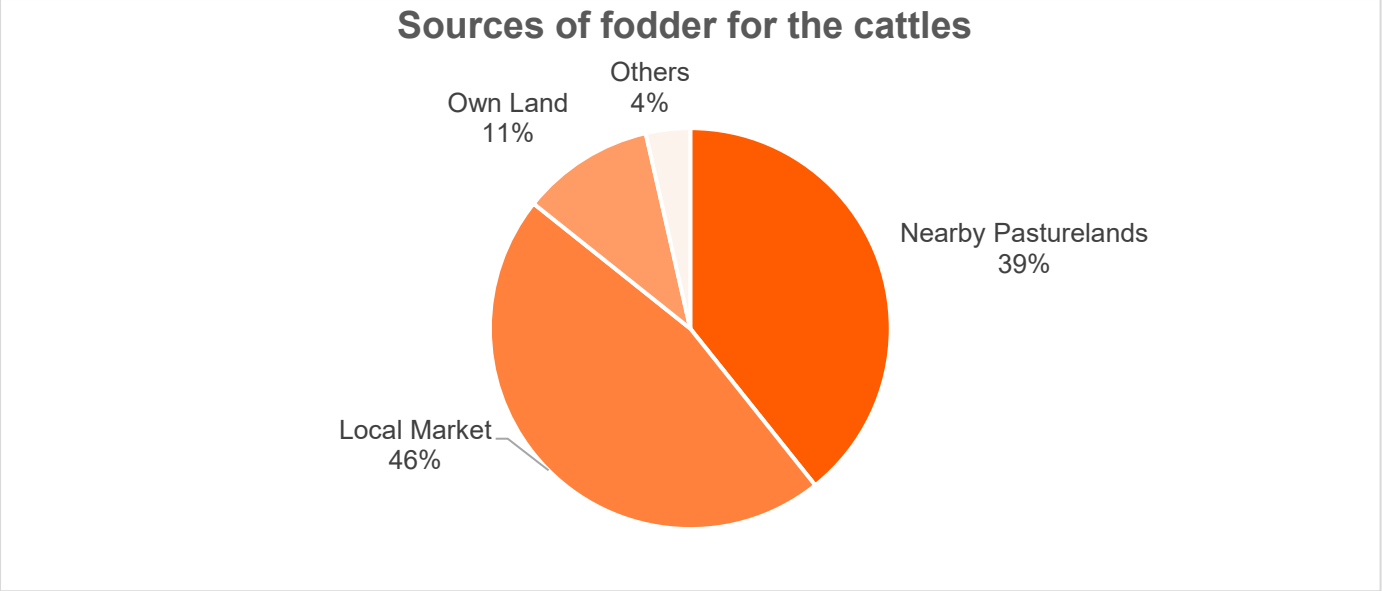


Figure 51 Where Cattle Rearers Source Fodder in Gauli Galli

13.2.2 Major issues emerging due to climate stressors and rapid urbanisation among the cattle rearers

- 100% of respondents express that they have faced fodder shortages (due to urbanisation of surrounding areas and rising heat).
- Milk production drops in summer due to heat stress on cattle and water scarcity. Fodder becomes costlier during drought, increasing expenses. During floods, stored fodder gets damaged, further squeezing profits. These seasonal income dips are becoming more frequent.
- Even though '24/7' water supply is promised (under the National Bharat Abhiyan Scheme), 60% cite regular water scarcity in the settlement which inhibits proper caretaking of cows.
- About 50% cited a rise in diseases among cattle due to heat and change in dietary lifestyles, extreme price fluctuation (25%), lack of transportation alongside limited cold storage facilities and cattle sheds (20% collectively).

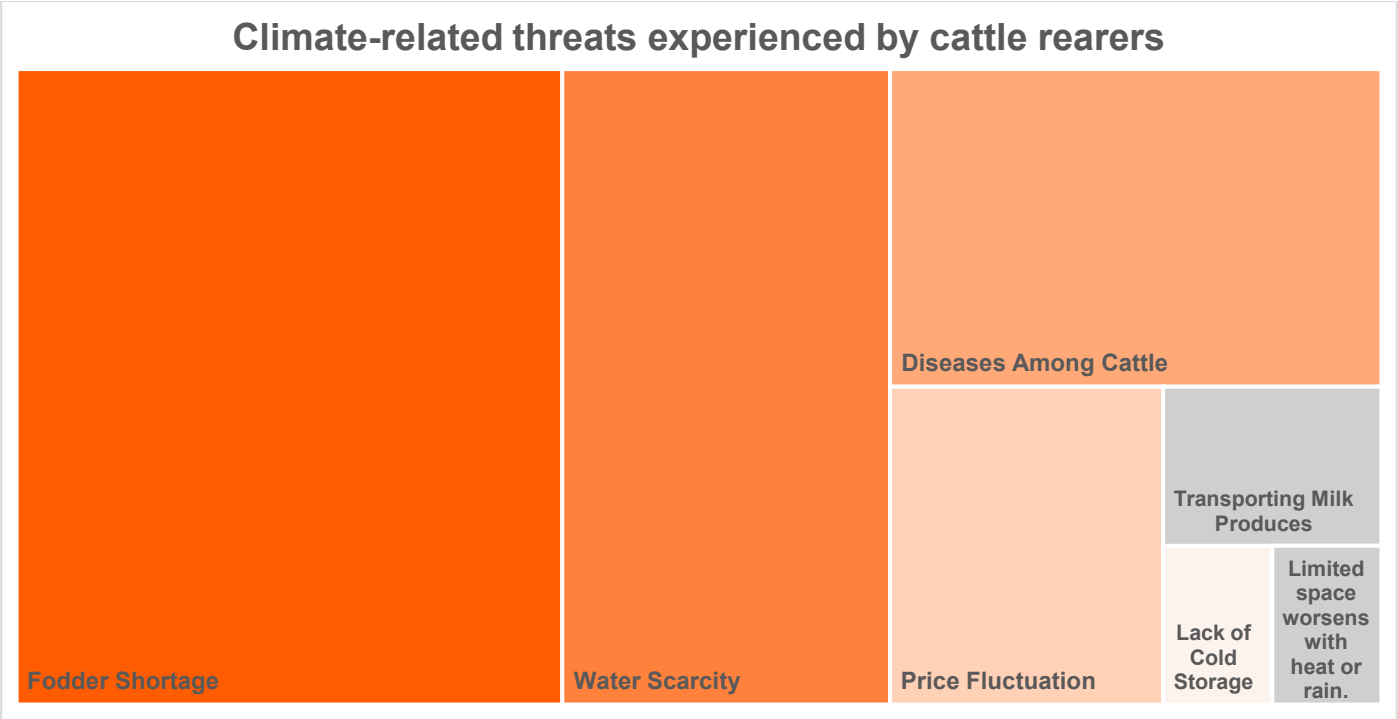


Figure 52 Climate-exacerbated Livelihood Challenges for Cattle Rearers

- 75% of cattle rearers cited that they face health issues due to climate change. Many experience a combination of mental health stress, skin issues, heat-related illnesses, water-borne diseases, respiratory problems and fever.

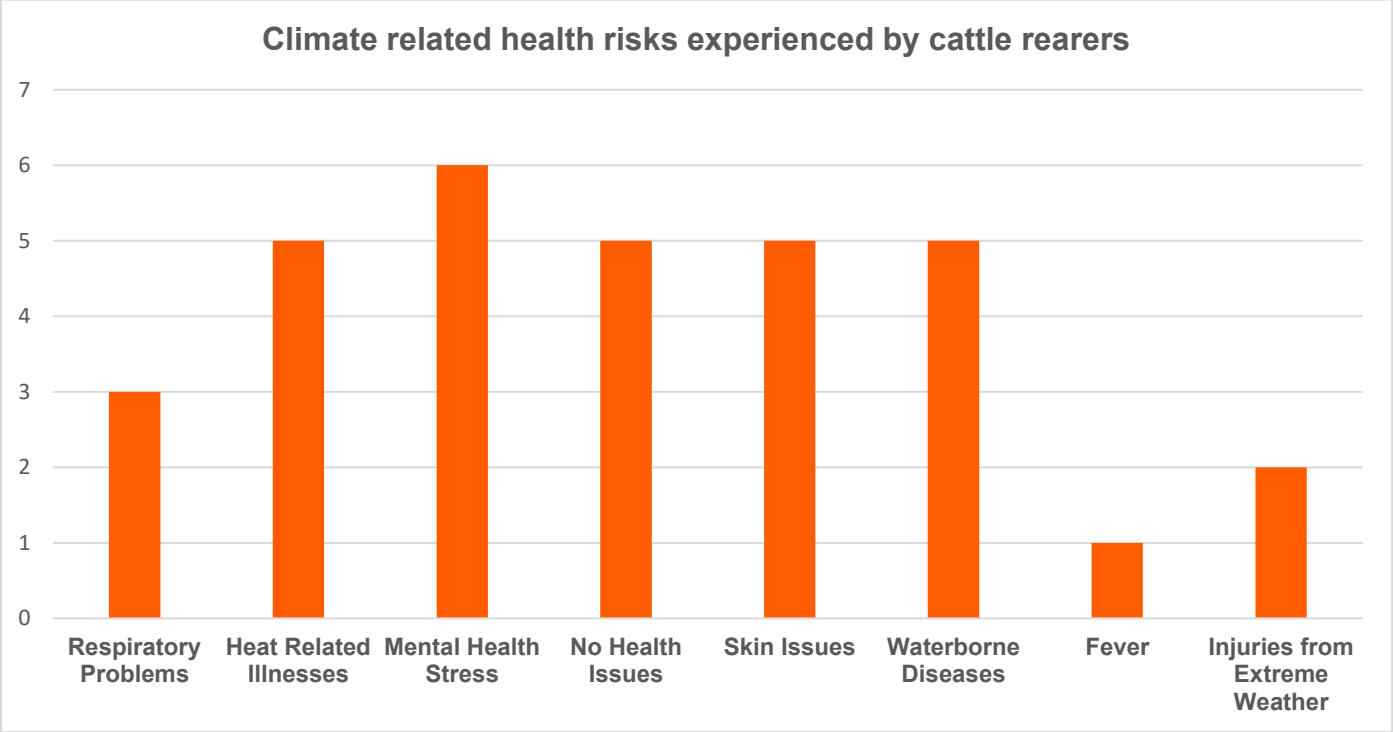


Figure 53 Cattle Rearers' Climate-induced Health Problems.

The primary livelihood of Gaulis in HDMC is under significant threat. Cattle rearers are pinched by a dual effect — rising production costs and lower milk production arising from both urbanisation and hotter temperatures. Problems persist in living spaces too. Even though over 90% of respondents

live in semi-pucca and pucca housing and have toilets in their homes, investigators noted extremely poor sanitation and a lack of basic amenities in Gauli Galli. There is no designated area for storing cow dung. Dung is disposed of by mixing with water and is frequently overflowing in the sewers, which is likely aggravating health issues such as water-borne diseases and fever. A distinct lack of space is worsening uncertainties of cattle rearers; any nearby lakes and grazing lands have given way to urbanisation.

In response to these challenges, 90% of respondents express their desire to receive support in terms of improving fodder cultivation and supply. Between 40% - 70% also seek improved cattle shelters, more health-services for cattle (such as veterinary visits), improved milk storage facilities and training on better practices. Strengthening links to markets and accessing loans are also highlighted as other means of potential livelihood support. Renewable energy solutions like solar-powered pumps are known but unaffordable. Moreover, respondents are also fairly disillusioned with any potential support or training schemes — the government is said to have previously surveyed the area without any concrete improvements or follow-ups. This may explain why the most frequently occurring response to questions about joining a dairy cooperative and adopting new ecological tools was ‘no’ (60% and 40% respectively).

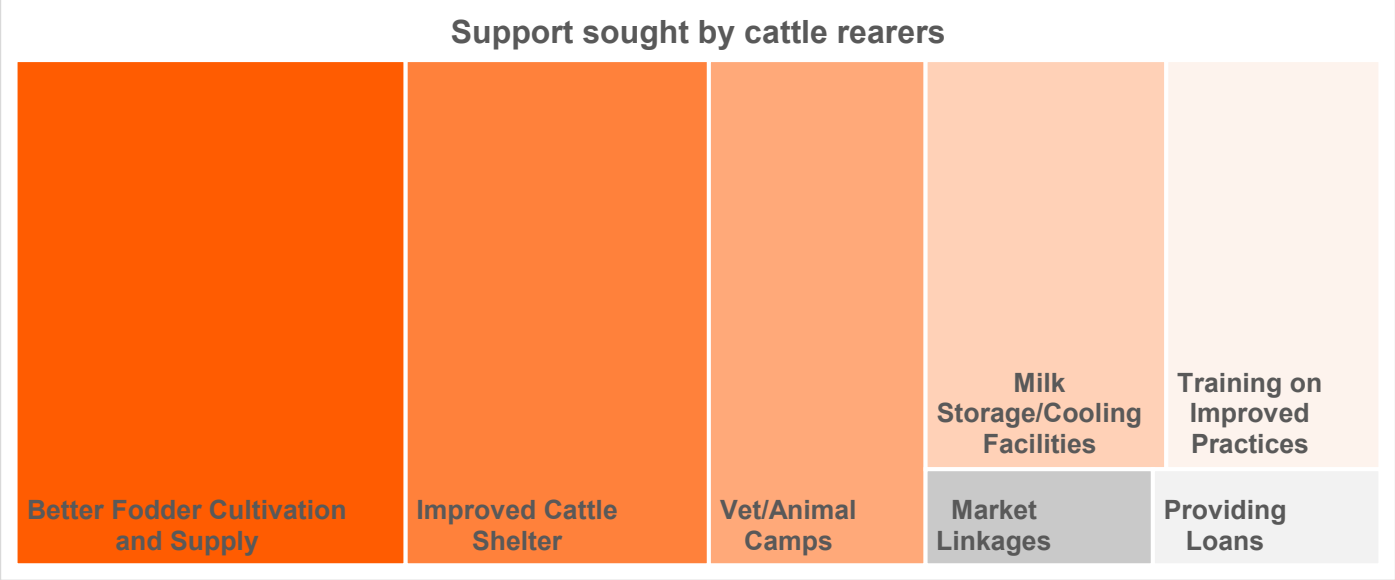


Figure 54 Support Sought by Surveyed Cattle Rearers

13.3 Bamboo Craftspeople

Key Facts

- A traditional occupation of women from the Myadar Community, mostly belonging to CBT Area (Dharwad) and Myadaroni (Hubballi).
- Bamboo craftspeople earn 25% less than other surveyed primary livelihoods.
- Raw materials sourced from within Karnataka and Maharashtra, predominantly sold at local markets.

Climate-Led Livelihood Vulnerabilities

- Unavailability of bamboo supply during monsoon (June to August).
- Major Livelihood Challenges - delayed bamboo growth due to erratic rainfalls, rising humidity damaging raw materials and finished products.
- Primary Health Issues Faced - heat-related illnesses, mental health issues and injuries from extreme weather events.

Barrier faced and the way forward

- Lack of dedicated space for both production and storage of bamboo - instead opt for within homes/public spaces.
- More than three in five have previously been trained on bamboo product design.
- This livelihood seeks machinery to reduce physical strain, improved access to bamboo supply during monsoon and support in marketing products.

Problem statement

Increasingly erratic monsoon rains and higher humidity negatively impact bamboo supply and destroy storage of products for bamboo craftspeople, bringing about major production-level challenges for this traditional livelihood

Workspace cum sales area for bamboo products set up in front of a house in the CBT area.

Other bamboo product markets along the roads in Myadaroni

Bamboo craftsmanship is a traditional occupation of Myadars, every respondent surveyed (fourteen in total) across Hubballi-Dharwad belongs to this community. All but one respondent are women. Over 70% of bamboo craftsmen are from the CBT Area (Dharwad). Three of the remaining respondents are from Myadaroni (Hubballi), with the last respondent residing in the nearby Narayan Oni and selling her products in Myadaroni. The CBT Area is predominantly a marketplace, supporting several vendors as well as bamboo crafts. Bamboo craftspeople generally double their residences in market areas to also serve as the vending location, selling to traders and festival organisers predominantly.

The decline in bamboo availability and competition from cheaper substitutes has led to a reduction in traditional bamboo crafts. Bamboo is sourced through middlemen, and is stored Several bamboo workers have transitioned to low-paying informal work, such as construction-related jobs for men and pounding areca nuts for women. The survey responses indicate that the average monthly household income for bamboo craftspeople is 23% less than the average for all major primary livelihood[3].

13.3.1 Key livelihood related insights - Bamboo Craftspeople

- Bamboo craftspeople are said to earn between 200 - 400 INR daily.
- Over 80% of the bamboo is sourced from within Karnataka (Sirsi, Belgaum, Dandeli for example) or from Maharashtra.
- Monsoon months (June - August) witness a reduced supply of bamboo as raw material, as cited by between 64% to 78% of all respondents in comparison to closer to 20% for the September - February period.

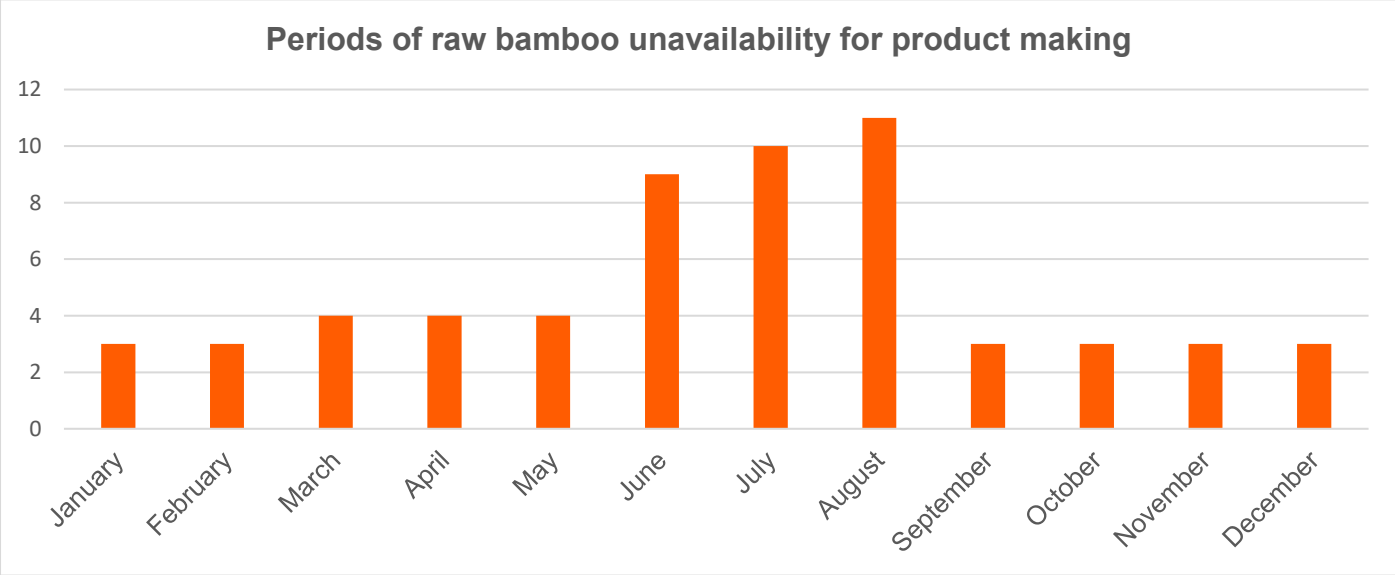


Figure 55 Months of the Year where Bamboo Supply is Unavailable

13.3.2 Major issues emerging due to climate stressors among the bamboo craftspeople

- 80% of climate-related livelihood challenges are related to the monsoon

[3] In this instance, 'major' primary livelihoods refer to all livelihoods surveyed with more than ten respondents (including bamboo craftspeople), to reduce dispersion of the mean by a few respondents.

- Bamboo growth and availability is either delayed/reduced due to unpredictable rain and deforestation.
- There are also major difficulties in storing bamboo arising from high levels of humidity. Open sheds have collapsed/leaked during storms, leading to a loss of tools.
- Waterlogging of homes (Myadaroni) in the aftermath of heavy rains disrupt daily work and damage bamboo products.
- The extreme heat makes bamboo brittle, increasing breakage during crafting, while persistent rain prevents drying, bringing production to a standstill.

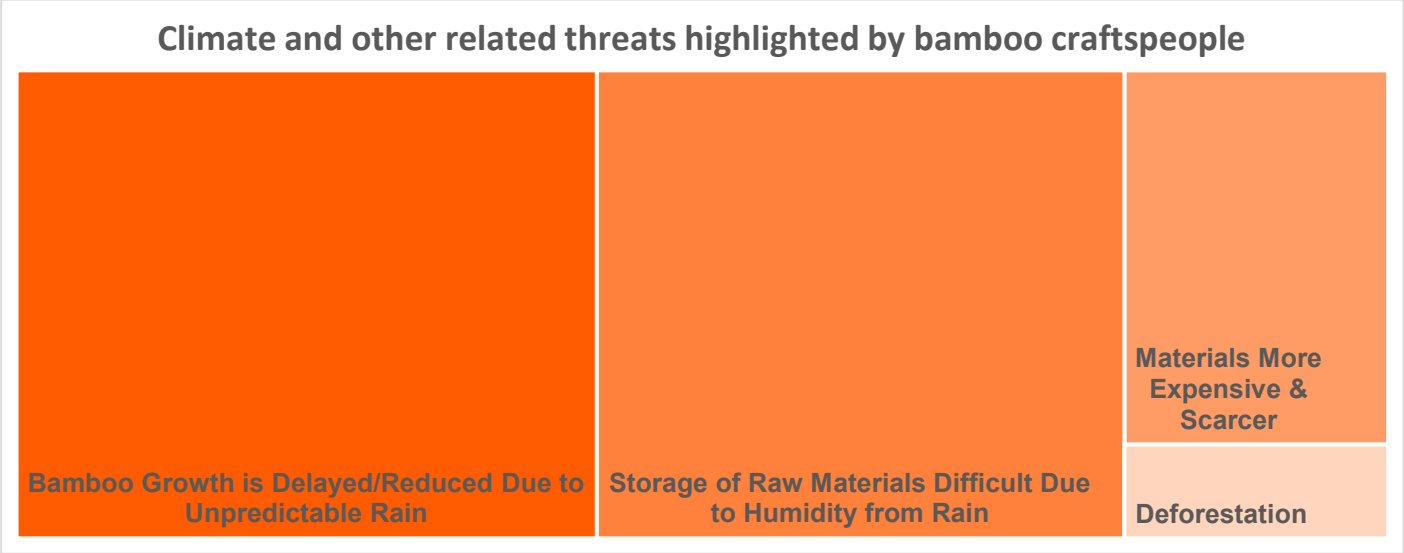


Figure 56 Climate-related Livelihood Challenges Faced by Bamboo Craftspeople

- Only 15% have a dedicated space for production and over 60% cite a lack of space for storing bamboo products as well as raw materials — instead, most opt to produce and store baskets and ladders within their homes or in public spaces (on the streets, footpaths etc.).
- 60% mention health issues such as heat-related illnesses, mental health issues and injuries from extreme weather events. These arise from humid conditions in the workspace, physical strain (cuts, infections) of hand-made production and the exposure to heat while selling on the roadside market.

Similar to other traditional livelihoods in HDMC, bamboo craftsmanship is an at-risk traditional occupation that is seeking or requires external intervention (governments, civil societies) to stay afloat. Altogether, bamboo craftspeople suffer from two predominant climate stressor-led challenges in production. First is an erratic supply of bamboo during monsoon months that inhibits production capabilities. FGDs explore that there is ‘great demand’ for bamboo currently unmet in the CBT Area for example. Even when raw materials are received, the second issue arises of poor storage and cramped production spaces exacerbated by humidity ruining product quality. Not exclusive to the production front, sales have been cited to be relatively low for this livelihood. Close to 80% of bamboo craftspeople receive their sales at local markets such as in the CBT Area, with the second most recurring response being customers approaching the sellers directly. Handicraft shops, roadside shops, cooperatives and wholesalers consist of the remaining source of customer-groups for bamboo craftspeople.

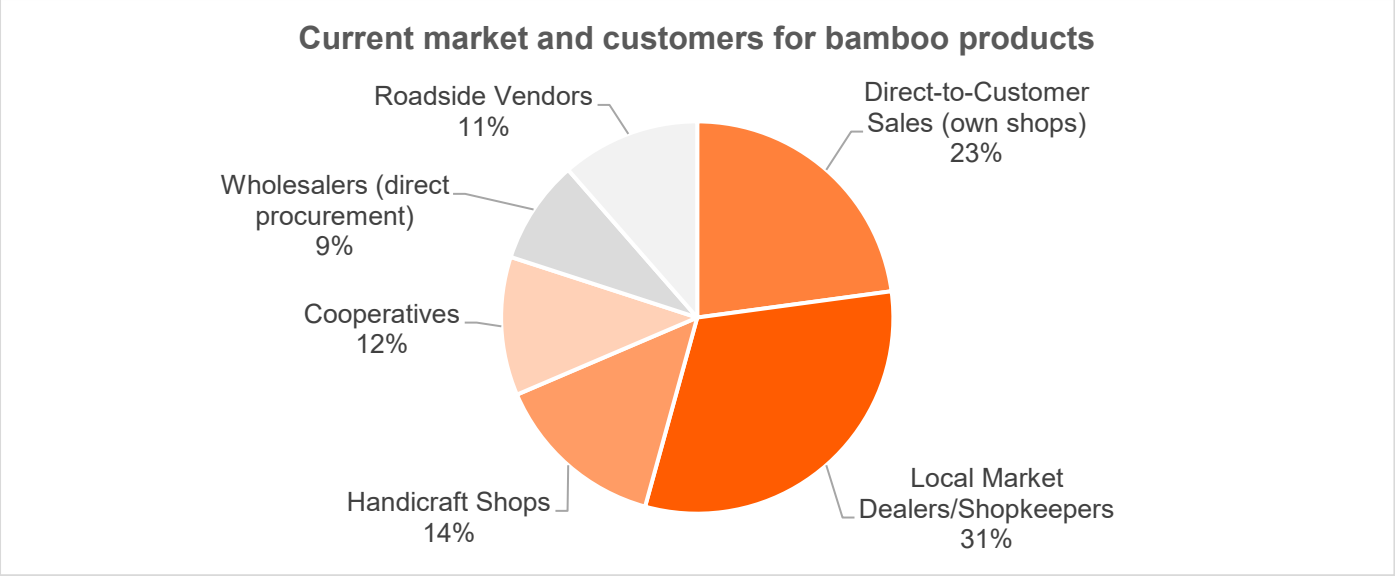


Figure 57 Consumers and market for bamboo products

More than three in five of these respondents have previously been trained on bamboo product design (such as from NGOs and government campaigns such as the 'Information, Education and Communication' campaign). Instead of exclusively receiving further training, the most frequently occurring support sought by this livelihood are better tools/machinery and improved access to raw materials. This would attend to the major production challenges bamboo craftspeople are facing. Finally, over 70% of the bamboo craftspeople express their desire to either receive help in marketing their products or having exhibitions with respect to improving sales.

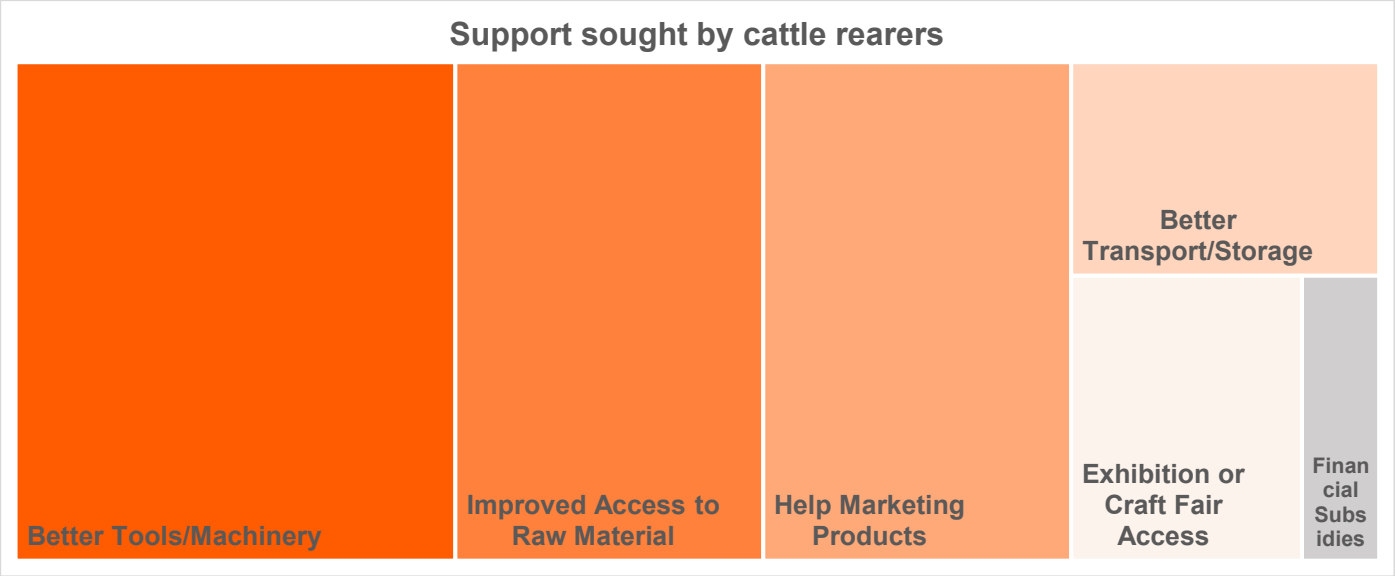


Figure 58 Support Sought by Bamboo Craftspeople.

13.4 Churmuri Bhatti

Key Facts

- A traditional occupation of Churmuri Bhatti (Dharwad) - Puffed Rice Processing
- Drying of wet rice takes place in public spaces - adjacent to both Herekeri Tank and a graveyard.
- Paid on the basis of number of “Cheelas” (sacks) dispatched to private sellers.

Climate-Led Livelihood Vulnerabilities

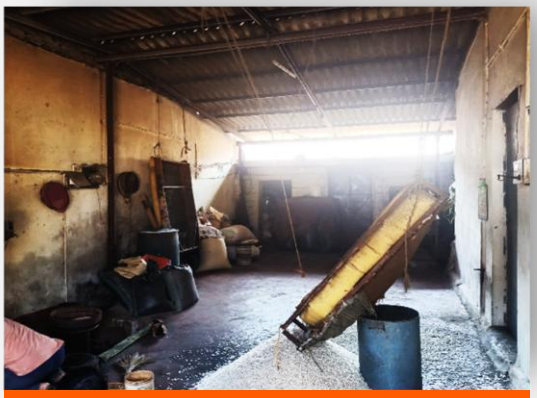
- Rudimentary machinery and arduous physical labour contributing to exhaustion, typically operate between 8:00 a.m. to 3:00 p.m. daily.
- Major Livelihood Challenges - flooding/inundation of homes during heavy rains, uncomfortable working conditions due to heat and poorly ventilated spaces.
- Primary Health Issues Faced - Asthma, Cold, Fever, respiratory illnesses due to exposure to heat and dust during production.

Barrier faced and the way forward

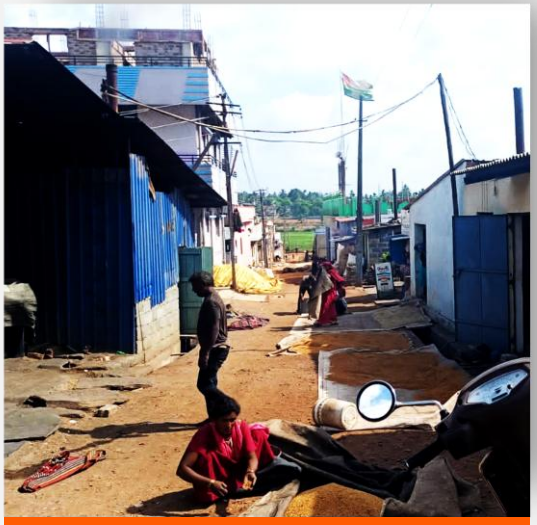
- Highest proportion of homes in ‘poor’ or ‘very poor’ condition relative to other surveyed settlements.
- Located adjacent to Herekeri Tank - ad-hoc informal & inadequate Sewerage.
- This livelihood seeks solar energy infrastructure to power fans and churmuri motors.

Problem statement

Suffering from poorly ventilated workspaces and waterlogging during monsoon, Churmuri Bhatti are one of the most financially vulnerable livelihoods in Huballi-Dharwad due to their alienated access to public facilities and poor residential conditions.



Churmuri Bhatti workspace with a tin-shed roof structure



Drying Rice on the Streets of Churmuri Bhatti

Churmuri Bhatti is a quarter century-old, dense settlement in Dharwad mostly comprising of SC, ST and Muslim communities. Currently about 150 households are settled near a graveyard, where the land is more affordable. 80% of the livelihoods surveyed in this region belonged to the namesake traditional occupation of *Churmuri Bhatti* (puffed rice processing), frequently operating as street vendors from the afternoon onwards after completing small-scale production.

The *bhatti* (processing unit) is located close to a landfill site. The rice (sourced from local mills) processing involves taking *bathha* (paddy), feeding it into a machine to separate the rice, and soaking the rice in water. Then, the production process includes roasting the rice on firewood or with the furnace, done after seasoning rice, oil and spices. The drying is done directly on the roadside, where dust levels are high due to poor infrastructure. Complaints have been raised against wet rice being laid out on the road by this livelihood. The government had previously mandated that *Churmuri Bhatti's* production be temporarily stopped due to these complaints, which caused great financial distress. As an alternative production space, the graveyard land south of the settlement is being used for drying rice.

13.4.1 Key livelihood related insights - Churmuri Bhatti

- All *Churmuri Bhatti* respondents express at least either 'longer heatwaves' and 'higher temperatures' occurring as a weather change from recent years.
- Over 80% of *Churmuri Bhatti* respondents cite observable monsoon-related climate changes ('intense downpours,' 'delayed monsoons,' 'reduced rain,' and 'greater humidity').
- Daily profits range between 200 - 300 INR.
- This livelihood uses firewood for roasting puffed rice and grid electricity for lighting, fans/coolers and the preparation process. 100% of *Churmuri Bhatti* have access to electricity from the grid, with close to 60% of respondents facing power cuts (up to three hours at a time) on either a daily or weekly basis.
- 33% of the survey respondents from this settlement live in homes that are in 'poor' or 'very poor' conditions, a higher proportion than any other surveyed slum in Hubballi-Dharwad.
- 100% of *Churmuri Bhatti* respondents are connected to the electricity grid, although power outages last less than three hours at a time. Regardless, each respondent reveals that power outages either reduce productivity or render machinery un-usable.
- The production spaces often have limited ventilation and lighting. Most buildings predominantly consist of rudimentary machinery that require upgrades.
- The workers typically operate from 8:00 a.m. to 3:00 p.m. and are under constant pressure to meet daily targets. They are paid based on the number of *cheelas* (puffed rice sacks) they can dispatch to private sellers. Otherwise, they themselves go as street vendors in the afternoon to receive their incomes.

13.4.2 Major issues emerging due to climate stressors in Churmuri Bhatti

- Homes are regularly waterlogged during monsoon, as ad-hoc sewerage created by residents exacerbate overflowing wastewater from Herekeri Tank onto the drying rice and into factory premises.
- Processing units often have mud floors, which get slippery and unsafe during rains. There is also contamination of rice stock due to damp conditions and poor sealing.

- Rainy weather completely halts production, as drying rice and roasting with firewood become impossible.
- Labourers have coated the churmuri furnaces with mud to cool the workspace, although the benefits of this coping mechanism are reducing as heat has risen in general.
- Firewood, essential to roasting the rice, has become more expensive due to deforestation — further straining margins. *Churmuri Bhatti* know that firewood is inefficient and polluting, but any other alternatives are too expensive.

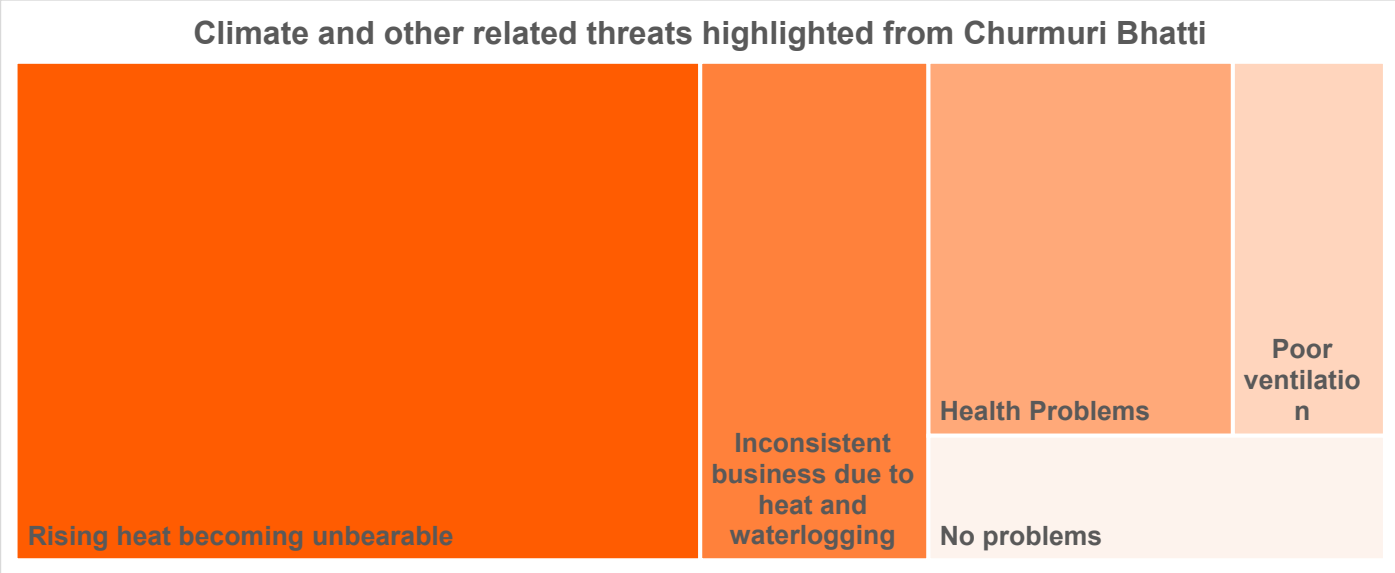


Figure 59 Climate-exacerbated Livelihood Challenges Faced by Churmuri Bhatt

- Structural damage to homes due to water intrusion during rains poses health risks too, as many residents suffer from asthma, cold and fever regularly.
- Workers face burns and breathing problems from exposure to firewood smoke.
- Dust and pollutants from a nearby plastic storage facility exacerbate respiratory illnesses, which this livelihood is exposed to during their daily work.

Figure 60 Workspace of Churmuri Bhatti with a mud-coated furnace (left); child labourers engaged in work inside the facility (right).

Churmuri Bhattis in HDMC are facing intense precarity both in their living conditions and earnings. To expand on the former, Churmuri Bhatti as a settlement adjacent to Herekeri Tank has faced great uncertainty in receiving basic amenities, occasionally in conflict with the government. During the development of the lake's park by the municipal corporation for example, a litigation issue arose

related to the lake and the settlement's drainage infrastructure. Since formal permission for adequate drainage facilities could not be obtained, some community members independently took a tender and began diverting the settlement's gutter water into the lake.

These ad-hoc independent solutions by settlement residents have exacerbated overflowing wastewater onto the drying rice and into the factory premises, impacting income levels. In addition to waterlogging and health challenges, the biggest issue cited by the respondents is rising heat; within which poor indoor ventilation also contributes greatly. The residents actively seek solar energy (as a source of electricity, powering fans and churmuri motors) in the settlement — towards improved working conditions and productivity in this traditional occupation.

13.5 Dhobis (Cloth Washing)

Key Facts

- A traditional occupation of women in Dhobi Ghat (Dharwad), mostly belonging to the Marata and Madiwala communities - laundry & cloth-washing services.
- One of the lowest-earning livelihood groups surveyed; monthly incomes almost 35% lower than the average.
- Clients in nearby settlements in Dharwad - Jannath Nagar, NTTF Area, within Dhobi Ghat.

Climate-Led Livelihood Vulnerabilities

- Water source for washing - one out of three wells available in settlement
- Dhobi Ghat - 'high heat vulnerability location' - rising temperatures/longer heatwaves widely cited.
- Major Livelihood Challenges - wells dry up during summer which inhibits washing to occur, waterlogging of homes disrupting washing and drying of clothes.
- Primary Health Issues Faced - eye irritation, throat and back pain due to factors such as heat and an 'increase in workload'.

Barriers Faced and the Way Forward

- This livelihood suffers from dual impact of heat and flooding/inundation.
- Three in five copes with rising water levels with sandbags, lack of formal instruments.
- Desire to commercialise laundry business - to reduce uncertainty and physical strain via financial subsidies for washing machines and ironing boards.

Problem statement

In Dhobi Ghat, Dhobis work increasingly long hours to cope with direct climate-led vulnerabilities — rising temperatures lower the water supply for washing clothes while flooding/inundation of homes in monsoon makes drying of clothes difficult.

Dhobis Washing Clothes in the Streets of Dhobi Ghat area

One of the wells in the Dhobi Ghat area used to fetch water for washing clothes

Dhobi Ghat (Dharwad) consists of about forty households, located adjacent to Herekeri Tank. As the name suggests, the predominant occupation within this settlement are *Dhobis* (cloth washers and laundry services), a caste and gendered tradition belonging to Hindu Marata and Madiwala women. Remaining male family members have broadly chosen to diversify into labor-intensive jobs such as construction work. The land was allocated by the government about two decades ago, whose residents relocated here for better access to water spaces and designated space for their livelihood.

In the early morning, *Dhobis* mostly visit houses and hotels in nearby areas, wash and iron clothes before returning them to the respective owners. For some others, nearby residents come and visit the *Dhobis'* house directly to receive their services. In terms of water sources for the community, they collectively ensure that their three wells are clean and well-kept, clearly separating the well for drinking water and the well for clothes washing. The ironing often takes place in public spaces such as streets, using coal. Broadly, *Dhobis'* clients come from surrounding settlements, such as Jannath Nagar, NTTF Industrial Area and within Dhobi Ghat itself.

13.5.1 Key climate-related and livelihood insights – Dhobis

- Dhobi Ghat is a 'high heat vulnerability location' — every survey respondent cited at least either one of 'higher temperatures' or 'longer heatwaves' as an observed climate change in recent years.
- *Dhobis* are one of the lowest-earning livelihood groups, who earn between 10 - 20 INR per garment. The monthly incomes at 8,750 INR are almost 35% lower than the average monthly surveyed income across all livelihoods
- All *Dhobis* mention that the major occupational challenge is an 'increase in workload' recently, which is related to other cited problems such as a decline in demand for their services driving lower prices for their services. This is associated with the spread of washing machines in the surrounding cityscape, while coal prices have been increasing too.

13.5.2 Major issues emerging due to climate stressors among the Dhobis

- Problems arising from heat include wells drying up during the summer, inhibiting cloth washing during these periods.
- 60% of surveyed responses in Dhobi Ghat cope with rising waterlogging of homes and streets by using sandbags, while the remaining members have no measures to cope. Waterlogging damages clothes and coal supplies.
- Physical strain is great on this livelihood whose labour is characterised by hand washing clothes outdoors under the sun — contributing to health issues such as eye irritation, blisters, skin infections, sore throats and back pain. Children also suffer from fatigue and fever during the summer.
- The use of coal for ironing in closed spaces adds to respiratory issues. Many report no access to medical insurance or regular treatment arising from poor public transport access inhibiting visits to hospitals.
- During the rainy season, minor fevers, mosquito bites, malaria, and dengue cases rise sharply.

Although this settlement is characterised by well-paved concrete internal roads and 80% pucca or semi-pucca homes, waterlogging of homes during heavy rains disrupts any laundry work that is possible during these times. Residents of Dhobi Ghat, therefore, suffer from not only relatively high

levels of heat but also high flood/inundation risk. This is a byproduct of natural drainage toward the Herekeri Tank and a high heat vulnerability score.

Overall, hotter summer months cause physical distress to *dhobis* such as body pain and blistering of skin. Monsoon meanwhile signals limited scope for washing and drying to take place due to flooding/inundation and humidity. The *dhobi* community desires to commercialise their laundry business, with the goal of alleviating the physical strain and production uncertainties associated with their livelihood. Respondents request subsidised loans to buy washing machines and ironing boards, therefore. Equally many are willing to receive training on home-based secondary income sources, such as roti, chutney and achar making. Considering the relatively low-income incomes of this livelihood, as well as aversion to undertaking more outdoor work under intense heat; these home-based sources of income offer a strong supplementary source of income to *dhobis* in HDMC.

13.6 Street Vendors

Key Facts

- Street vendors, mostly women, frequently sell vegetables on the roadside of local markets CBT Area in Dharwad, Jagadeesh Nagar, Kumbar Oni, Sadar Sofa and Jannath Nagar for Hubballi.
- Generally, purchases fruits and vegetables from wholesale (APMC) markets early in the morning.
- Livelihood earns about 25% less than the average surveyed income at 10,714 INR monthly, struggles with competition from well-resourced supermarkets.

Climate-Led Livelihood Vulnerabilities

- Selling on the street without any means to combat heat from the sun or rains. A few have installed umbrellas and overhead tarp to receive some respite from the elements.
- Major Livelihood Challenges - heavy rains bring waterlogging, blocking access to roads for pedestrians and vendors drastically reducing customer footfall and damaging carts and awnings. Perishables spoil due to humidity and heat.
- Primary Health Issues Faced - working past noon is physically strenuous for street vendors, many of whom suffer from heat-related fever and respiratory illnesses.

Barriers Faced and the Way Forward

- Daily labour is characterised by deep uncertainty whether vegetables perish/prices change, number of customers in market, threat of storms disrupting workspace and equipment.
- Seeking their own shops and/or better workspaces (more space, ventilation facilities etc.) to better manage climate vulnerabilities.

Problem statement

Regularly experiencing fluctuating prices for vegetables that spoil under extreme heat and rain, street vendors (predominantly from the CBT Area) have little means to cope with climate stressors that damage their workspaces and threaten income levels.

Street vendors in the CBT area—some with makeshift protection from heat, others directly exposed to the sun

Street Vendor with her Child in the CBT area

Street vendors surveyed, mostly women, frequently sell vegetables on the roadside of local small-scale markets. From the fourteen survey responses, nine come from the CBT Area (Dharwad), the rest in Hubballi from Jagadeesh Nagar, Kumbar Oni, Sadar Sofa and Jannath Nagar. Concerning the former, the CBT Area is centrally located, and historically has attracted street vendors and artisans due to the commercial nature of the bus terminal's surroundings. Muslim and Myadar families began settling in this area about seventy years ago to benefit from the proximity to this market. The remaining street vendors from Hubballi sell at smaller local markets or from their homes.

This livelihood generally purchases fruits and vegetables from wholesale (APMC) markets early in the morning, only one respondent cited that their products are homegrown. Finding shade is of the essence for street vendors, many of whom sit on the streets without any means to combat the sun or rain. A few have installed umbrellas and overhead tarp to receive some respite from the elements. Street vendors target households and food stalls, using simple machinery and weights to weigh the products. This livelihood regularly cites that work is becoming increasingly more physically strenuous and uncertain, which compounds with a general reduction in market activity causing income stress.

13.6.1 Key livelihood related insights – Street Vendors

- Over 90% of street vendor respondents express at least either 'longer heatwaves' and 'higher temperatures' occurring as a weather change from recent years.
- Close to 65% of this livelihood cite observable monsoon-related climate changes ('intense downpours,' 'delayed monsoons,' 'reduced rain,' 'more dry spells,' 'greater humidity').

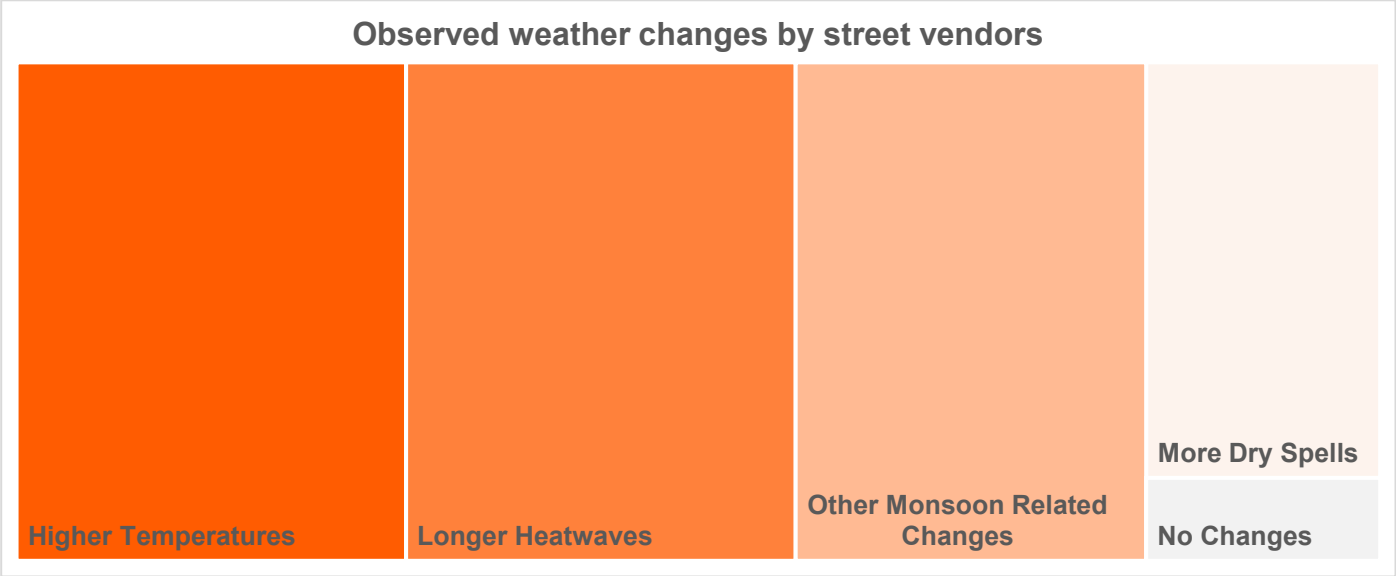


Figure 61 Observed weather changes by Street Vendors

- Vegetable traders operate within local lanes, making small daily profits of about 200 - 300 INR on average through negotiation and bargaining with customers.
- This livelihood earns about 25% less than the average surveyed income at 10,714 INR monthly, and suffers from competition with well-resourced supermarkets.
- Street vendors require lighting during evening sales - 100% use grid electricity for this purpose.

- General daily challenges include: high transportation costs (from wholesale market to vending areas), a lack of cold storage, and seasonal price fluctuations.

13.6.2 Major issues emerging due to climate stressors among the Dhobis

- Over 85% cite that their livelihood is negatively impacted by changes to weather conditions.
- The arrival of monsoon signals difficulties in conducting street vending, whose impacts are the most cited challenge faced. Heavy rains bring waterlogging, blocking access to roads for pedestrians and vendors — drastically reducing customer footfall. Moreover, many perishables are spoiled due to humidity, leaving sales particularly low during this period.
- Street vendors often lose their wooden carts and umbrellas in storms, reducing their capacity to operate during extreme weather.
- Rising heat and a lack of cool vending spaces are equally frequently cited as a climate-led livelihood challenge. Street vendors face significant losses in the heat, as vegetables (particularly tomatoes and greens) spoil quickly.
- Working past noon is physically strenuous for street vendors, many of whom suffer from heat-related fever and respiratory illnesses.

In sum, street vendors face major challenges to their livelihood from several angles. After purchasing price-volatile perishables from wholesale markets in the early morning, this group must travel quickly to their homes/markets to set-up for incoming customers. From this point on, a lack of certainty about steady income characterises their day. Perhaps customers choose to shop for vegetables from a supermarket, or heat damages the quality of products, or heavy rains flood the streets and damage carts as well as awnings. Like many other livelihoods in HDMC, the lack of resources, knowledge, or support systems causes these communities to only endure the impacts of climate stressors, rather than proactively adapt. These vendors fear that climate change and income levels will only worsen in the coming years. Over 70% of respondents cite seeking their own shops and/or better workspaces (more space, ventilation facilities etc.) to better manage climate vulnerabilities for this community.

Figure 62 Street Vendor’s vending lane in the CBT Area

13.7 Scrap Collectors

Key Facts

- All surveyed scrap collectors reside in Saraswatapura (Dharwad), many residents belong to the Chikkaligaru, Masalagar, Valmiki, Koravar, and Maratha communities.
- Typical workday — collecting recyclable materials like cardboard, plastic, and paper (from public spaces, household waste and construction sites), sorting them, and selling them to dealers for income.
- This livelihood earns about 33% less than the average surveyed income at 8,468 INR monthly, struggling from heat-related illness and damaged products due to outdoor work and rains.

Climate-Led Livelihood Vulnerabilities

- Saraswatapura — Highest share of kutcha houses (56%), all in poor or very poor condition—highlighting severe vulnerability in housing and low climate resilience at both home and work.
- Major Livelihood Challenges - Scrap materials become unsellable when wet due to lack of storage; monsoons damage goods and disrupt transport to dealers.
- Primary Health Issues Faced - Common problems include respiratory and water-borne diseases from damp, unhygienic conditions, along with heat-related illnesses from outdoor manual work.

Barriers Faced and the Way Forward

- Suffering from poor quality of kutcha homes where scrap is frequently stored and damaged (health and income issues) alongside difficulties in traversing, lack of safety gear and unreliable middlemen.
- Seeking access to better tools, training in safe handling and disposal of hazardous waste and safer/organised workspaces.

Problem statement

Picking scrap from the ground with barely any safety gear, this livelihood sells scrap at low rates. Monsoon is a particularly vulnerable time, damaging poorly stored scrap and waterlogging roads to prevent access to middlemen, rendering scrap collectors' wages unpredictable and exposing them to several health challenges.

A scrap collector's home in Saraswatapura

Outdoor storage space for scrap materials, exposed to rain and prone to damage.

All surveyed scrap collectors reside in Saraswatapura (Dharwad). This settlement has seen families residing here for about half a century. Housing was initially provided by the government before expanding to accommodate incoming migrants, home to about five thousand people today. Many residents come from the Chikkaligaru, Masalagar, Valmiki, Koravar, and Maratha communities, speaking a mix of languages such as Kannada, Telugu, Marathi, Hindi and the Chikkaligaru dialect.

Many surveyed scrap collectors have no formal education. A typical workday involves collecting recyclable materials like cardboard, plastic, and paper from within Saraswatapura and nearby neighbourhoods, sorting them, and selling them to dealers for income. These activities rely on basic resources like pushcarts, weighing scales, packaging materials and occasionally solar power when electricity is unreliable. The work is labor-intensive and highly dependent on weather conditions — extreme heat and rain significantly affecting productivity and income, when scrap collectors suffer from heat-related illness and damaged products respectively. Middlemen and dealers play a crucial role in the value chain by purchasing scrap and other goods from collectors and vendors, facilitating access to recycling centres and broader markets. However, limited storage space and inadequate infrastructure complicate the handling and safeguarding of materials, making the livelihood vulnerable to climatic and economic shocks.

13.7.1 Key livelihood related insights – Scrap Collectors

- 100% of scrap vendor respondents express at least either ‘longer heatwaves’ and ‘higher temperatures’ occurring as a weather change from recent years.
- General rates include scrap iron being sold at around 25 INR per kg, plastic at 7–8 INR per kg, and other materials at 8–9 INR per kg. This livelihood earns about 33% less than the average surveyed income at 8,468 INR monthly.
- Over 90% of collection of scrap (including hair) takes place at streets/public spaces and household waste. Construction Sites frequently occur too, with recycling centres less popular scrap collection locations. Only one surveyed scrap collector has a monthly fixed income, employed to collect at the SDM Hospital in Dharwad.
- More than half of scrap collectors do not have a dedicated storage space, instead relying on outdoor spaces in public which are susceptible to damage from rains, waterlogging and general unkemptness. During the rainy season, stagnant water around public scrap storage areas damages products and creates a breeding ground for mosquitoes. This has led to an increase in mosquito-borne illnesses such as dengue, malaria, and viral fevers.
- Saraswatapura has the highest surveyed proportion of homes as kutcha housing, at about 56%. All of these kutcha houses are deemed to be in either ‘poor’ or ‘very poor’ conditions, indicating high degrees of vulnerability in terms of dignified living spaces and resilience to climate change. Only 12.5% of surveyed homes were pucca, and just over a third were in either ‘good’ or ‘liveable’ condition. Some impacting factors include garbage collection occurring only once in ten days, causing waste to accumulate as well as traditional roofs (*hanchina mane)* which seep into houses and damage them during monsoon.
- General daily challenges include: difficulties in collection (often without any safety gear), inconsistent business, low profits and transportation issues.

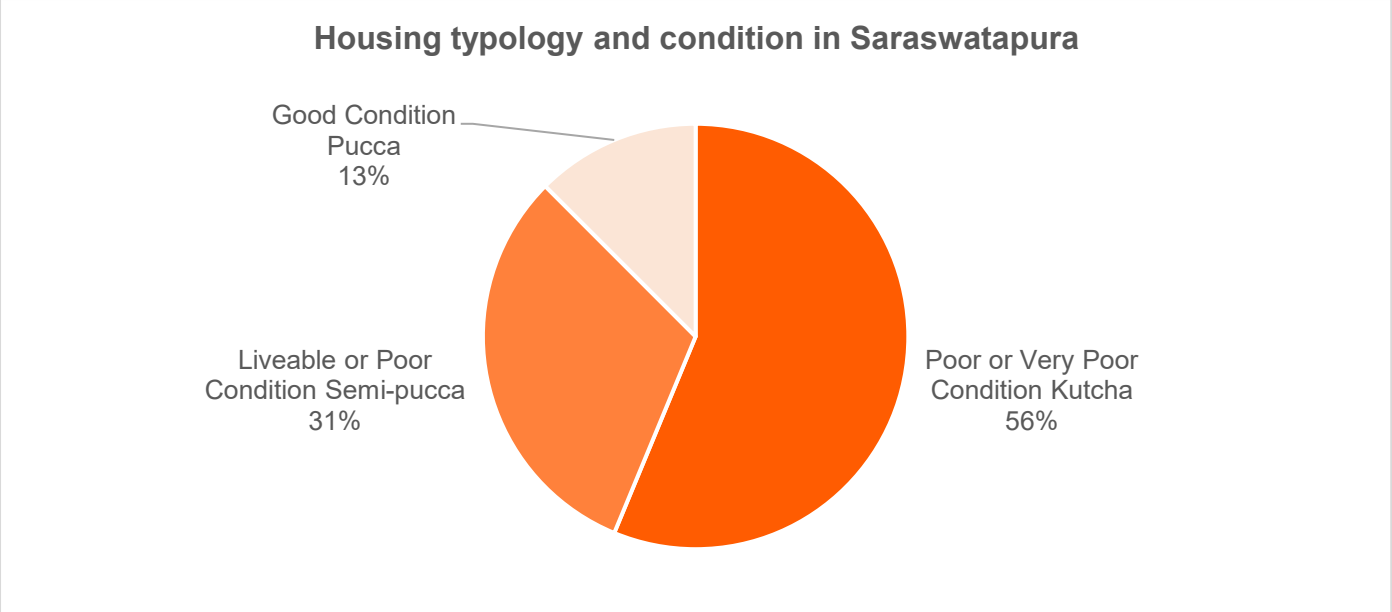


Figure 63 Housing typology and condition in Saraswatapura

Figure 64 Poorly made streets and temporary semi-pucca houses in Saraswatapura (left); wholesale intermediary scrap dealer shops in the same area (right)

13.7.2 Major issues emerging due to climate stressors among the Scrap Collectors

- More than 90% of respondents explain that incomes vary across the year, with monsoon months of June and July being the most cited as particularly devastating.
- Over 70% surveyed cite that the monsoon season negatively impacts scrap clollectors' livelihoods — regularly damaging materials, making storage difficult and hampering transportation abilities. When goods are damaged by the rain, they are unsellable to intermediaries. This issue is explained by a lack of measures to combat waterlogging at homes as well as a few dedicated storage facilities, with water seeping in — disrupting daily working routines and reducing income opportunities as repair costs rise and selling opportunities reduce.

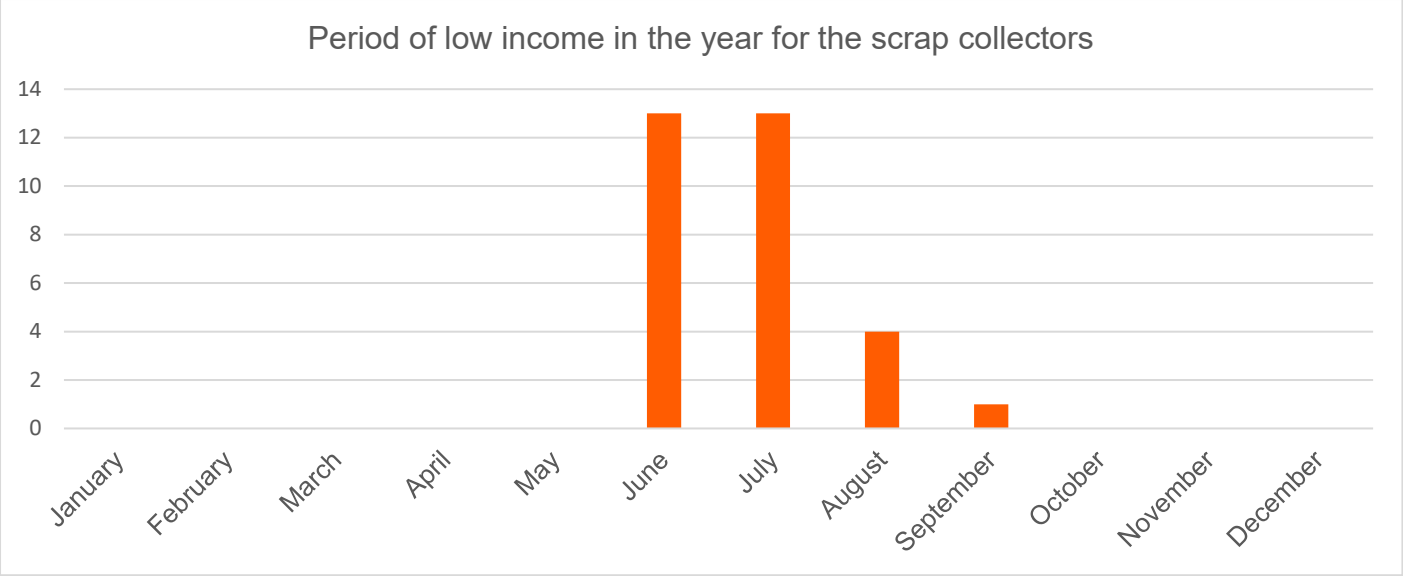


Figure 65 Months of the year when scrap collectors have low-income earnings

- Close to 80% reveal that they have faced a loss of income/customers/damage to products directly due to climate change.
- Respiratory issues frequently occur among scrap vendors as cited by over 85% of scrap collectors, emerging from damp and unhygienic working conditions.
- As this livelihood is predominantly manual work done outdoors for hours at a time, they too frequently face heat-related illnesses such as headaches, dizziness and dehydration.
- After heavy rains and flooding, mosquito-borne diseases like dengue and malaria have become more common due to stagnant water around homes and work areas.
- To manage these health risks, people try to avoid working during the hottest parts of the day or use simple protective measures, but access to proper healthcare remains limited, affecting their overall well-being and livelihood stability.

Scrap collectors in Dharwad are highly vulnerable populations to climate-exacerbated livelihood vulnerabilities. Not only are the quality of their homes relatively poor, their income levels are extremely low. Monsoon rains destroy scrap, make traversing by feet even more difficult and worsen sanitary conditions of the scrap that must be picked up by rudimentary tools/by hand. Transportation of scrap and other products to markets is frequently delayed or disrupted due to poor road conditions caused by floods and storms, limiting access to buyers and leading to financial losses. Considering this, all surveyed scrap collectors seek access to better tools and financial support/micro loans to improve working conditions. Next, training in safe handling and disposal of hazardous waste as well as improved transportation options (such as the provision and training with vehicles) are widely sought by about 80% of respondents. Finally, over half expressed a desire for a safer/organised workspace alongside health and safety support. This reveals the multifaceted challenges faced by these members of this livelihood, poor working conditions and unsanitary living spaces have a compounding effect on increased vulnerabilities due to climate stressors and informal livelihood opportunities.

14. Key concerns and Conclusions on Livelihoods

Field engagements provided critical insights into how existing challenges—particularly the lack of and limited access to basic services, informal livelihoods, and secure employment—are being worsened by climate change. While the primary focus is on seven specific livelihoods, issues such as income and health instability extend beyond these groups, also affecting others who, though not surveyed in detail, contributed valuable perspectives (as given below). The key findings from the broader set of surveyed and interviewed participants are summarized following that.

14.1 Remaining Livelihoods - Background and Insights

The survey captured sixteen different livelihood categories, most of which are either at-risk traditional occupations (bamboo craftspeople and *Beedi work* for example) or are informal occupations serving the emerging urban fabric (such as construction and domestic work). Mentioned below are a few other livelihoods that fall under the criteria of facing fragmentation of opportunities due to climate change impacts.

14.1.1 Auto Drivers

Auto drivers begin their days as early as 6:00 a.m., working long hours throughout the day. Regular customers are students and office-going workers. They rely on daily fuel purchases and vehicle maintenance, but rising fuel prices and a lack of credit for repairs strain their income. Climatic impacts of heat and flooding/inundation prevail for this livelihood too. During scorching heat in the afternoon, most are unwilling to work due to the physical strain. Health issues such as respiratory ones, from traffic-related pollution, get compounded by the heat. Heavy rains bring waterlogging of roads (many already have potholes and damage), reducing customer footfall and mobility around the city. Many also cited the Shakti Yojane scheme as a leading reason for a decline in demand for their services. Almost 60% of surveyed auto drivers are willing to undertake home-based business training, to reduce regular outdoor exposure to heat and rains as well as to have an alternative income source.

14.1.2 Beedi Workers

Women in informal settlements across Hubballi engage in *Beedi work.* The women are supplied materials by contractors and paid per thousand *beedis* rolled. They generally earn about 150 - 200 INR daily by rolling *beedis* from home. This livelihood often faces exploitation through wage deductions for so-called “low quality” and suffer from health hazards like chronic cough and eye irritation due to prolonged exposure to tobacco dust. The contractors control the supply and market access, leaving this livelihood particularly vulnerable. Climate-related challenges include humidity spoiling tobacco leaves, affecting the quality and marketability of their products. All surveyed beedi workers cited low/unfair wages as a major livelihood issue, who are actively seeking comfortable workspaces and less income uncertainty.

14.1.3 Domestic Workers

Domestic work is a primary occupation for many women, which includes cleaning, cooking and caregiving in nearby households. Many women formerly partaking in traditional occupations have transitioned to this livelihood, such as Myadars (bamboo craftspeople) due to a lack of income opportunities. Laxmisinganakeri and Jagadeesh Nagar residents are also actively involved in this

informal, low-paying livelihood which offers minimal social security. Work in neighbouring middle-class neighbourhoods is found through word-of-mouth. They work long hours through the early morning to late evening, while others end in the early afternoon to instead undertake caretaking activities at home. In general, domestic workers earn about 2,000 - 4,000 INR monthly on a per household basis. From a climate perspective, long hours with neither proper rest nor well-ventilated workspaces contributes to high levels of exhaustion and weakness. Jobs are lost too, when employers relocate or cut-back during extreme events. Within the domestic workers' residences too, those living in low-lying areas face water entering their homes, causing temporary relocation and absenteeism that disrupts income stability. This livelihood seeks improved financial literacy through self-help groups, support during emergencies and fixed wages to reduce income and health uncertainties.

14.2 Livelihood study's takeaways: Highlights

Gender and Livelihoods

- Livelihoods remain **highly gendered**: many **women continue in traditional jobs** while **men shift to newer urban roles** like construction work or auto driving.
- Livelihoods like **Dhobis, bamboo craft, and Beedi work are dominated by women**, reflecting both tradition and economic need.
- **Cattle rearing and Churmuri Bhatti** involve participation from **both men and women**, offering potential investigation for more inclusive livelihoods.

➔ Promote **gender-responsive livelihood development**—support women in traditional roles while also enabling access to **newer income opportunities** through training and inclusive infrastructure.

Education

- The most common education level among respondents is **'no formal education' (42%)**.
- Over half have studied between **1st and 12th standard**, but only **2% have attended college**, limiting access to formal jobs due to perceived low skills.
- Encouragingly, respondents report that **about one-third of their children are likely to complete college**, while many will at least complete 12th standard.
- Those who did not pursue further studies often cite **financial issues**, **lack of interest**, or **early marriage (especially of daughters)** as the main reasons.

➔ Expand access to **education support and scholarships**, especially for girls and low-income families, to help **break cycles of limited opportunity and enable entry into skilled or formal work**.

Housing and Infrastructure

- **90% of homes are pucca or semi-pucca**, but **around 20%** (among the semi pucca and kutcha) **report living in homes of 'poor' or 'very poor' condition**—with **Saraswatapura** having the highest proportion.
- Across all areas, residents experience **regular disruptions from heat and flooding**—which damage homes, belongings, and affect work.
- These challenges are worsened by **poor healthcare access**, especially due to **limited public transport** to hospitals in most areas, apart from the CBT.
- Some settlements with more pucca homes (like **Gauli Galli and Kumbar Oni**) show a **willingness to install solar panels.** However, the **feasibility and effectiveness of solar energy, along with its integration into other energy sources used in livelihood activities.**

➡ Prioritize **housing upgrades, drainage improvement**, and **basic services like transport and health access.**

Income and Livelihoods

- Out of all livelihoods studied, **Dhobis have the lowest monthly household incomes (~INR 8,750)**, while **cattle rearers report the highest (~INR 25,425)**.
- However, **cattle rearers spend about a maximum share of their earnings on production costs**, leaving them financially stressed despite higher incomes.
- As a general pattern, informal livelihoods in **Hubballi-Dharwad earn between INR 100 – 400 per day**.
- Around 75% of people earn low incomes, while few earn above INR 15,000/month—**showing income gaps across livelihoods and a clear potential to boost earnings with targeted support**.

➡ Support informal livelihoods—both those with high running costs and those facing income volatility and low wages—through **cost-reduction measures, improved access to inputs, and stronger market linkages** to enhance net income and economic stability.

Climate Stress and Livelihoods

- Around **95% of respondents report noticeable weather changes**, especially **longer heatwaves and higher temperatures**.
- More than one-third also report **more intense and unpredictable rains**, including rising humidity.
- Although indoor and outdoor temperatures fall within the general range of thermal comfort, responses indicate that **many people—especially from marginalized communities—are already experiencing significant heat stress**.
- This highlights two critical concerns: **first, the disproportionate impact on vulnerable populations with limited coping mechanisms; and second, a warning for the future**, given the projected rise in maximum temperatures in Dharwad district and the heightened risks for these communities.
- Every type of livelihood—whether **indoor-outdoor (like Dhobis, Churmuri Bhatti)** or **fully outdoor (like construction, cattle rearing)**—is affected by heat.
- **Construction workers**, in particular, face serious challenges due to **lack of shaded areas and heat-resilient gear**, making their work environments unbearable.
- At present, **coping mechanisms within the community are limited**. Common responses—such as using fans or coolers for heat and sandbags for flooding—**reflect a lack of more sustainable and robust adaptation solutions.**

➡ Promote **climate-resilient work and community environments** through **shade, flexible hours, cooling stations, and protective gear**, along with **better drainage, affordable cooling, and climate preparedness training**.

Energy Access

- Most surveyed households have access to **grid electricity and LPG** for daily use.
- **Power cuts still affect around 20% of households**, sometimes lasting up to **three hours**, reducing productivity, especially for home-based workers.
- Many respondents find **electricity expensive**, and some still use **firewood or coal** alongside LPG—especially in Churmuri Bhatti, Saraswatapura, and Laxmisinganakeri.

➡ Improve **grid reliability and reduce energy costs** where possible, especially for supporting livelihoods.

Access to Government Schemes

- Nearly **1 in 5 respondents have never accessed any government schemes**.
- A common perception is that **only those with political connections** benefit from these programs.
- Despite this, **Ayushman Bharat (60%)** and **MGNREGA (33%)** are the most commonly used schemes, showing that healthcare and wage support are critical.
- Notably, **the use of MGNREGA—typically a rural program—by urban informal workers suggests past or ongoing reliance**, pointing to **a continued need for similar support in urban contexts**. This underscores the importance of **better awareness and provision of urban schemes tailored to informal livelihoods**.

➔ Strengthen **community outreach and transparency** around schemes to ensure **equitable access**, especially for vulnerable and politically disconnected groups.

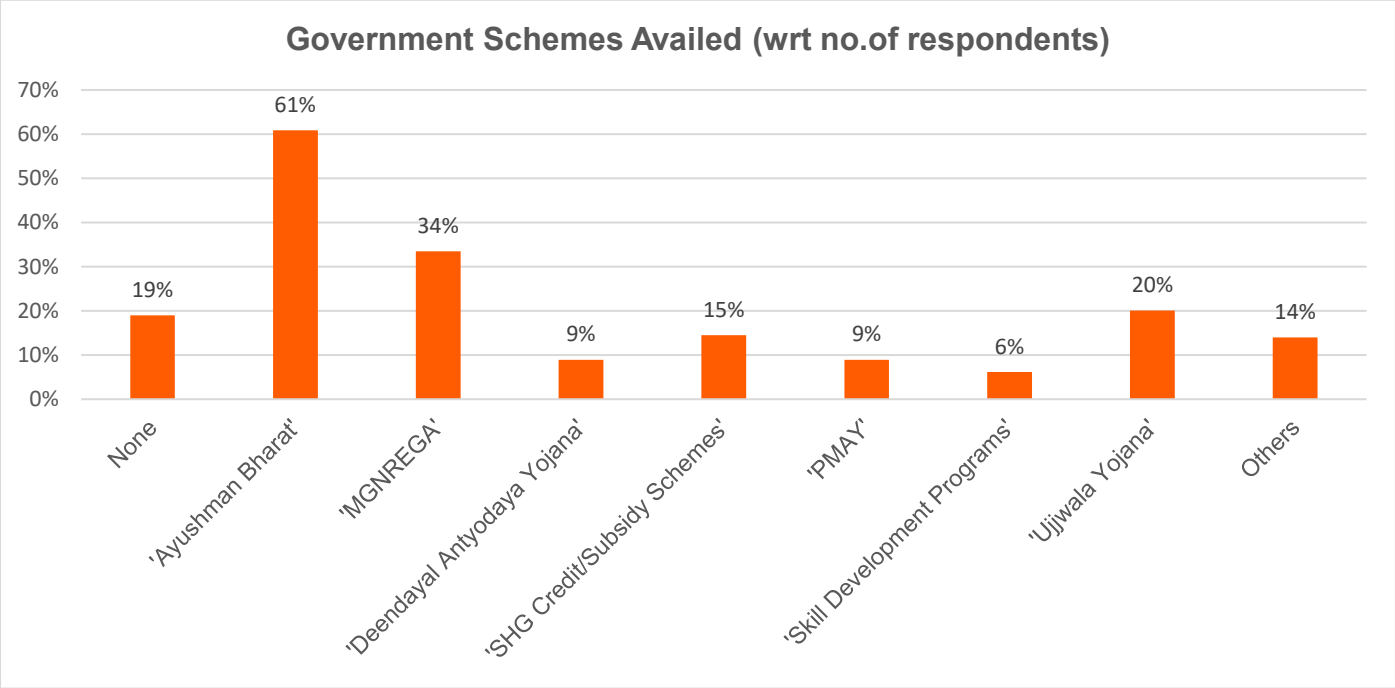


Figure 66 Government schemes availed by respondents across different livelihoods

14.3 Key Concerns and Potential Interventions for Major Livelihoods

The remainder of the conclusion will focus on key concerns faced and potential support to be provided to the major livelihoods, represented as a table. Further contextualisation about these findings will be mentioned after the table:

Table 20 Specific challenges and potential support for different livelihoods

Sno.	Livelihood	Specific Challenges	Potential Support (Short term, and medium term)	Key Stakeholder to involve
Key Concern: Lack of Climate-resilient Services				

1	Construction Workers	▪ Injuries sustained during work because of slippery construction sites with poor drainage and safety gear ▪ Extreme, constant exposure to heat outdoors without shade	▪ Designated shaded rest areas ▪ Provision of heat-protection gear and ensuring access to water/hydration	▪ Developers ▪ NGOs' advocacy ▪ Mandate on shaded working areas at construction sites across HDMC (Arvind Bellad, MLA)
2	Cattle Rearers	▪ Water scarcity and lack of nearby health infrastructure (Gauli Galli) ▪ Grazing and washing of cattle takes place outdoors, walking far distances	▪ Solar-powered water pumps for cattle ▪ Better shaded/organised shed facilities for cattle	▪ Gauli Galli community itself ▪ NGOs' feasibility studies of solar energy (pre-implementation) ▪ Slum Board redevelopments (Mr. Praveen, AEE)
3	Bamboo Craftspeople	▪ Lack of storage facilities enabling humidity and waterlogging to destroy products ▪ Open sheds collapsing during extreme weather events	▪ Protective community storage sheds for bamboo raw materials and products	▪ NGOs' advocacy ▪ Slum Board intervention in CBT Area (Mr. Praveen, AEE)
4	*Dhobis*	▪ Summer dries wells used for cloth washing ▪ Waterlogging of homes and humidity impacting drying of clothes	▪ Recharge and refurbishment of community wells and ground water table ▪ Dedicated washing stations that are not prone to waterlogging ▪ Financial subsidies for washing machines and modern *istaris* (irons)	▪ NGOs' advocacy and provision of subsidies ▪ Community itself, who maintain wells ▪ Guidelines from government on the need to refurbish ground water tables in Dhobi Ghat
5	*Churmuri Bhatti*	▪ Informal sewerage overflowing onto workspaces, impacting drying of rice in public spaces ▪ Poor quality housing trapping heat indoors, leading to uncomfortable working conditions	▪ Adequate water supply for washing and cleaning rice ▪ Providing elevated and shaded drying platforms for rice ▪ Upgrading of outdated machinery	▪ NGOs' advocacy and introduction of modern technology ▪ Government providing improved sewerage facilities (Ms. Jyothi Patil, Corporator)
6	Street Vendors	▪ Lack of shade at workspace ▪ Informal shade efforts (umbrellas, tarp) are vulnerable to damage during extreme storms	▪ Distributing more resilient vendor umbrellas to cope with heat and extreme weather events ▪ Insurance against perishing of products and vending space during extreme weather events	▪ NGOs providing resilient vendor umbrellas, advocating for perishable commodities' insurance
7	Scrap Collectors	▪ Traditional roofing/poor quality homes vulnerable to flooding, impacting health conditions and storage of scrap	▪ Creating community storage sheds for sorting and storing scrap that does not face rain damage ▪ Transition to pucca housing	▪ NGOs' advocacy ▪ Slum Board intervention to pucca housing in Saraswatapura (Mr. Praveen, AEE)
Key Concern: Supply-side Constraints due to Climate Change				
1	Construction Workers	▪ High levels of job unavailability during	▪ Creating formal networks of information	▪ Developers

		monsoon months — much fewer/delayed construction projects due to rains	about job availabilities to reduce dependence on contractors	▪ NGOs mapping out and disseminating key stakeholders when finding jobs ▪ Community itself, who do they speak to for jobs etc.
2	Cattle Rearers	▪ More heatwaves and higher temperatures reducing milk yield from cattle, more cattle diseases ▪ Increasingly distant grazing lands and lakes, more frequent purchases from market increasing production costs	▪ Providing cooling/storage facilities for dairy products ▪ Regular veterinary check-ups for cattle ▪ Solar water pumps to wash cattle and dispose waste	▪ NGOs' feasibility studies of solar energy (pre-implementation) ▪ Slum Board redevelopments (Mr. Praveen, AEE)
3	Bamboo Craftspeople	▪ Reduced bamboo supply during monsoon, excessive reliance on contractors	▪ Financial Subsidies for raw materials ▪ Support mechanisation of livelihood	▪ NGOs' advocacy and provision of subsidies
4	*Dhobis*	▪ Wells dry up in summer months ▪ Coal prices have been increasing	▪ Ensure consistent access to coal before mechanisation takes place (electric istaris, washing machines) ▪ Support mechanisation of livelihood	▪ NGOs advocacy and ensuring access to coal
5	*Churmuri Bhatti*	▪ Frequent electricity shortages inhibiting ability to work during the day ▪ Government occasionally mandating to stop production	▪ Solar-powered fans and machinery for improved ventilation indoors and reduced dependence on grid electricity	▪ NGOs' feasibility studies of solar energy (pre-implementation) ▪ Slum Board redevelopments (Mr. Praveen, AEE)
6	Street Vendors	▪ Increasing cost of vegetables on the market	▪ Financial subsidies for purchase of vegetables ▪ Better storage facilities for vegetables at home (allowing bulk purchases)	▪ NGOs' provision of subsidies and advocacy of dedicated storage ▪ Slum Board intervention in CBT Area (Mr. Praveen, AEE)
7	Scrap Collectors	▪ Reliance on middlemen and dealers to pick up scrap, irregular visits due to poor condition of roads	▪ Urging maintenance of roads and managing flooding/inundation risks to make Saraswatapura more accessible to middlemen year-round	▪ NGOs' advocacy ▪ Slum Board intervention in Saraswatapura (Mr. Praveen, AEE and Ms. Jyothi Patil, Corporator)
Key Concern: Non-existent/Inadequate Responses to Climate Stressors				
1	Construction Workers	▪ Only rarely or occasionally take breaks despite facing health issues after exposure to heavy rains and extreme heat	▪ Flexible work to cooler hours (night/early morning) ▪ Improving access to safety gear, first aid and accident insurance	▪ Developers ▪ NGOs' advocacy and provision of basic safety gear ▪ Mandate on shaded working areas at construction sites across HDMC (Mr. Arvind Bellad, MLA)

2	Cattle Rearers	▪ Poor waste disposal facilities (driven by water scarcity) causing cow dung to be mixed directly with water into sewers	▪ Awareness campaign on waste disposal methods	▪ NGOs in collaboration with the Gauli community
3	Bamboo Craftspeople	▪ Storage of raw materials and products at home and public spaces getting waterlogged, impacting production for months	▪ Raised community sheds for bamboo storage	▪ NGOs' advocacy ▪ Slum Board intervention in CBT Area (Mr. Praveen, AEE)
4	*Dhobis*	▪ Waterlogging of homes making drying of clothes difficult ▪ Working outdoors directly under heat ▪ Inaccessible public hospitals, poor public transport facilities during climate-induced health problems	▪ Urging maintenance of roads and managing flooding/inundation risks in Dhobi Ghat	▪ NGOs' advocacy ▪ Slum Board intervention in Dhobi Ghat (Mr. Praveen, AEE and Ms. Jyothi Patil, Corporator)
5	*Churmuri Bhatti*	▪ Drying of rice in public spaces getting flooded/interrupted by vehicles ▪ Inaccessible public hospitals, poor public transport facilities during climate-induced health problems	▪ Formal sewerage system to reduce flooding ▪ Dedicated rice drying spaces ▪ Alternatives to firewood during puffed rice making, such as biogas and solar energy	▪ NGOs' advocacy and feasibility studies of biogas/solar energy in Churmuri Bhatti (pre-implementation) ▪ Slum Board intervention in Churmuri Bhatti (Mr. Praveen, AEE and Ms. Jyothi Patil, Corporator)
6	Street Vendors	▪ Coping mechanisms of umbrellas, tarped roofs frequently get damaged and destroyed	▪ Providing more resilient shade infrastructure	▪ NGOs' regular checking up on climate resilience of shade infrastructure
7	Scrap Collectors	▪ Trying to cover scrap with plastic sheets or relocate materials to safer spots during rains	▪ Creating elevated storage spaces and rain-resilient storage sacks	▪ NGOs' advocacy ▪ Slum Board intervention in Saraswatapura (Mr. Praveen, AEE)

For almost all the surveyed households, a **lack of climate-resilient infrastructure** is forcing individuals to resort to short-term coping mechanisms that inhibit income opportunities and health conditions. Cattle rearers in Gauli Galli, for one, no longer reap the benefits of nearby grazing land. Instead, now cows and bulls are kept on the streets, drains filled with cow dung overflow and prices of cattle-related products are low. Water scarcity is a major issue for residents here, even though the settlement should receive water throughout the day. Like many other traditional occupations in Hubballi-Dharwad, poor infrastructure facilities actively undermine income-earning opportunities. For cattle rearers, water scarcity and poor drainage impacts the health of the cattle. Meanwhile, bamboo craftspeople, *Churmuri Bhatti, dhobis* and street vendors all face intense heat conditions and waterlogging in their workspaces. Households and workers mostly rely on informal coping solutions (sandbags, makeshift overhead tarp, short-term migration), which are, at best, only temporarily effective. For the most part, despite these efforts, heat and flooding/inundation risks impact the quality and storage of products that they are selling. Popular alternative livelihoods emerging due to a lack of opportunities in traditional occupations is domestic work and construction labour. However, these livelihoods too face regular disruptions to work opportunities (such as monsoons stopping projects) and physical strain in their occupations owing to manual labour.

From a health perspective, across the livelihoods — waterborne diseases, respiratory illnesses, and heat-related ailments are common. This is driven by lack of inadequate access to basic services, mainly sanitation and inadequate solid waste management. The illnesses are further exacerbated by water stagnation, and prolonged exposure to high temperatures. As established, drainage systems are often clogged or absent, leading to frequent flooding. Damaged and poorly maintained roads hinder mobility and market access, particularly during monsoons. Although most households have access to grid electricity and LPG, slum settlements overall do not find basic services and public infrastructure to be adaptive to frequently cited changes to the weather such as increased temperatures and unpredictable monsoons.

The next key concern common to all livelihoods are **supply-side constraints emerging due to climate change.** This issue manifests itself in a variety of ways for each livelihood individually. For traditional livelihoods, climate stressors reduce supply of raw materials necessary towards the final goods sold on the market. Cattle rearers see milk production drop due to cattle diseases emerging from hotter conditions, lack of sanitary conditions in Gauli Galli and water scarcity. Meanwhile, bamboo craftspeople and street vendors find that the cost of their respective raw materials have risen significantly; mostly due to the erratic nature of rainfall in recent years. These groups rely on local wholesale markets and contractors to procure their materials, now becoming more unreliable and expensive. Meanwhile, *Churmuri Bhatti* and *dhobis* face waterlogging and hot working conditions near Herekeri Tank. These processes make wells dry up as well as make drying of clothes and rice more difficult, to which these livelihoods do not have the capacity or tools to maintain production levels. Intermediaries rarely visit Saraswatapura to pick up scrap during monsoon as roads become difficult to navigate, meaning that scrap collectors have nobody to sell to during these months. Finally, construction workers see that jobs reduce dramatically during monsoon months, where contractors delay projects and cancel contracts at short notice.

Importantly, evidence from this primary survey reveals that **current responses to climate stressors in informal settlements are either non-existent or highly inadequate.** Despite facing frequent disruptions arising from intense heat, storms, and waterlogging; livelihoods continue to work through adverse weather simply because there are no alternative job opportunities available. They have not greatly modified their working methods or implemented new strategies to cope with extreme weather events. The informal coping mechanisms to climate stressors help, but are becoming increasingly strained. For example, mud-coated furnaces done by *Churmuri Bhatti* attempts to cool the workspace; but the most frequently cited challenge of this livelihood is ‘rising heat’ due to poor ventilation and the area’s vulnerability to heat. Similarly, most coping mechanisms lack the resilience to be a sustainable response to rising heat levels and rains that are increasingly unpredictable.

To protect these communities, there is an urgent need for long-term coping and adaptation measures. This includes weather-resilient infrastructure like permanently shaded markets and storage spaces, alternative livelihood training to diversify income, social protection schemes to compensate for climate-induced work loss, and sustainable water and energy solutions like rainwater harvesting and solar-powered tools. Without timely intervention, the livelihoods of Hubballi-Dharwad’s urban poor may become unsustainable, pushing already marginalized families further into poverty.

14.4 Study Conclusion

This study set out to assess how climate stressors exacerbate livelihood challenges among the urban poor in Hubballi-Dharwad by identifying vulnerable geographies, mapping their risks, and analyzing the intersection of traditional and evolving livelihoods under changing climatic and urban conditions. Using a three-stage approach—beginning with vulnerability mapping, followed by direct community engagement and ending with the synthesis of livelihood challenges—the research offered a detailed understanding of how climate risks and socio-economic stressors intersect in slum settlements across the city.

Hubballi-Dharwad presents an important urban landscape in the north Karnataka. It is home to both historic slums that have existed for decades and newer ones emerging rapidly, largely driven by migration from North Karnataka and other northern states. Its strategic location and expanding urban economy make it a major location for in-migration. As a result, the city is witnessing an evolving slum typology—where traditional, long-established settlements coexist with newly forming ones. At the same time, the landscape of these slums is also changing, owing to infrastructural improvements, housing interventions through schemes like PMAY, and recent efforts by the Karnataka Slum Development Board to provide land tenure rights to long-time slum dwellers. Consultations with local representatives confirms that many slums have seen upgrades in roads, drainage, water access, and even housing conditions—placing the city on a track of progressive slum development.

However, while climate risks in Hubballi-Dharwad may not be as extreme as in some surrounding districts, the city has already begun to experience significant climate-related disruptions—particularly in the form of flooding, inundation, and rising heat stress. These risks disproportionately affect the urban poor, particularly those residing in low-lying, congested, and informally planned slum areas. These risks, if not addressed through comprehensive planning, threaten to compound existing vulnerabilities and undo the gains made through infrastructure and housing initiatives.

Given these conditions, the need for livelihood-sensitive climate action is critical. As migration continues to increase and climate impacts worsen, traditional and informal livelihoods—often the only source of income for slum residents—are becoming increasingly fragile. This is especially true for communities like the dhobis, bamboo craftsmen, and Churmuri makers, whose occupations are deeply rooted in tradition but lack institutional and market support. As highlighted in consultations with local social experts, these livelihoods face existential threats, not just due to climate stress but also due to urban transformation and a lack of integration with modern economic systems. These occupations are perishable—not only in terms of economic viability but also in cultural continuity—unless timely, context-sensitive interventions are made. In contrast, other livelihoods such as construction work, though physically demanding and climate-exposed, can show greater adaptability and income-generating potential, especially when supported by infrastructure development, skill-based opportunities and protection from the climate risks.

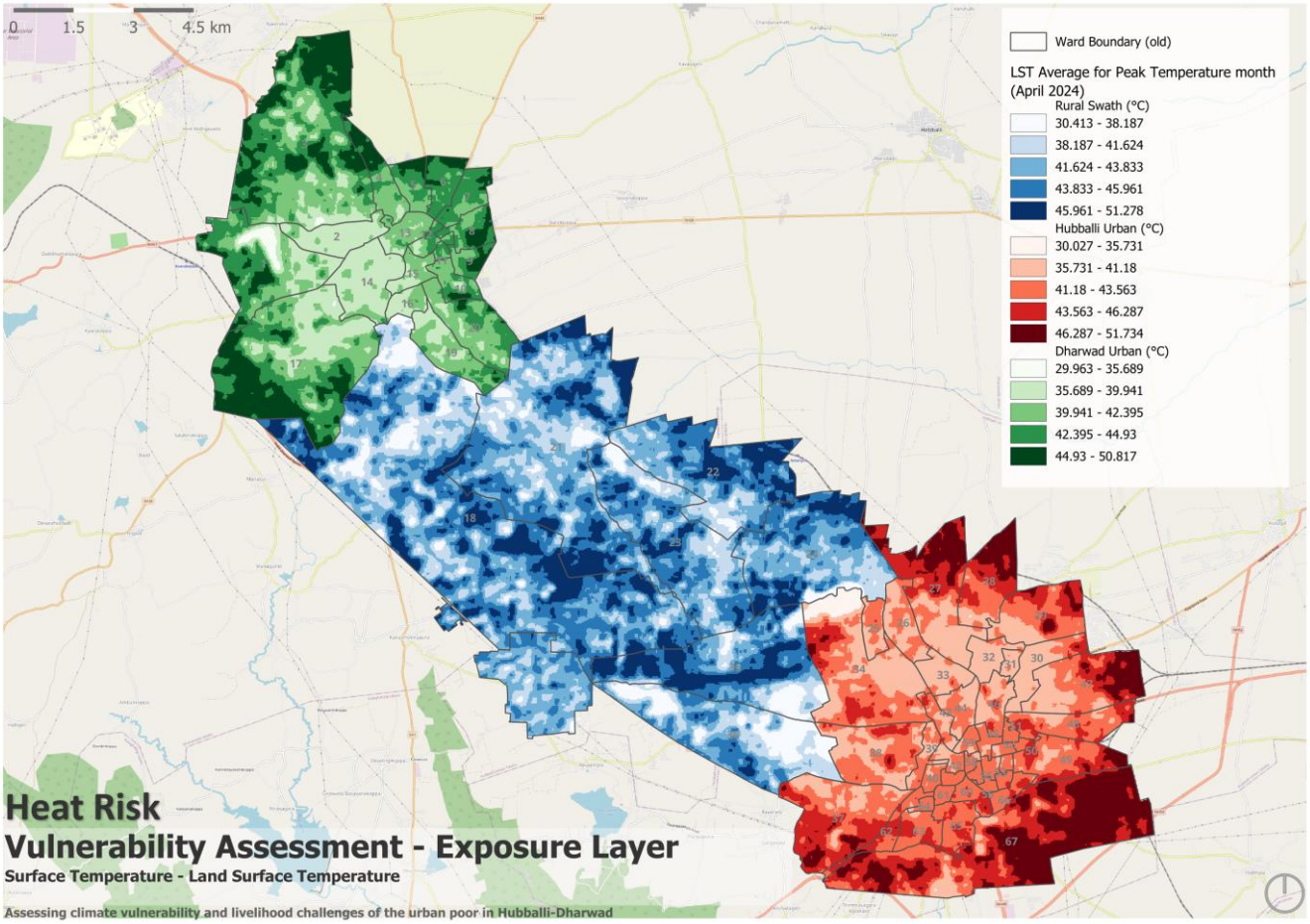
In sum, the resilience of Hubballi-Dharwad's slum communities depends not only on physical upgradation but also on targeted support for climate-adaptive livelihoods. Going forward, slum development strategies must take into account the dual pressures of urban expansion and climate change. A livelihood-centered approach that combines secure housing, legal tenure, access to education and healthcare, and sustainable income-generation—especially for traditional and

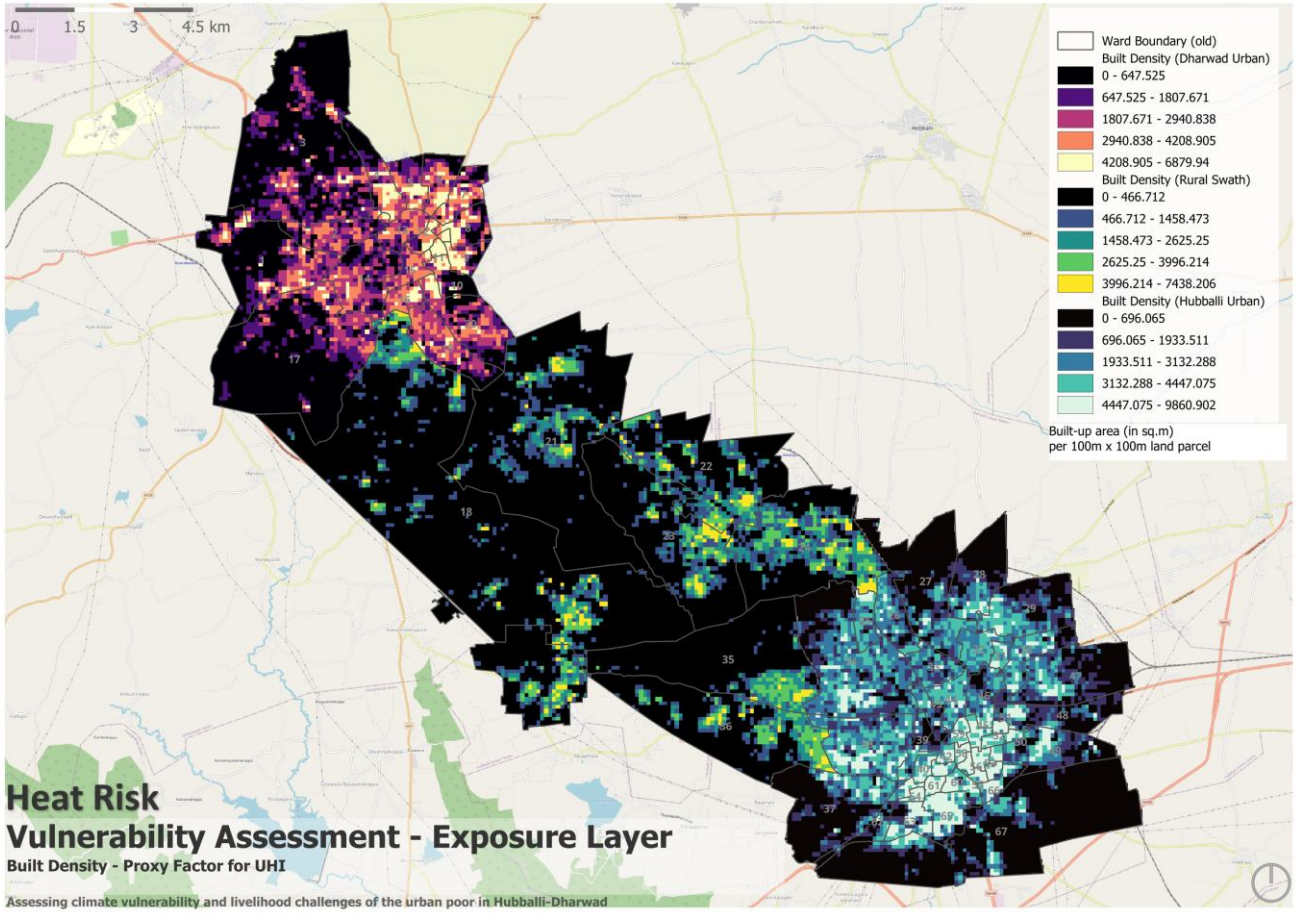
vulnerable occupations—is essential to ensure that the urban poor are not left behind in the city's development trajectory. Without this, Hubballi-Dharwad risks widening socio-economic gaps and facing an urban crisis that could become unmanageable in the face of rising climate risks and continued in-migration.

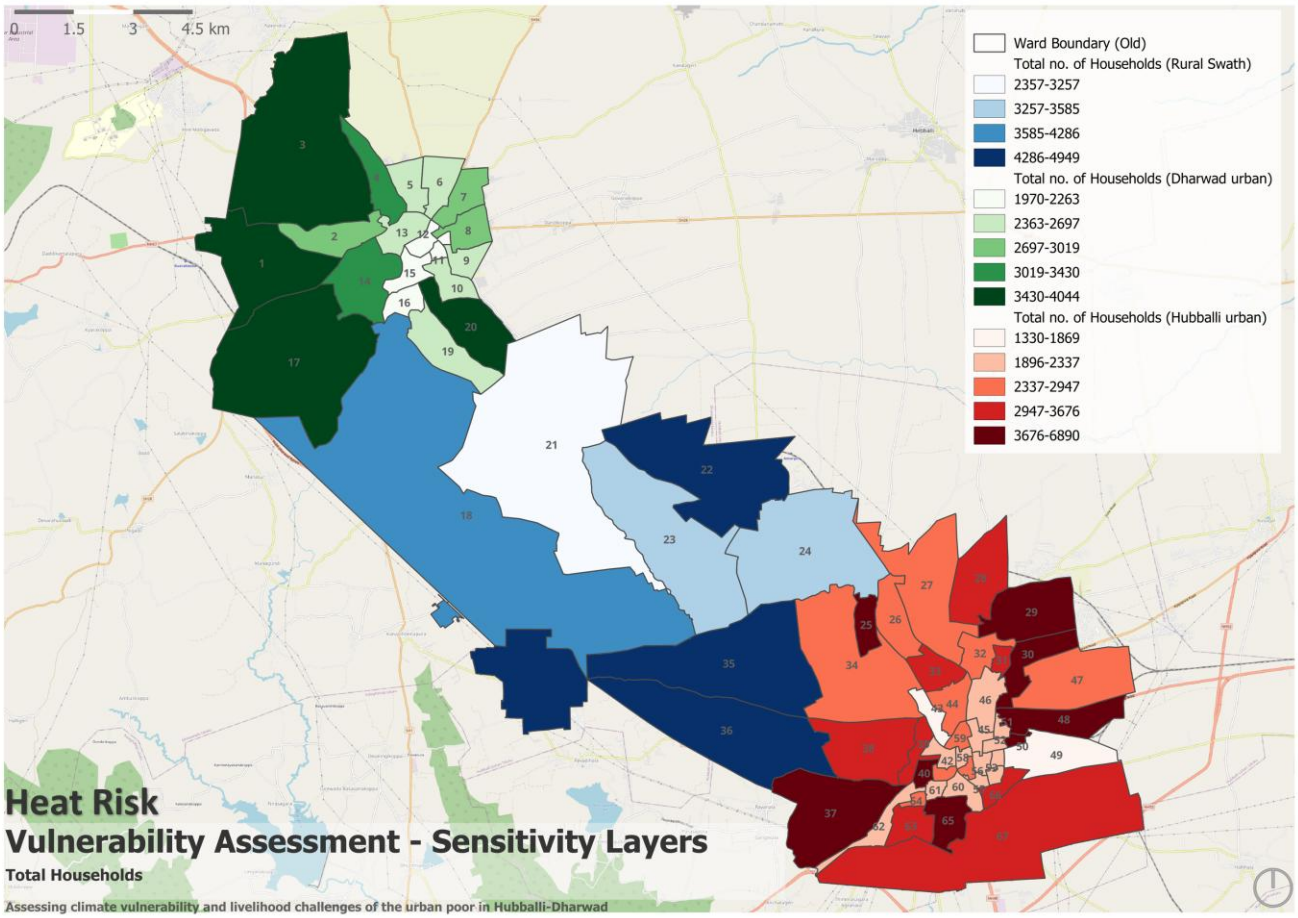
Annexure

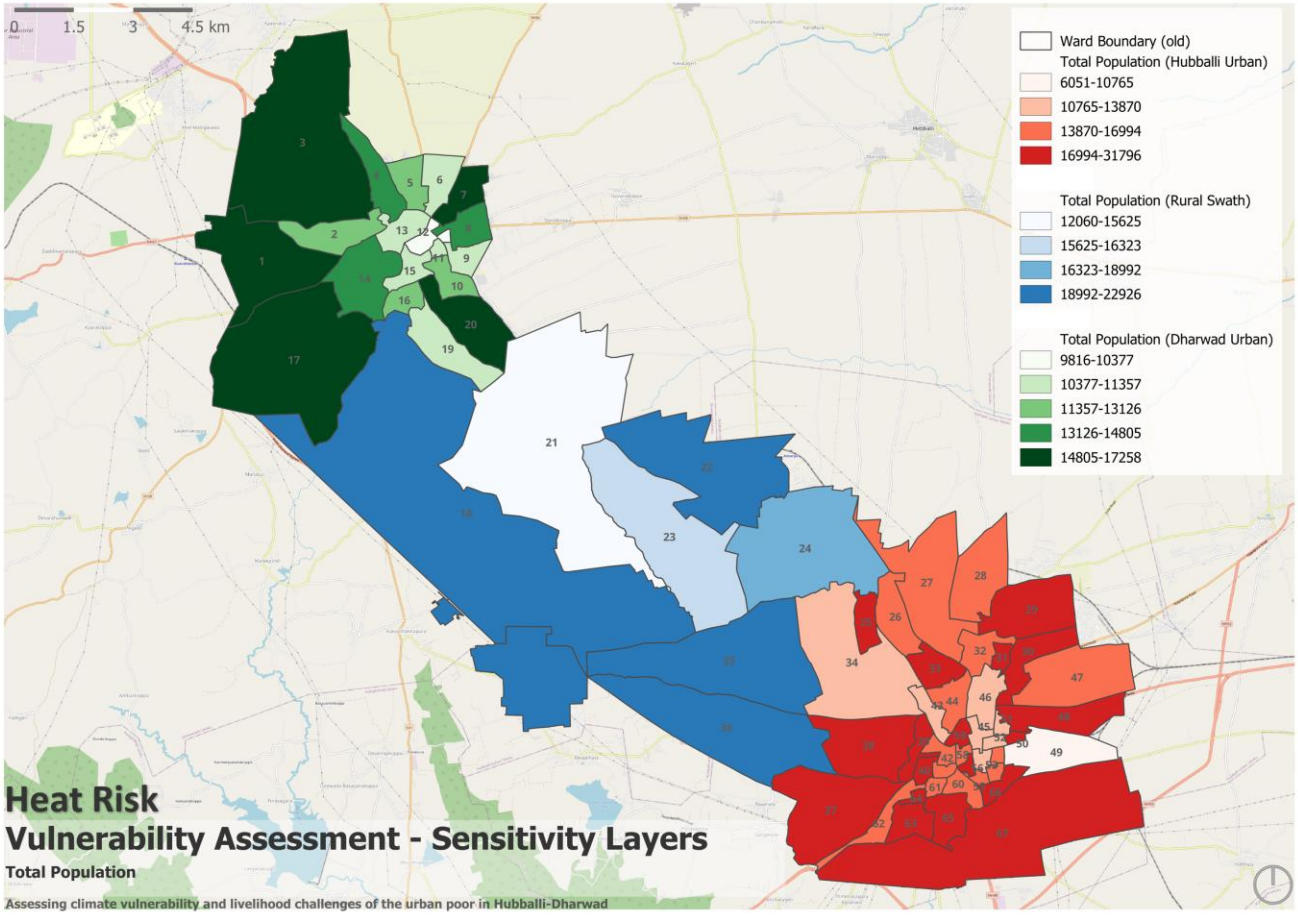
Annexure 1 – Individual Layers used for Heat Vulnerability

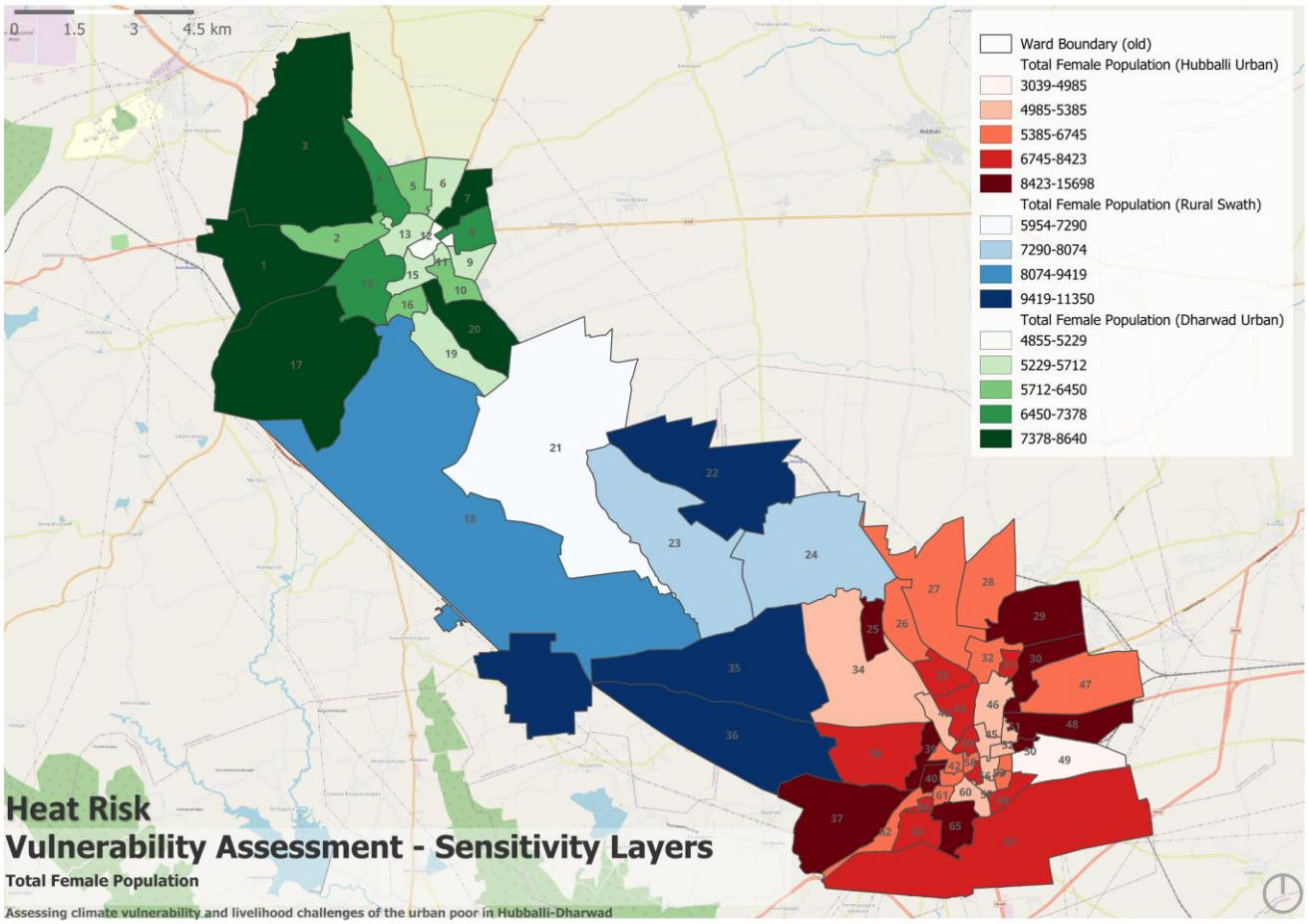
Heat Exposure, Sensitivity, and Adaptive capacity Layers

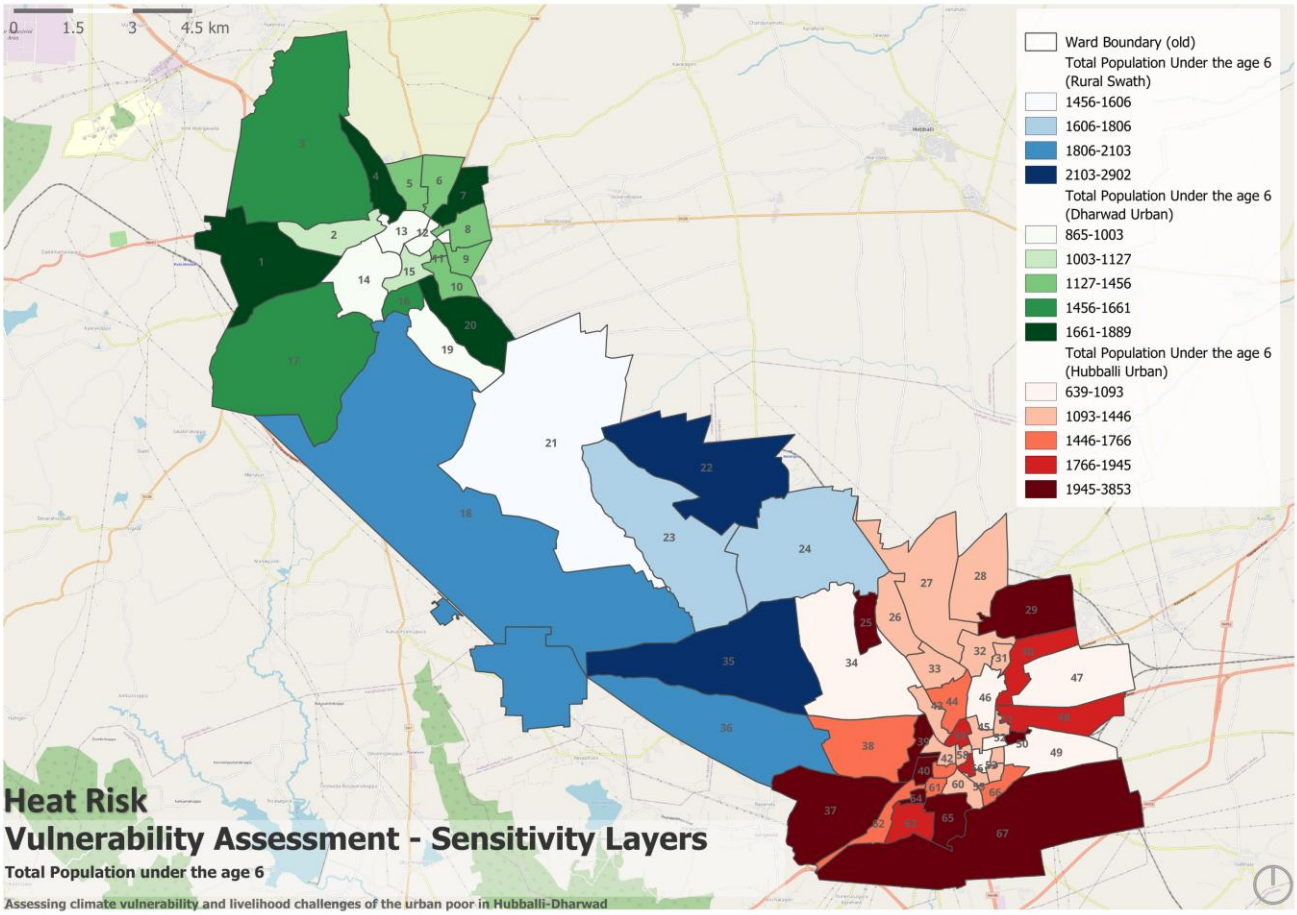


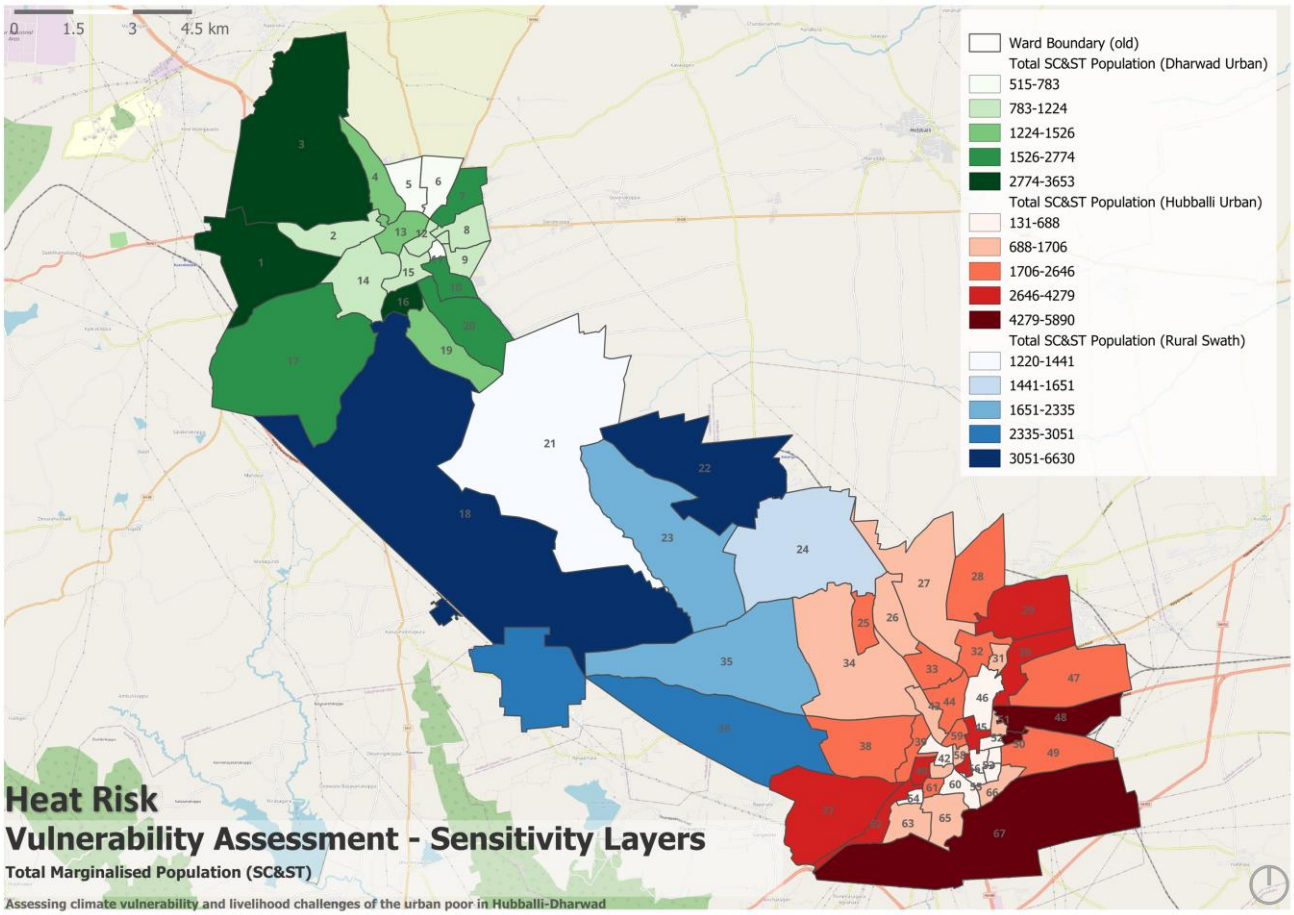

0 1.5 3 4.5 km
Ward Boundary (old)
Built Density (Dharwad Urban)
0 - 647.525
647.525 - 1807.671
1807.671 - 2940.838
2940.838 - 4208.905
4208.905 - 6879.94
Built Density (Rural Swath)
0 - 466.712
466.712 - 1458.473
1458.473 - 2625.25
2625.25 - 3996.214
3996.214 - 7438.206
Built Density (Hubballi Urban)
0 - 696.065
696.065 - 1933.511
1933.511 - 3132.288
3132.288 - 4447.075
4447.075 - 9860.902
Built-up area (in sq.m)
per 100m x 100m land parcel
Heat Risk
Vulnerability Assessment - Exposure Layer
Built Density - Proxy Factor for UHI
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

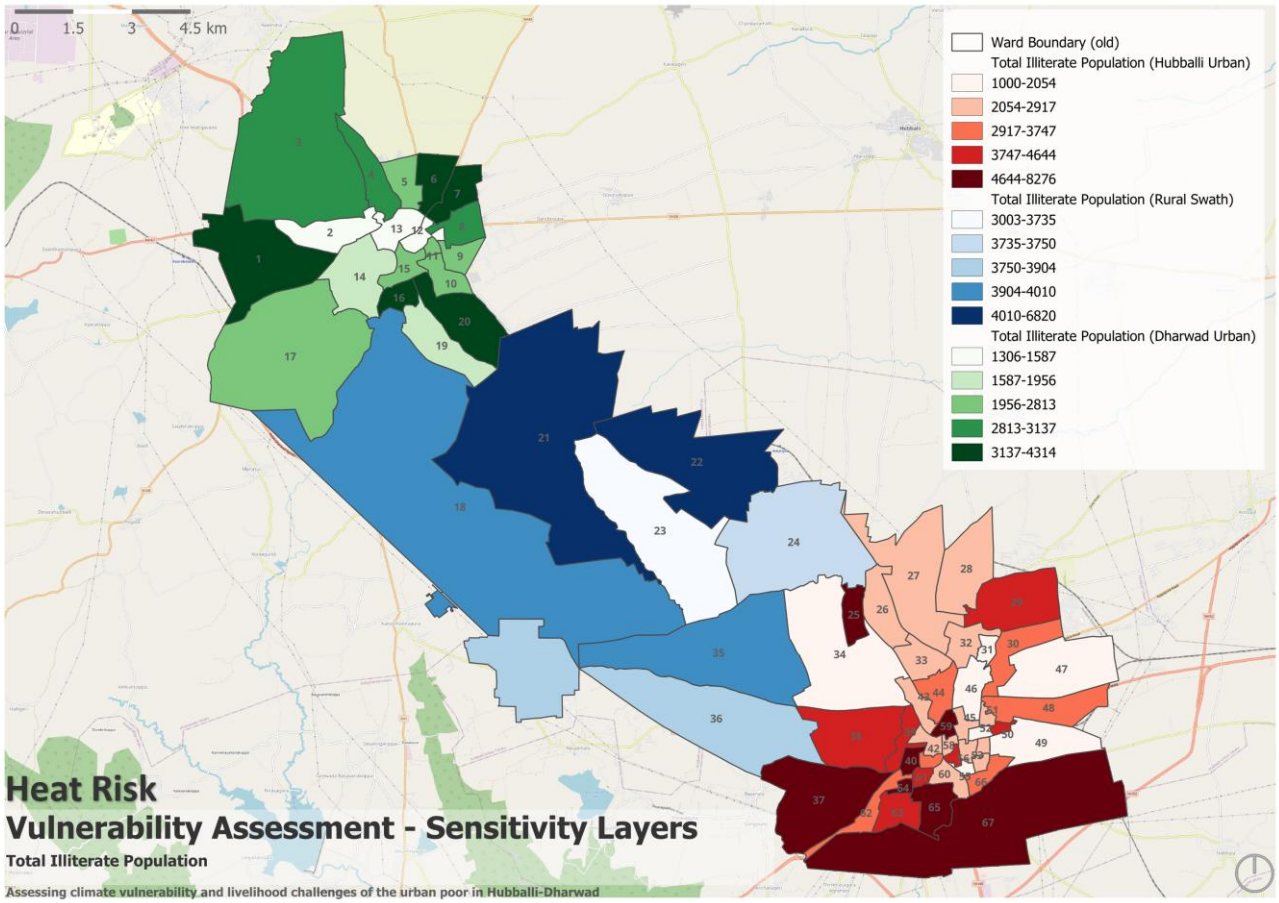

0 1.5 3 4.5 km
Ward Boundary (Old)
Total no. of Households (Rural Swath)
2357-3257
3257-3585
3585-4286
4286-4949
Total no. of Households (Dharwad urban)
1970-2263
2363-2697
2697-3019
3019-3430
3430-4044
Total no. of Households (Hubballi urban)
1330-1869
1896-2337
2337-2947
2947-3676
3676-6890
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Households
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

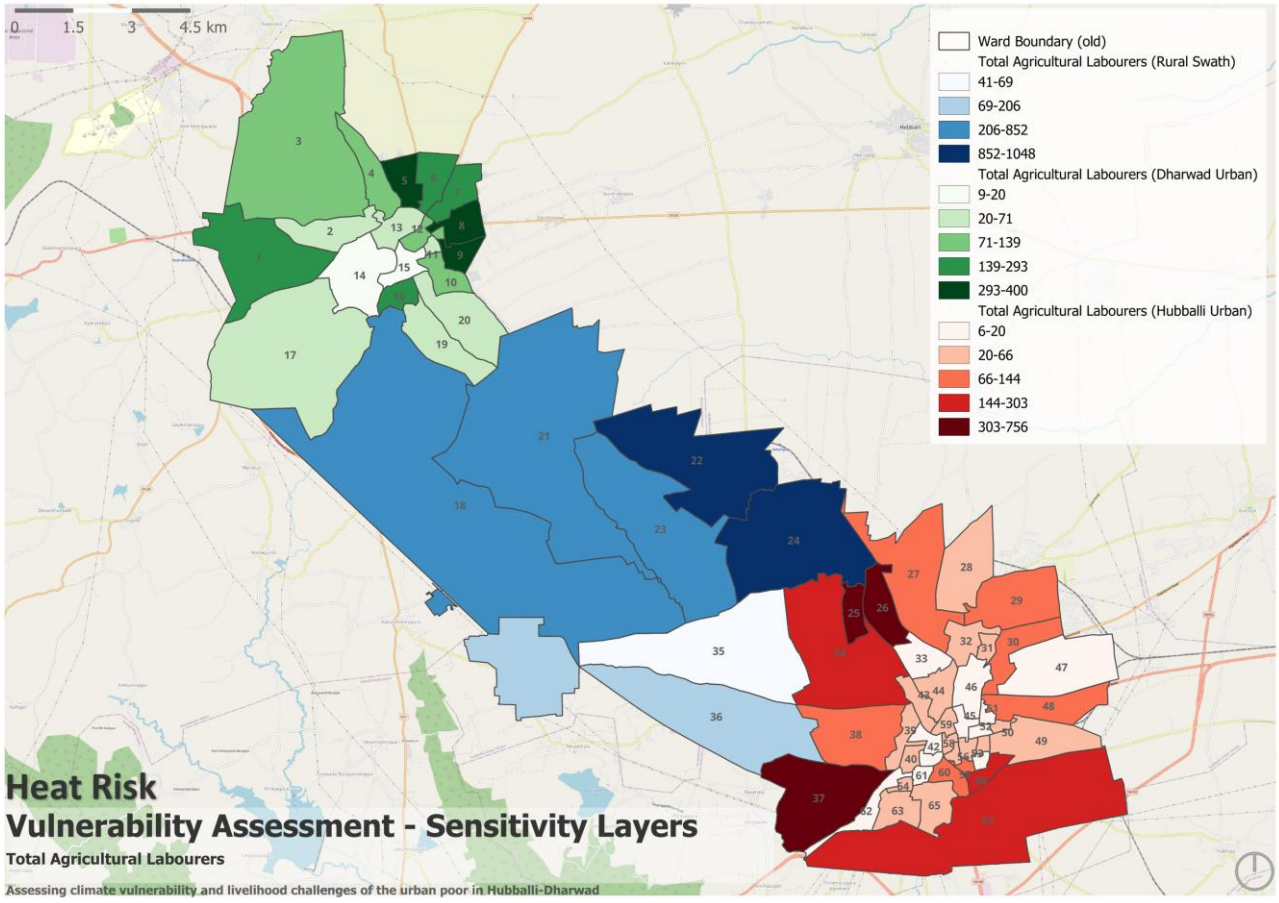

0 1.5 3 4.5 km
Ward Boundary (old)
Total Population (Hubballi Urban)
6051-10765
10765-13870
13870-16994
16994-31796
Total Population (Rural Swath)
12060-15625
15625-16323
16323-18992
18992-22926
Total Population (Dharwad Urban)
9816-10377
10377-11357
11357-13126
13126-14805
14805-17258
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Population
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

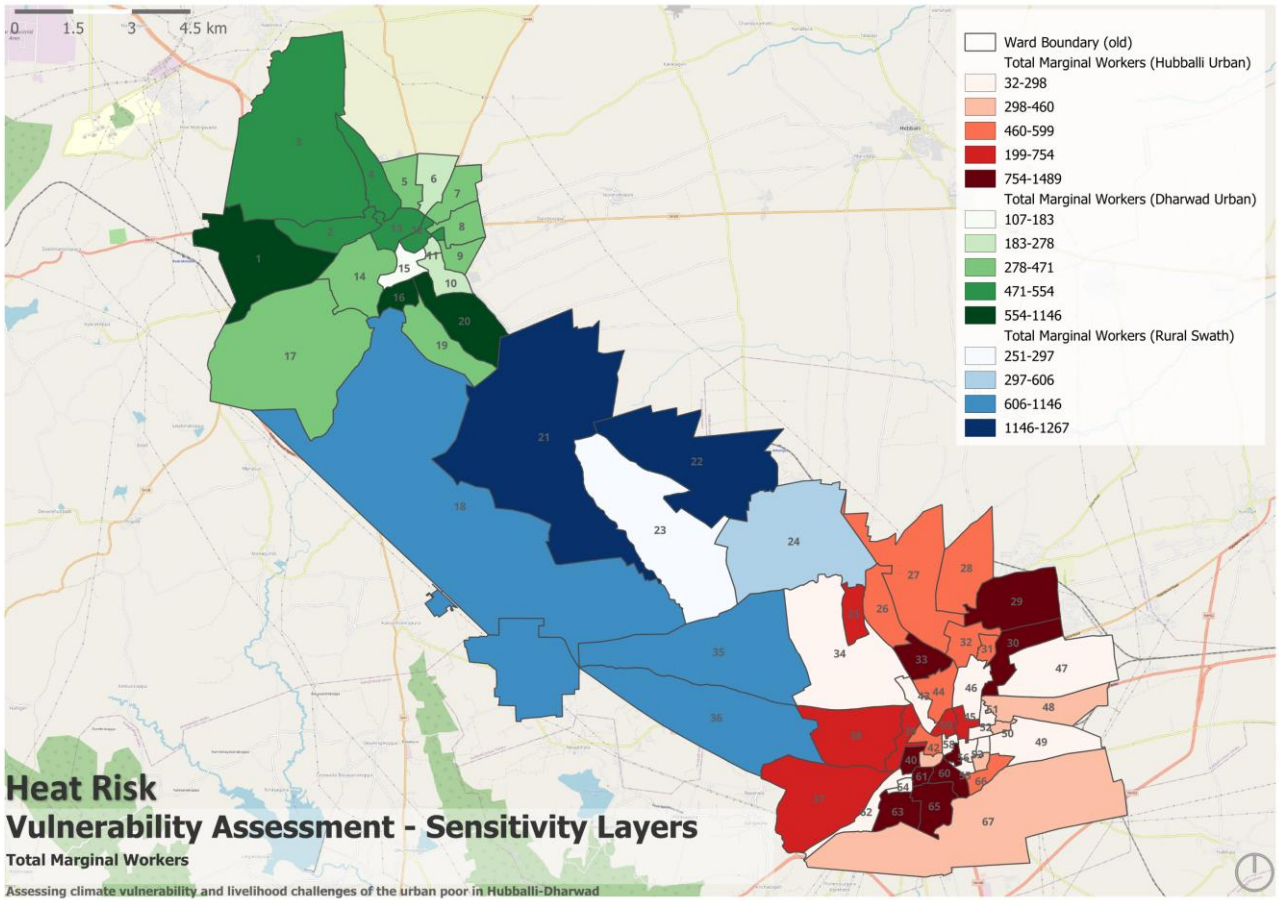

0 1.5 3 4.5 km
Ward Boundary (old)
Total Female Population (Hubballi Urban)
3039-4985
4985-5385
5385-6745
6745-8423
8423-15698
Total Female Population (Rural Swath)
5954-7290
7290-8074
8074-9419
9419-11350
Total Female Population (Dharwad Urban)
4855-5229
5229-5712
5712-6450
6450-7378
7378-8640
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Female Population
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

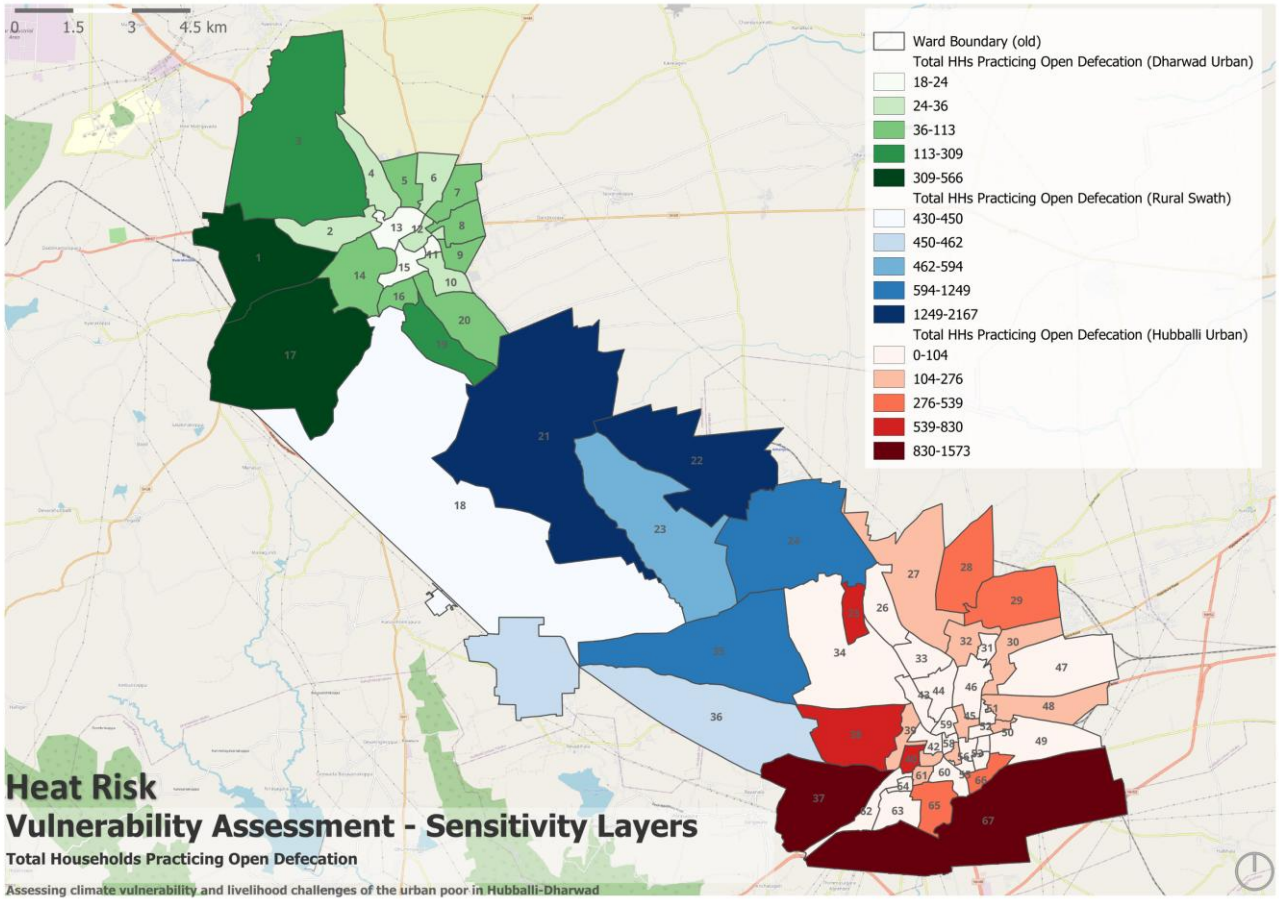

0 1.5 3 4.5 km
Ward Boundary (old)
Total Population Under the age 6 (Rural Swath)
1456-1606
1606-1806
1806-2103
2103-2902
Total Population Under the age 6 (Dharwad Urban)
865-1003
1003-1127
1127-1456
1456-1661
1661-1889
Total Population Under the age 6 (Hubballi Urban)
639-1093
1093-1446
1446-1766
1766-1945
1945-3853
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Population under the age 6
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

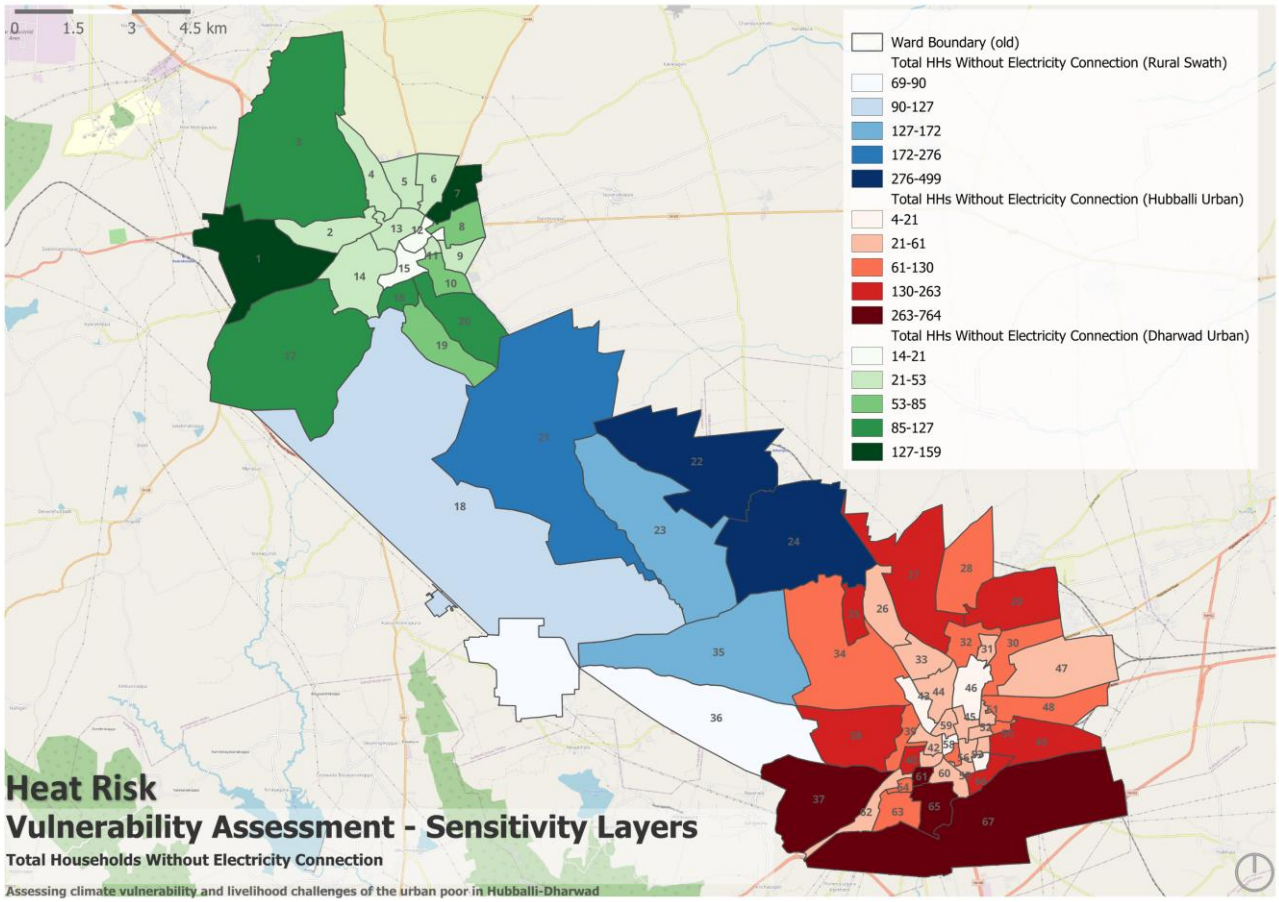

0 1.5 3 4.5 km
Ward Boundary (old)
Total SC&ST Population (Dharwad Urban)
515-783
783-1224
1224-1526
1526-2774
2774-3653
Total SC&ST Population (Hubballi Urban)
131-688
688-1706
1706-2646
2646-4279
4279-5890
Total SC&ST Population (Rural Swath)
1220-1441
1441-1651
1651-2335
2335-3051
3051-6630
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Marginalised Population (SC&ST)
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

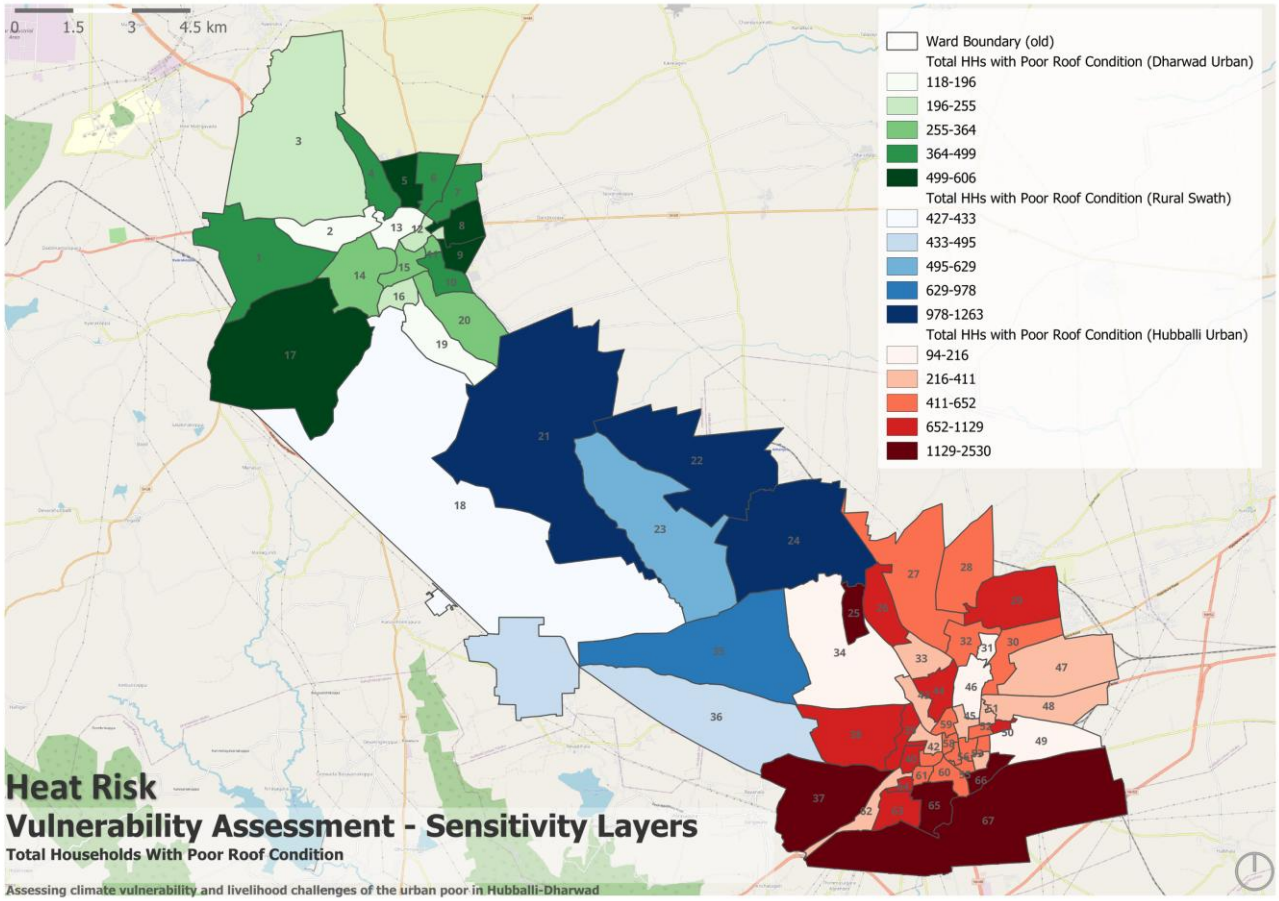

0 1.5 3 4.5 km
Ward Boundary (old)
Total Illiterate Population (Hubballi Urban)
1000-2054
2054-2917
2917-3747
3747-4644
4644-8276
Total Illiterate Population (Rural Swath)
3003-3735
3735-3750
3750-3904
3904-4010
4010-6820
Total Illiterate Population (Dharwad Urban)
1306-1587
1587-1956
1956-2813
2813-3137
3137-4314
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Illiterate Population
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

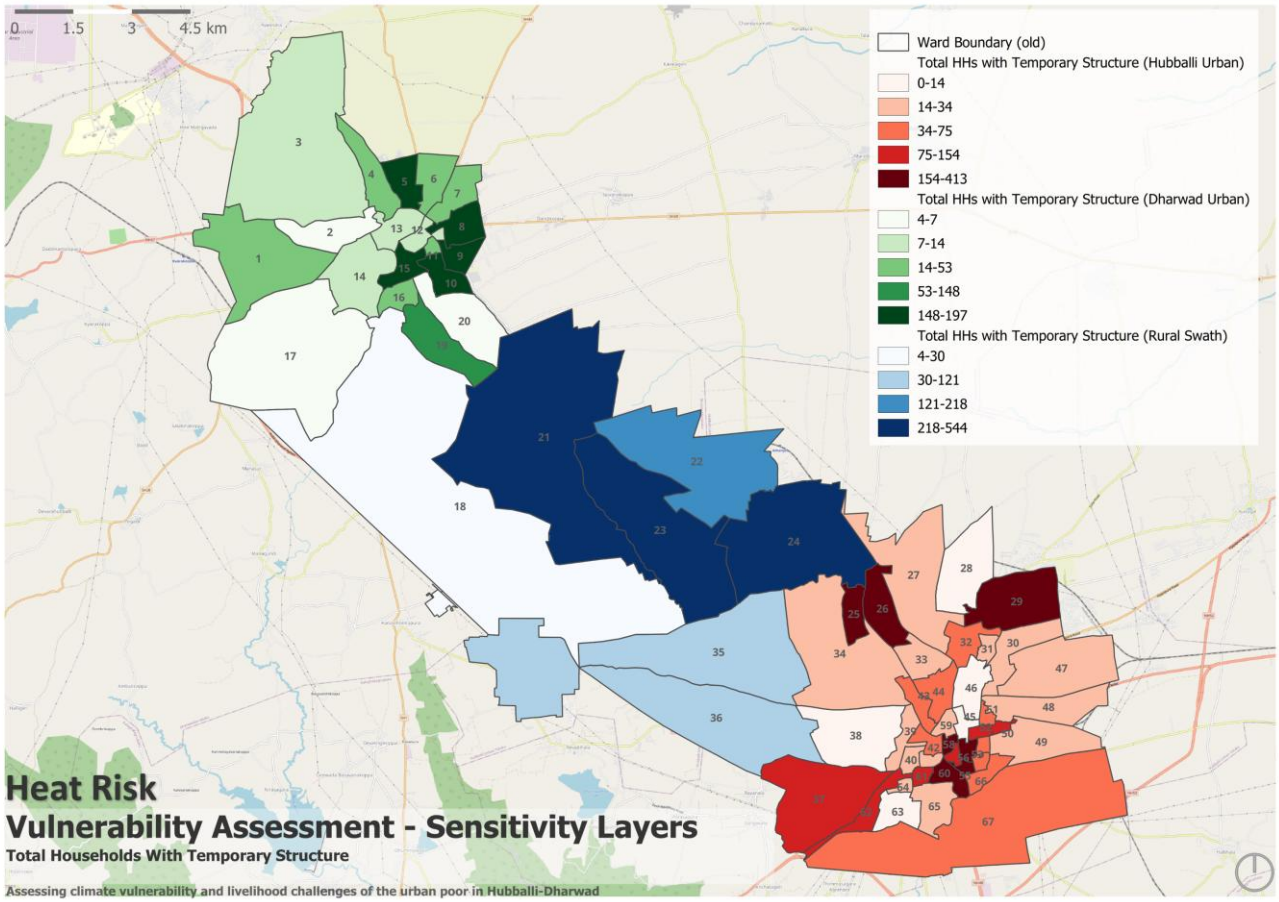

0 1.5 3 4.5 km
Ward Boundary (old)
Total Agricultural Labourers (Rural Swath)
41-69
69-206
206-852
852-1048
Total Agricultural Labourers (Dharwad Urban)
9-20
20-71
71-139
139-293
293-400
Total Agricultural Labourers (Hubballi Urban)
6-20
20-66
66-144
144-303
303-756
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Agricultural Labourers
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

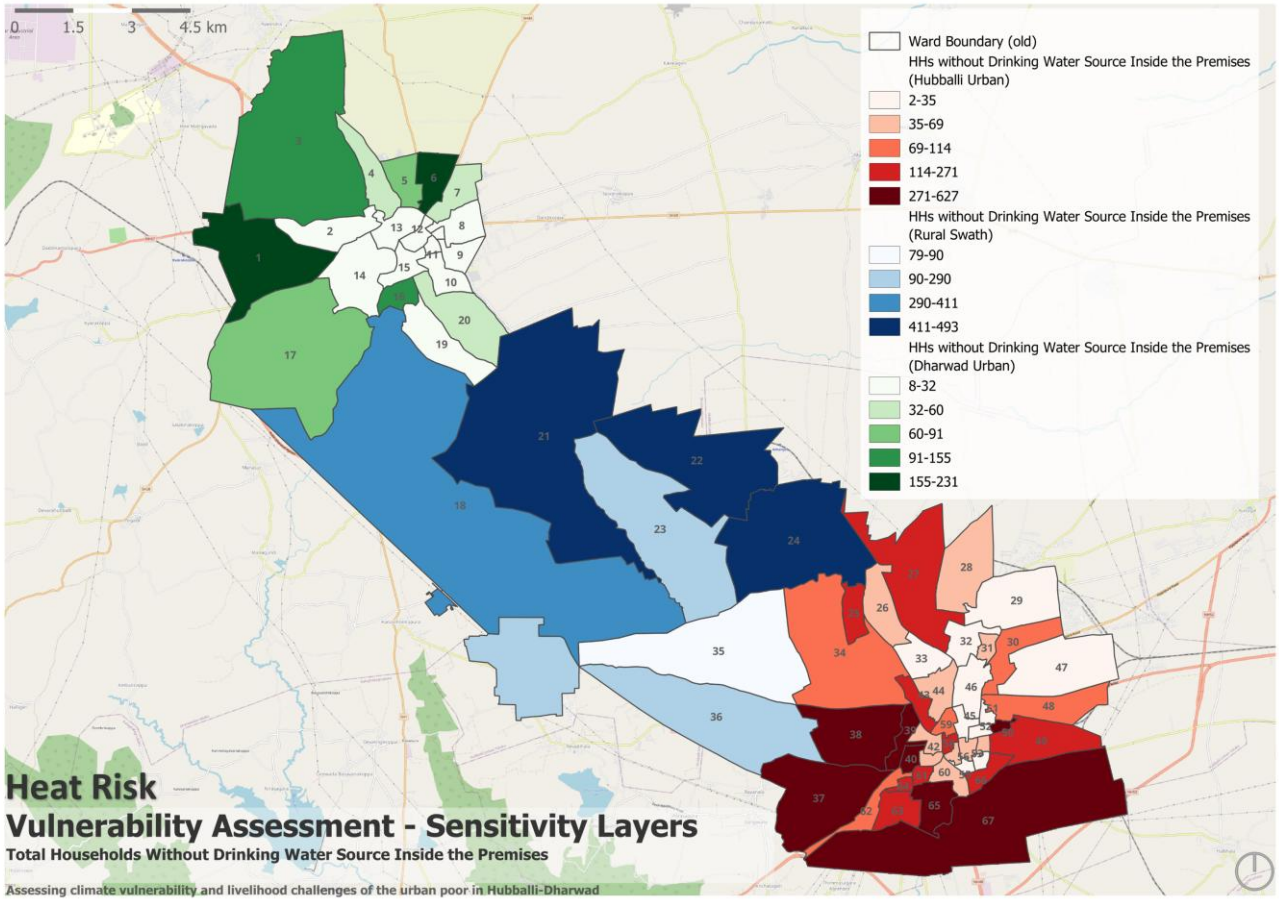

0 1.5 3 4.5 km
Ward Boundary (old)
Total Marginal Workers (Hubballi Urban)
32-298
298-460
460-599
199-754
754-1489
Total Marginal Workers (Dharwad Urban)
107-183
183-278
278-471
471-554
554-1146
Total Marginal Workers (Rural Swath)
251-297
297-606
606-1146
1146-1267
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Marginal Workers
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

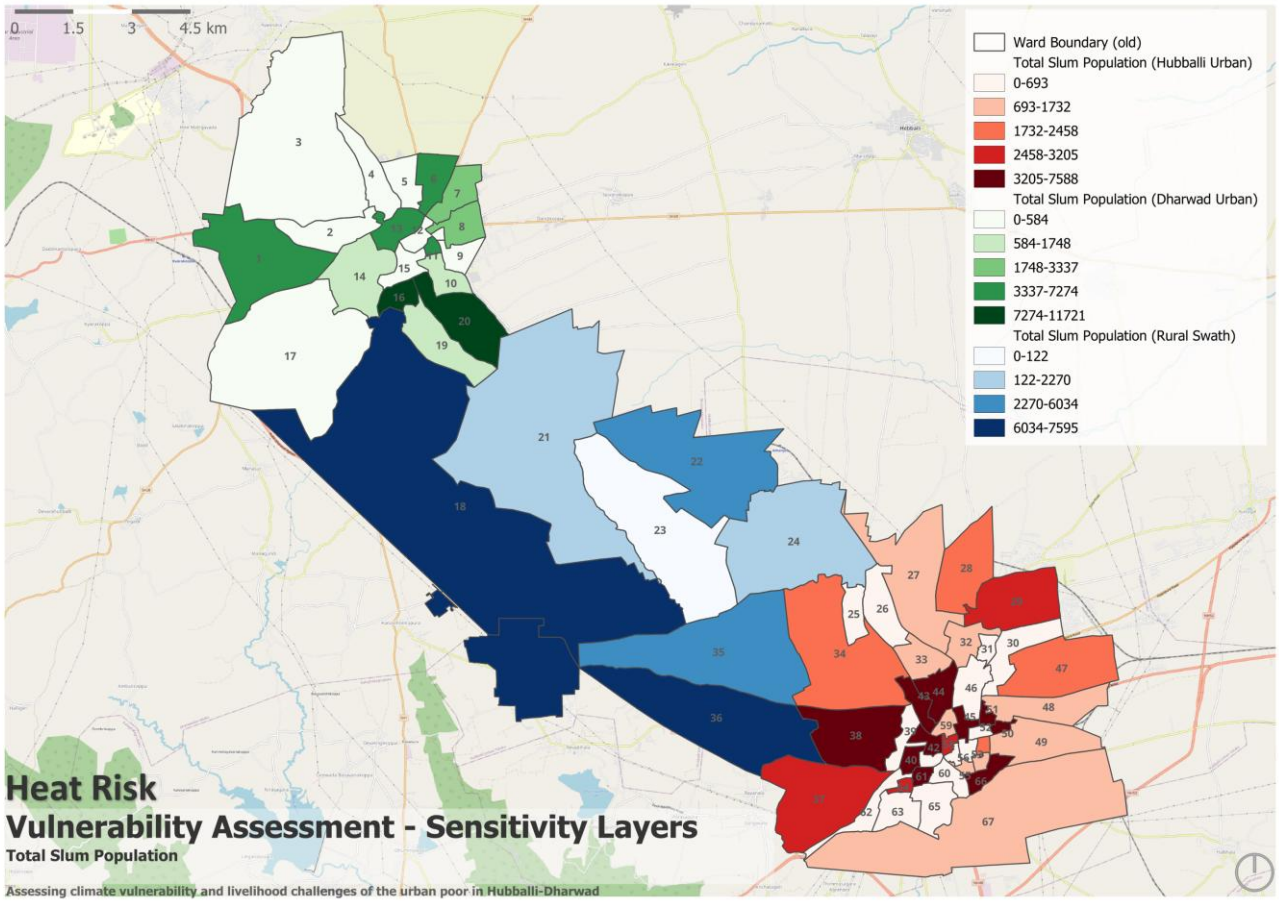

0 1.5 3 4.5 km
Ward Boundary (old)
Total HHs Practicing Open Defecation (Dharwad Urban)
18-24
24-36
36-113
113-309
309-566
Total HHs Practicing Open Defecation (Rural Swath)
430-450
450-462
462-594
594-1249
1249-2167
Total HHs Practicing Open Defecation (Hubballi Urban)
0-104
104-276
276-539
539-830
830-1573
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Households Practicing Open Defecation
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

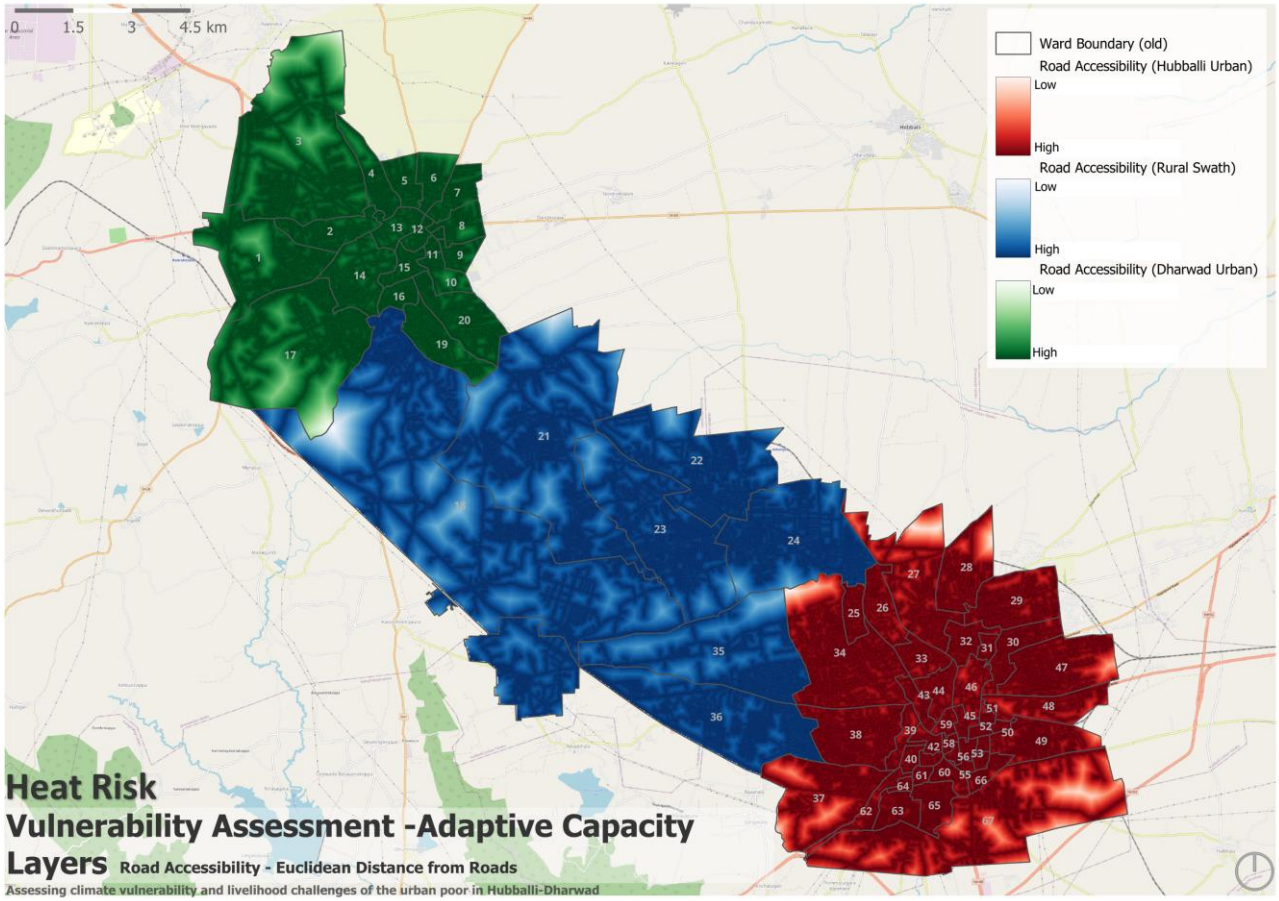

0 1.5 3 4.5 km
Ward Boundary (old)
Total HHs Without Electricity Connection (Rural Swath)
69-90
90-127
127-172
172-276
276-499
Total HHs Without Electricity Connection (Hubballi Urban)
4-21
21-61
61-130
130-263
263-764
Total HHs Without Electricity Connection (Dharwad Urban)
14-21
21-53
53-85
85-127
127-159
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Households Without Electricity Connection
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

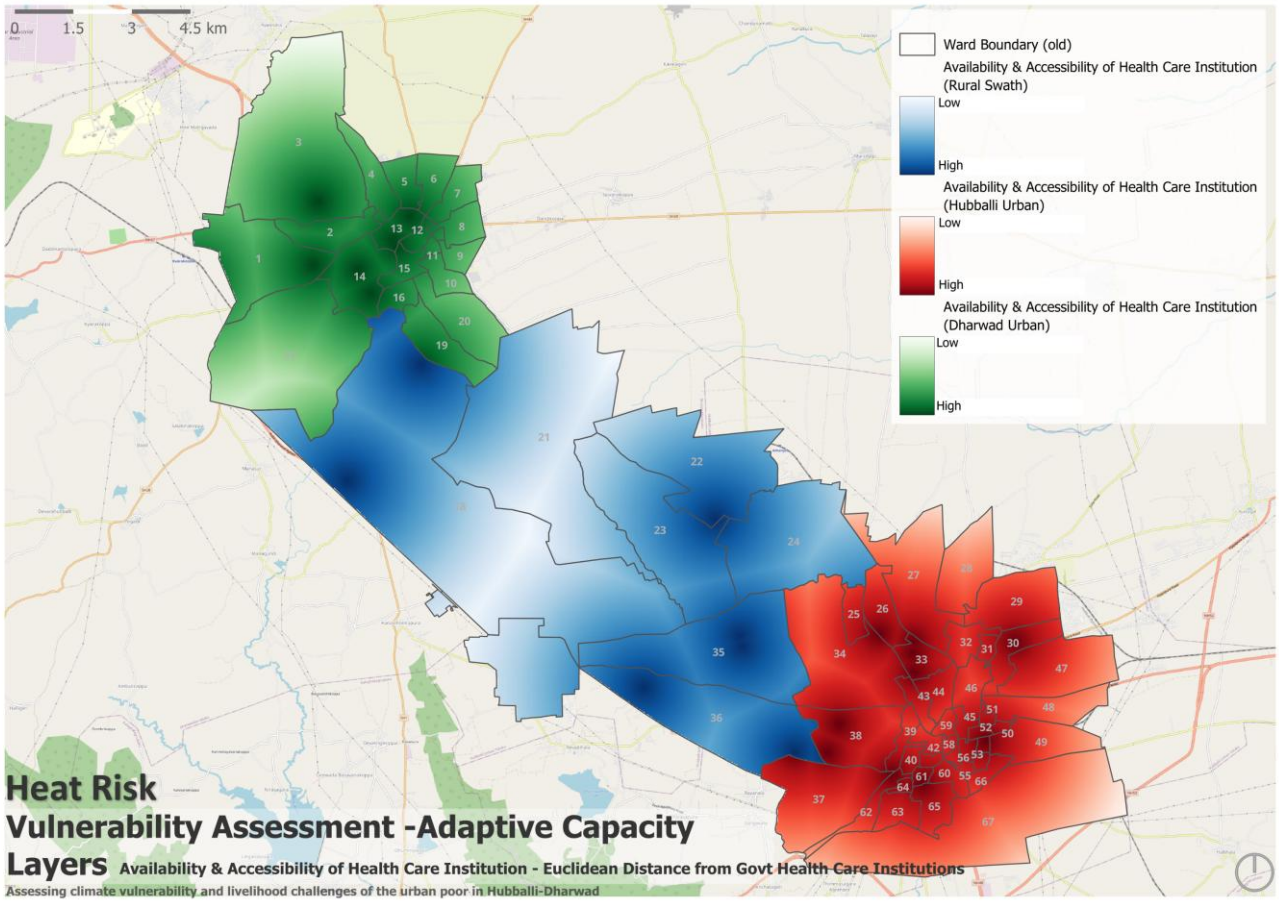

0 1.5 3 4.5 km
Ward Boundary (old)
Total HHs with Poor Roof Condition (Dharwad Urban)
118-196
196-255
255-364
364-499
499-606
Total HHs with Poor Roof Condition (Rural Swath)
427-433
433-495
495-629
629-978
978-1263
Total HHs with Poor Roof Condition (Hubballi Urban)
94-216
216-411
411-652
652-1129
1129-2530
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Households With Poor Roof Condition
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

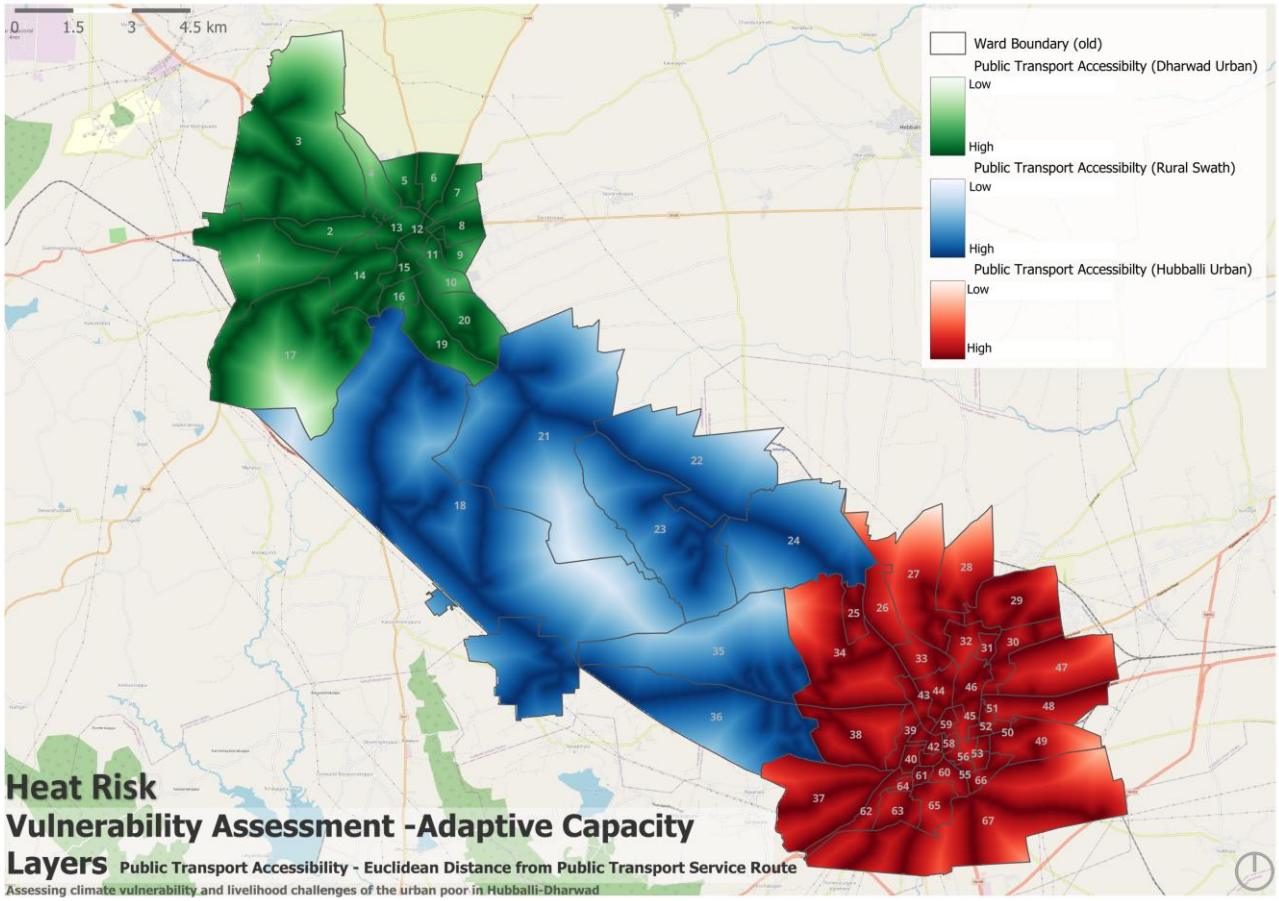

0 1.5 3 4.5 km
Ward Boundary (old)
Total HHs with Temporary Structure (Hubballi Urban)
0-14
14-34
34-75
75-154
154-413
Total HHs with Temporary Structure (Dharwad Urban)
4-7
7-14
14-53
53-148
148-197
Total HHs with Temporary Structure (Rural Swath)
4-30
30-121
121-218
218-544
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Households With Temporary Structure
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

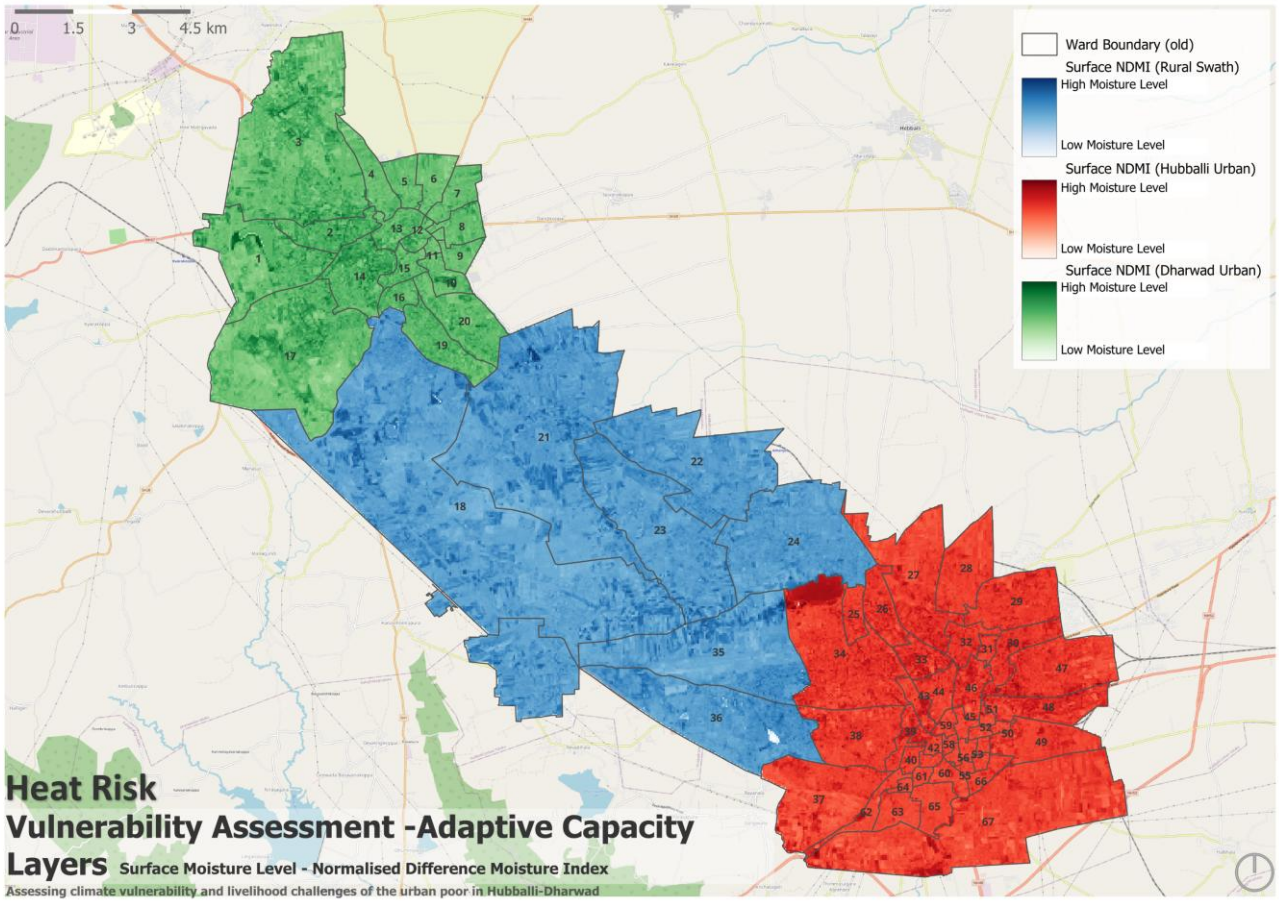

0 1.5 3 4.5 km
Ward Boundary (old)
HHs without Drinking Water Source Inside the Premises (Hubballi Urban)
2-35
35-69
69-114
114-271
271-627
HHs without Drinking Water Source Inside the Premises (Rural Swath)
79-90
90-290
290-411
411-493
HHs without Drinking Water Source Inside the Premises (Dharwad Urban)
8-32
32-60
60-91
91-155
155-231
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Households Without Drinking Water Source Inside the Premises
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

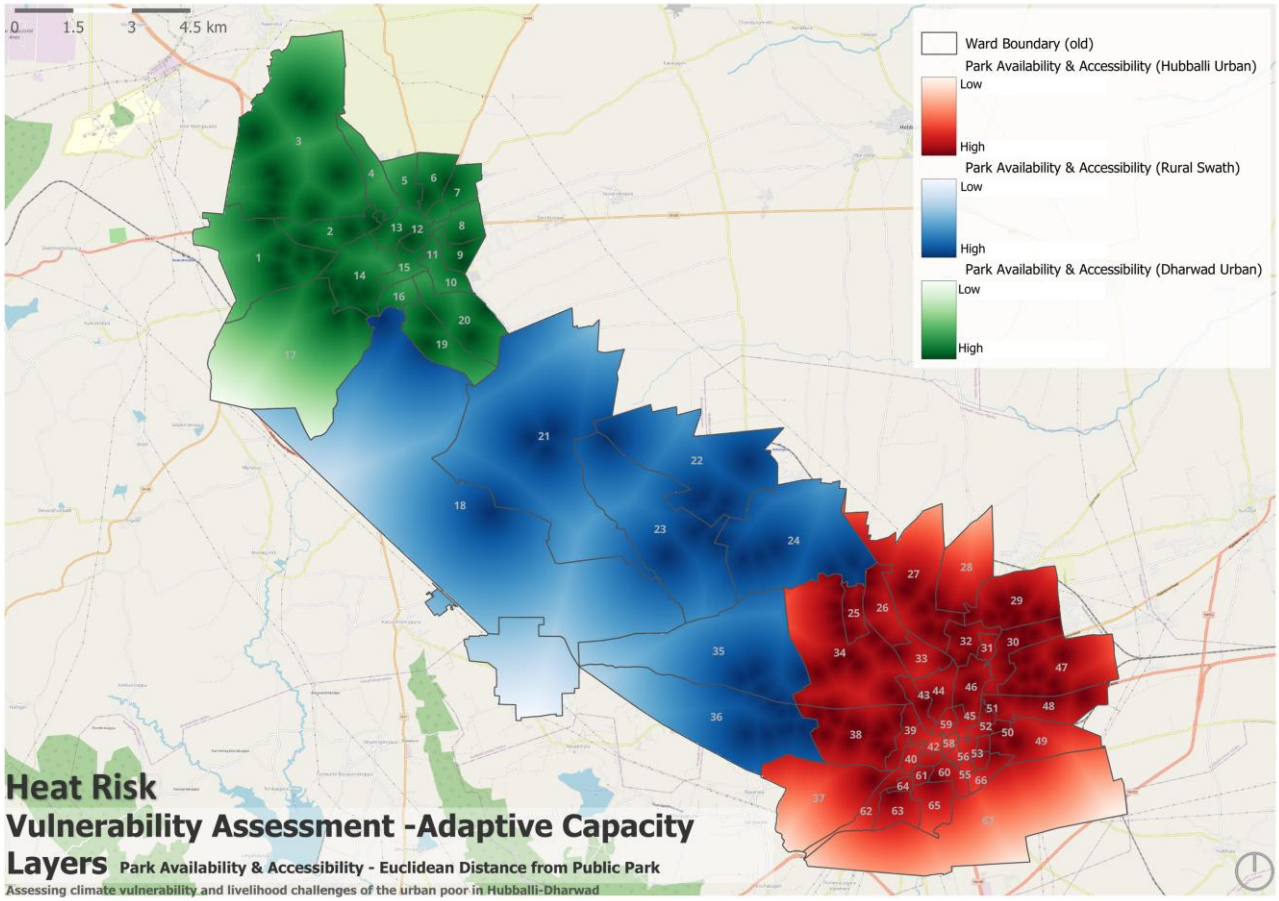

0 1.5 3 4.5 km
Ward Boundary (old)
Total Slum Population (Hubballi Urban)
0-693
693-1732
1732-2458
2458-3205
3205-7588
Total Slum Population (Dharwad Urban)
0-584
584-1748
1748-3337
3337-7274
7274-11721
Total Slum Population (Rural Swath)
0-122
122-2270
2270-6034
6034-7595
Heat Risk
Vulnerability Assessment - Sensitivity Layers
Total Slum Population
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad


0 1.5 3 4.5 km
Ward Boundary (old)
Road Accessibility (Hubballi Urban)
Low
High
Road Accessibility (Rural Swath)
Low
High
Road Accessibility (Dharwad Urban)
Low
High
Heat Risk
Vulnerability Assessment -Adaptive Capacity
Layers Road Accessibility - Euclidean Distance from Roads
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad


0 1.5 3 4.5 km
Ward Boundary (old)
Availability & Accessibility of Health Care Institution (Rural Swath)
Low
High
Availability & Accessibility of Health Care Institution (Hubballi Urban)
Low
High
Availability & Accessibility of Health Care Institution (Dharwad Urban)
Low
High
Heat Risk
Vulnerability Assessment -Adaptive Capacity
Layers Availability & Accessibility of Health Care Institution - Euclidean Distance from Govt Health Care Institutions
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad


0 1.5 3 4.5 km
Ward Boundary (old)
Public Transport Accessibilty (Dharwad Urban)
Low
High
Public Transport Accessibilty (Rural Swath)
Low
High
Public Transport Accessibilty (Hubballi Urban)
Low
High
Heat Risk
Vulnerability Assessment -Adaptive Capacity
Layers Public Transport Accessibility - Euclidean Distance from Public Transport Service Route
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad


0 1.5 3 4.5 km
Ward Boundary (old)
Surface NDMI (Rural Swath)
High Moisture Level
Low Moisture Level
Surface NDMI (Hubballi Urban)
High Moisture Level
Low Moisture Level
Surface NDMI (Dharwad Urban)
High Moisture Level
Low Moisture Level
Heat Risk
Vulnerability Assessment -Adaptive Capacity
Layers Surface Moisture Level - Normalised Difference Moisture Index
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad


0 1.5 3 4.5 km
Ward Boundary (old)
Park Availability & Accessibility (Hubballi Urban)
Low
High
Park Availability & Accessibility (Rural Swath)
Low
High
Park Availability & Accessibility (Dharwad Urban)
Low
High
Heat Risk
Vulnerability Assessment -Adaptive Capacity
Layers Park Availability & Accessibility - Euclidean Distance from Public Park
Assessing climate vulnerability and livelihood challenges of the urban poor in Hubballi-Dharwad

Annexure 2 – Detailed data and insights from FGDs, and KIIs

Raw Data and Insights from Survey, Focus Group Discussions, Key Informant Interviews, and Small Group Discussions

Field Area:

Sno.	Slum / Area	No. of FGDs
Hubballi		
1	Jagadeesh Nagar	1
2	Myadar Oni	1
3	Kumbar Oni	1
4	Sadar Sofa	1
Dharwad		
5	CBT Area (Myadar Oni and Vegetable Vendors)	2
6	Gauli Galli	1
7	Dhobi Colony	2
8	Jannath Nagar	1
9	Churmuri Bhatti	1
10	Laxmisinganakeri	1
11	Saraswatapura	1
Total		**12**

FGD questions and responses – Related to Livelihood and Community

Can you tell us about yourself, how long you've lived here, and what kind of work you or your family members do?

The urban poor communities of Hubballi-Dharwad have long histories of residence, with many households having lived in these areas for several decades. Their livelihoods are rooted in informal, often climate-sensitive occupations, reflecting both cultural traditions and economic necessity. The following description outlines key occupational patterns along with the settlement duration for each locality.

Hubballi Region

a. Jagadeesh Nagar

Residents here have been living in the area for 50–60 years. The primary occupations include auto driving, vegetable vending, running small kirana shops, and construction labour. These informal activities are sensitive to weather conditions and provide limited economic security.

b. Myadar Oni

This locality has a strong presence of families involved in bamboo craft, a traditional livelihood passed down through generations. The residents have been settled here for approximately 48–60 years, relying on local markets for the sale of handmade bamboo products.

c. Kumbar Oni

Inhabited for around 40–50 years, Kumbar Oni is primarily home to workers engaged in welding, tile laying, and centering work, especially in the construction sector. These jobs are labor-intensive and vulnerable to disruptions caused by climate events.

d. Sadar Sofa

Families in Sadar Sofa have lived in this area for 50–60 years. Occupations include construction labour, bedi beeding (masonry work), centering, and small-scale home-based cloth businesses, reflecting a mix of outdoor and home-based informal work.

Dharwad Region

e. CBT Area (Myadar & Vegetable Vendors)

With a settlement history of 60–70 years, residents here are mainly involved in vegetable vending and bamboo craft. The central location facilitates street vending, but also exposes vendors to regulatory constraints and weather-related disturbances.

f. Gavaligalli

One of the oldest settlements, with families living here for 80–90 years, this area is known for its traditional occupation of cattle rearing. However, urban expansion and lack of pasture land are increasingly threatening this livelihood.

g. Dhobi Colony

This settlement was officially allocated by the government around 20 years ago for the Dhobi (washermen) community. The primary occupation is laundry work, which is highly water-dependent and affected by seasonal variations, particularly during monsoons.

h. Jannath Nagar

Residents have been living in Jannath Nagar for about 50–60 years. The main occupations include construction work and vegetable selling from home, reflecting a mix of physical and home-based income-generating activities.

i. Churmuri Bhatti

This is a relatively newer settlement with residents living here for the past 24–25 years. The community is known for its involvement in the churmuri (puffed rice) business, often operated as street vending or small-scale production from homes.

j. Laxmisinganakeri

Home to many for the past 30 years, this area is primarily inhabited by women engaged in domestic work, including cleaning and caregiving in nearby households. These jobs are informal, low-paying, and offer minimal social security.

k. Saraswatapura

Most residents in Saraswatapura have been living in the area for the past 50 to 60 years. The community is primarily engaged in informal livelihood activities. Many households work as scrap

collectors and dealers, collecting and sorting recyclable materials. Some family members are involved in collecting and selling human hair, which is later used in various industries. Additionally, a few residents are small-scale vendors who sell spices to nearby villages, often traveling to rural areas to supply their products.

What are the different communities living in this settlement, and what brought them here initially?

The urban poor settlements of Hubballi-Dharwad are home to a diverse mix of communities, each with unique social, cultural, and occupational backgrounds. These communities have settled over time due to various factors, including traditional occupations, migration for employment, displacement, and the availability of low-cost or informal housing. Below is an area-wise description of the communities and their likely reasons for settling:

Hubballi Region

a. Jagadeesh Nagar

This settlement hosts Chikkaligaru, Scheduled Castes (SC), Scheduled Tribes (ST), Muslim, and a few Hindu families. Many migrated here decades ago in search of livelihood opportunities in construction, driving, and petty trade, while others were drawn by the availability of affordable land or informal plots during urban expansion.

b. Myadar Oni

Communities residing here include Medar, Maratha Muslims, Badiger (carpenters), SC, and ST groups. The Medar and Badiger families have traditionally engaged in bamboo craft and woodworking. Their settlement is closely linked to their craft-based livelihoods, which required space for raw materials and tools.

c. KumbarOni

Primarily inhabited by Muslim families with a few Hindu households, this area grew as a working-class settlement. Most residents migrated here to work in construction-related trades such as welding, tiling, and centering.

d. Sadar Sofa

The area is predominantly inhabited by Muslim families. The migration was likely driven by proximity to livelihood opportunities in construction and small-scale trade, combined with the availability of informal housing.

Dharwad Region

a. CBT Area (Myadar & Vegetable Vendors)

Inhabited by Medar and Muslim communities, this centrally located area attracted street vendors and artisans due to the commercial nature of the bus terminal. Families settled here over generations to be close to bustling markets and commuters.

b. Gauli Galli

Home to the Gaulis community, known for cattle rearing. This group has a long history in the area, with settlement patterns shaped by access to grazing areas and water resources. Their continued presence is tied to traditional livelihoods.

c. Dhobi Colony

This colony was government-allocated about 20 years ago to members of the Dhobi (washermen) community. They were relocated here to facilitate better access to water sources and designated spaces for their laundry work.

d. Jannath Nagar

This area is home to Bihari migrants and SC families. Migration to this settlement was primarily for work in construction and small-scale trading. Affordable informal housing and community networks facilitated their long-term settlement.

e. Churmuri Bhatti

Inhabited by SC, ST, and Muslim families, this area emerged more recently due to the expansion of street food businesses, such as the churmuri (puffed rice) trade. Migration here is linked to economic survival and informal job markets.

f. Laxmisinganakeri

This settlement includes SC, ST, Vaddar (stone cutters), and Muslim families. The settlement developed around the availability of domestic work and daily wage labor, offering proximity to middle-class neighborhoods for employment.

g. Saraswatapura

The settlement is home to diverse communities, including the Chikkaligaru, Masalagar, Valmiki, Koravar, and Maratha communities. Over time, these groups migrated and settled here in search of livelihood opportunities and due to displacement from other areas. The residents speak a mix of languages such as Kannada, Telugu, Marathi, Hindi, and the Chikkaligaru dialect, reflecting the cultural and linguistic diversity of the settlement.

How would you describe your settlement—its layout, size, housing, and the general condition of the neighborhood?

Hubballi Region

a. Jagadeesh Nagar

This area includes approximately 1,500 houses, mostly semi-pucca and built on small plots. Many houses are very small in structure, making it difficult for large families to live comfortably. The settlement faces severe drainage issues, and there is no proper drinking water facility. The streets are narrow and often waterlogged, with poor waste management systems.

b. Myadar Oni

Around 1,500 to 2,000 households reside here, many in kaccha or rented houses. The majority of houses are small and poorly ventilated. Open drainage systems in front of homes emit foul smells, significantly affecting the residents' quality of life. The area is congested with limited open space and lacks planned infrastructure.

c. Kumbar Oni

Home to about 2,000 households, this locality has substandard housing and unhygienic surroundings. The houses are often small and poorly constructed, with a lack of proper sanitation and waste disposal systems. The layout is unplanned, contributing to water stagnation during rains.

d. Sadar Sofa

This area consists of roughly 1,500 households, with a mix of owned and rented homes. While the structures are mostly average in quality, many houses are very small and overcrowded. Drainage systems are either absent or dysfunctional, and water accumulation is a common issue during the rainy season.

Dharwad Region

e. CBT Area (Myadar & Vegetable Vendors)

Infrastructure has seen improvements here, with concrete roads and 24/7 water supply added in recent years. However, many homes remain very small, measuring around 400 to 500 sq. ft.. Previously, shared houses were common, and although living conditions have improved, space constraints and sanitation remain concerns.

f. Gauli galli

With around 400 to 500 homes, this area is marked by improperly designed houses and inadequate space for cattle-related activities. There is no organized system for managing manure or fodder, making hygiene a major concern. The lack of space is a persistent challenge.

g. Dhobi Colony

Comprising 40 to 45 houses, the colony includes cement-sheet and RCC structures. However, the absence of a proper road system limits access and mobility. The houses are modest, and drainage infrastructure is either lacking or poorly maintained.

h. Jannath Nagar

This area has around 600 to 700 houses, most of which are very small in structure, providing limited living space. Though a road was constructed ten years ago, it lacks effective stormwater management. Rainwater frequently enters homes, making the area vulnerable during the monsoon.

i. Churmuri Bhatti

A densely packed area with around 150 houses, many of which are cramped and inadequately structured. Drinking water supply has been available for the last seven years, but sanitation and drainage facilities remain basic. The small size of houses restricts living comfort.

j. Laxmisinganakeri

With about 200 households, the area benefits from proper roads and drainage, reflecting some progress. However, most houses are very small, and some are prone to flooding during heavy rainfall. While there are signs of improvement in lifestyle, structural and spatial limitations persist.

k. Saraswatapura

The settlement has a moderately organized housing layout. Around 50 years ago, the government provided housing to many residents, and over time, the area has expanded. Currently, there are approximately 600 to 700 houses, with an estimated population of around 5,000 people. Basic amenities in the area are available but average in quality. One of the major concerns is the poor drainage system, which often leads to sanitation and hygiene issues, especially during the rainy season.

What are the major challenges people face here regarding water, toilets, garbage disposal, roads, and housing?

Hubballi Region

a. Jagadeesh Nagar

The area faces multiple infrastructural challenges. There is no regular drinking water supply, and residents rely on a single public toilet, which is insufficient for the population. Street lighting is absent, and road conditions are poor. Garbage collection is irregular—the municipal vehicle comes only 4 to 5 days a month—and waste often clogs the open drains, creating unhygienic conditions. Sanitation awareness is low, contributing to the worsening of living conditions.

b. Myadar Oni

Drinking water is supplied once every 8 to 9 days, which is inadequate. Though most houses have toilets, the municipal solid waste vehicle only visits twice a week, leading to accumulation of waste. During the rainy season, leakages from roofs and water intrusion into homes are common due to poorly constructed houses. The lack of sanitation awareness further adds to the unhygienic environment.

c. Kumbar Oni

Here, water scarcity is a major issue as supply comes once every 9 days. Toilets exist in every house, but the drainage system is poor, causing sewage overflow during rains. Waste collection is inconsistent—only once every two days—and residents struggle with dirty surroundings. Proper sanitation habits and cleanliness awareness are still lacking.

d. Sadar sofa

Faces similar issues as Kumbar Oni: irregular water supply (once in 9 days), presence of household toilets, and inefficient sewage system. Water from drains often enters homes during rains. Although garbage is collected biweekly, the neighborhood still suffers from unhygienic conditions, underscoring the need for better sanitation practices.

Dharwad Region

e. CBT Area (Myadar & Vegetable Vendors)

The area has a relatively stable water and toilet system, and the municipal garbage truck comes daily. However, gutters overflow during rains, allowing floodwater and filth into homes, which highlights poor maintenance of stormwater infrastructure. Cleanliness awareness needs strengthening, especially during the monsoon season.

f. Gauli galli

The timing of water supply is irregular, causing inconvenience. Although toilets exist in every house, waste management is a serious problem. Both garbage and manure are frequently dumped into drains, creating serious hygiene risks. There is a significant lack of awareness about proper waste disposal and sanitation.

g. Dhobi Colony

This area has 24/7 water availability, supported by three wells. However, there is no proper public transport system, requiring residents to walk long distances to access buses. Despite adequate water and housing, cleanliness and connectivity remain issues.

h. Jannath Nagar

Most residents have toilets at home, and a 24/7 water system is technically available, but actual water supply occurs only once in eight days. Public toilets are underutilized, and improved waste collection and sanitation practices are needed.

i. Churmuri Bhatti

While there is no water shortage and basic facilities like toilets are in place, the roads are in poor condition. A nearby plastic storage facility causes discomfort due to pollution and foul smells. Waste segregation and cleanliness awareness are minimal.

j. Laxmisinganakeri

Water and sanitation infrastructure is better here, with garbage vehicles making rounds and toilets present in homes. However, some houses flood during rains, and leakage issues remain unaddressed. More education on cleanliness and environmental hygiene is required.

k. Saraswatapura

The water supply in the settlement is generally good, and most households have access to individual toilets. However, there are challenges in garbage disposal—municipal vehicles come to collect solid waste only once every 10 days, which is insufficient and leads to waste accumulation. Many houses in the area are roofed with traditional tiles (Hanchina Mane), which are vulnerable during the rainy season. Rainwater often seeps into these houses, causing inconvenience and damage. Additionally, there is a lack of cleanliness in the neighborhood, and poor sanitation remains a concern.

How do people in the community interact with each other? Is there a strong sense of togetherness or cooperation?

Hubballi Region

a. Jagadeesh Nagar

This settlement reflects a good degree of unity among residents. People interact well with each other and support one another during times of need. Community relationships appear to be stable, contributing positively to their collective daily lives.

b. Myadar Oni

There is a lack of unity and cooperation among the residents. Community members tend to stay isolated, and collective action is minimal or absent. This hampers any organized effort toward addressing common local issues.

c. Kumbar Oni

While associations based on community groups do exist, they function more within specific groups than across the settlement. Broader unity among all residents is missing. Moreover, despite these associations, infrastructure and sanitation are poorly maintained, suggesting a lack of effective cooperation at the settlement level.

d. Sadar sofa

Similar to Kumbar Oni, community associations exist, but they don't reflect active cooperation or mutual engagement across groups. The lack of collective effort shows in the poor cleanliness and upkeep of the area.

Dharwad Region

e. CBT Area (Myadar & Vegetable Vendors)

The community here is fragmented, and internal disputes are common. Although an association has been formed, no activities or community-building programs are being conducted. Government benefits are often accessed through personal contacts, and information is not shared, breeding distrust. There is a clear absence of solidarity.

f. Gauli galli

Despite the formation of associations, the community lacks unity and effective cooperation. Management of associations is weak, and residents are disconnected, which affects any form of collective action or neighborhood improvement.

g. Dhobi Colony

Only one formal group (Dharmasthala Sangha) is active in this area, but it has limited impact due to the lack of unity among residents. Community engagement is low, and mutual support is minimal.

h. Jannath Nagar

This area shows a comparatively higher level of cooperation and community engagement. Some residents are part of organizations like Dharmasthala and Ujjivan, through which they engage in micro-businesses like tailoring and petty trade. These organizations foster mutual support and financial cooperation, contributing to a sense of togetherness.

i. Churmuri Bhatti

The settlement has faced conflicts within the Muslim community association, leading to division and disunity. These internal issues have weakened the sense of community and hindered collective progress.

j. Laxmisinganakeri

A moderate degree of unity exists, and people show a respectable level of cooperation in everyday life. However, access to benefits is often restricted to those with higher-level connections, which creates inequality and occasional resentment within the community.

k. Saraswatapura

There is a fair level of social interaction and cooperation among the different communities in the settlement. The Valmiki community has an organized group called the Valmiki Samudaya Sangha, which plays an active role in community activities. Similarly, the Masalagar and Koravar communities also maintain equal levels of participation and interaction within the neighbourhood. Overall, people support one another and maintain harmonious relationships, contributing to a sense of unity despite belonging to different social groups.

What kind of public services like schools, health centers, anganwadis, or government assistance are available? Are they accessible and sufficient?

Hubballi Region

a.Jagadeesh Nagar

This area has basic public services including an Anganwadi, primary health center, government school, and a community hall. The Durga Devi temple acts as a cultural center. However, there is no public transportation facility, which limits access to external services, especially for the elderly and school-going children.

b. Myadar Oni

Residents have access to Anganwadi, school, and a health center, but they often visit KIMS Hospital for more serious ailments, indicating limited trust in the local health center's capacity. No transport facility is available, making healthcare access and commuting to institutions difficult.

c. Kumbar Oni

There is an Anganwadi, government school, and health center, but like other areas, the health facilities are under-resourced. No transportation options exist, adding a burden on residents, particularly in emergencies or for schoolchildren.

d. Sadar sofa

This area is equipped with an Anganwadi, school, and primary health center, but infrastructure is basic and inadequate. The lack of public transport makes it hard for residents to reach better services elsewhere.

Dharwad Region

e. CBT Area (Myadar & Vegetable Vendors)

This is the only area with a functioning transport system due to its central location. It also benefits from nearby government hospitals, and while Anganwadi is around 800 meters away, the lack of a nearby government school is still a concern. Access to services is comparatively better here than in other settlements.

f. Gavaligalli

There are no Anganwadis or health centers in the vicinity. Residents walk to Malamaddy for school and depend on the District Hospital for healthcare. No public transport exists, making access particularly difficult for children and the elderly.

g. Dhobi Colony

There is no nearby hospital, school, or Anganwadi. Residents must travel around 4 km to reach a Civil Hospital and walk long distances to reach educational services. The absence of a transport system severely impacts daily life.

h. Jannath Nagar

Although some private healthcare services exist nearby, the government hospital and school are both around 3 km away. There is no bus or transportation service, which especially affects schoolchildren and those needing medical care.

i. Churmuri Bhatti

This area lacks Anganwadi and healthcare services entirely. Poor road conditions and drainage, combined with no transport facilities, make it highly disconnected and underserved.

j. Laxmisinganakeri

Though this locality has an Anganwadi, school, and primary health center, the lack of public transport remains a barrier. While services are locally present, reaching facilities in emergencies or for specialized care is difficult.

k. Saraswatapura

The settlement has access to some basic public services. An Anganwadi center is located nearby and is easily accessible for children and women. For healthcare, residents usually visit the Civil Hospital for treatment during illness. Additionally, a hospital in Purohit Nagar serves as the nearest healthcare facility. While these services are available, their adequacy in terms of quality and timely access may vary, especially during emergencies or for specialized care.

Overall Observation

CBT Area (Myadar Oni & Vegetable Vendors) is the only settlement with adequate transportation infrastructure.

All other locations lack public transport, making access to schools, health centers, and government offices difficult.

Health centers in several areas lack essential facilities, and many residents travel to distant hospitals like KIMS or the District Hospital.

Children often walk long distances to school or Anganwadi centers, especially in Gavaligalli, Dhobi Colony, and Jannath Nagar.

Roads and drainage issues further hinder accessibility, particularly during the rainy season.

What are the main sources of income and types of jobs people are engaged in here? Are many people involved in informal work or traditional livelihoods?

Hubballi Region

a. Jagadeesh Nagar

The community is largely engaged in informal and low-income jobs such as:

Auto driving, tailoring, Barber shop, construction work

Domestic work, vegetable vending, tile and centering labor

Running small Kirana (grocery) shops. This indicates a high dependence on informal sector employment with no job security.

b. Myadar Oni

Traditionally known for bamboo craft, but many have abandoned it due to lack of raw materials and poor income.

Currently, most residents engage in cutting work, domestic labor, and other informal jobs. There's a shift from traditional to low-paying informal work, highlighting economic instability.

c. Kumbar Oni

Residents do carpentry, painting, beedi tying, and work in grocery shops and garages.

Most women engage in home-based informal labor. This area sees a mix of manual labor and informal domestic activities, with little formal employment.

d. Sadar sofa

Similar to Kumbar Oni, with carpentry, painting, and beedi tying being common.

Also dependent on small jobs in shops and garages. The area reflects limited occupational diversity and heavy reliance on informal sector work.

Dharwad Region

e. CBT Area (Myadar & Vegetable Vendors)

Men often work in private companies or as wage laborers, while women take up domestic work.

Some elderly still engage in bamboo handicrafts, but adverse weather conditions (heat, rain) restrict productivity.

Small houses make working from home difficult.

Despite some private-sector work, informal and traditional livelihoods dominate, especially for women and elders.

f. Gauli galli

The main source of income is dairy farming.

Women stay home and assist with livestock.

It is a traditional livelihood setup, with little involvement in formal employment or outside jobs.

g. Dhobi Colony

Residents continue their traditional occupation of laundry work.

Girls go house-to-house to iron clothes, often due to the lack of adequate water infrastructure at home.

Boys have diversified into different jobs.

The community reflects a continuation of caste-based traditional work, with limited upward mobility.

h. Jannath Nagar

Many work as domestic workers and maids.

Earlier, home-based businesses were common, but this has declined.
The shift indicates loss of self-employment avenues and increased dependency on low-wage labor.

i. Churmuri Bhatti

People here continue their traditional occupation of Churmuri (snack) selling.
This is a clear example of a sustained traditional livelihood, albeit with limited income potential.

j. Laxmisinganakeri

Women work outside the home as cooks, cleaners, and domestic helpers.

Men take up jobs as cleaners, centering laborers, and security guards.
The community is deeply entrenched in manual and unorganized labor, with both genders contributing.

k. Saraswatapura

The majority of residents in the settlement are engaged in informal and traditional livelihood activities. Many work as scrap collectors and dealers, which is a primary source of income for several

families. Some individuals collect and sell human hair, while others are small-scale vendors who sell spices, often to nearby villages. A few residents run small stationary shops within the area, and some work as auto drivers.

General Observations

Across all settlements, informal employment dominates.

Traditional livelihoods like bamboo craft, dairy farming, laundry, and churumuri making persist but are declining or poorly paid.

Women are heavily engaged in domestic work, often outside their homes due to lack of space or infrastructure.

There is a lack of skill training, formal employment opportunities, and social mobility, reinforcing economic vulnerability.

Have you noticed any changes in the weather in recent years, such as more heatwaves, irregular rainfall, or floods? How has this affected your daily life or work?

Hubballi Region

a. Jagadeesh Nagar

The rising temperatures cause health problems such as eye burning, headaches, and fever, partly due to poor drinking water quality. During the rainy season, local businesses suffer as activities slow down.

b. Myadar oni

Increased heat makes it difficult for residents to travel outside for work. Many feel the need for home-based business training to adapt to these challenges.

c. Kumbar oni

Hot weather negatively affects health and work. Contract workers who fall ill face not only financial hardship but also loss of income, as they cannot work during sickness.

d. Sadar sofa

Similar to Kumbaroni, residents report that heat impacts both health and work. Illness while on contract work leads to income loss and financial stress.

Dharwad Region

e. CBT Area (Myadar and Vegetable Vendors)

The intense sun heat causes breathing difficulties. During the rainy season, waterlogged grounds slow down business activities, leading to reduced earnings.

f. Gauli galli

Heatwaves cause grazing difficulties for cattle due to lack of proper grazing areas, resulting in reduced milk production during summer.

g. Dhobi Colony

Summer poses challenges for laundry work; residents wash clothes early in the morning to avoid the heat. Health issues such as burning eyes, sore throats, and back pain are common, compounded by increased water shortages.

h. Jannath Nagar

Vegetable vendors face significant losses in the heat, as vegetables spoil quickly. It becomes difficult to work outdoors after noon, with many suffering from heat-related fever.

i. Churmuri Bhatti

Employment decreases during the rainy season. There is inadequate storage and drying space for produce like rice, which lowers production and income.

j. Laxmisinganakeri

Temperature changes cause headaches and fatigue, making it harder for people to get to work and perform daily tasks.

k. Saraswatapura

Residents have observed noticeable changes in the weather in recent years. There has been a rise in temperatures, which often leads to health issues, especially among the elderly and children. Irregular and heavy rainfall is also a concern, as rainwater frequently enters houses—particularly those with tiled roofs—causing damage and discomfort. These climate-related issues directly affect daily life and livelihoods. During such periods, income levels drop as many informal workers, such as scrap collectors and vendors, are unable to work consistently due to weather disruptions.

Have extreme weather events (like heavy rain, storms, or droughts) caused damage to your homes, roads, or workplaces? How did you cope with them?

Hubballi Region

a. Jagadeesh Nagar

The settlement suffers from an inadequate drainage system, causing waterlogging in front of houses during heavy rains. This stagnant water becomes a breeding ground for mosquitoes, leading to increased health risks such as vector-borne diseases. The foul odors emanating from clogged and poorly managed drainage further degrade living conditions. Additionally, improper waste disposal practices contribute to environmental pollution and exacerbate health problems in the community. Residents face recurring illness and discomfort, especially during the monsoon season.

b. Myadar oni

Homes experience leakage and flooding during heavy rains, which severely disrupts daily activities and work, particularly for those engaged in bamboo craft. The community also faces challenges due to limited storage space for bamboo raw materials, which are susceptible to damage during the rainy season. This results in complete work stoppage for several months, causing financial hardship. The structural condition of houses often fails to provide adequate protection from harsh weather.

c. Kumbar oni

The drainage and sewage systems are highly inadequate. During rains, sewage water frequently floods residential areas, entering homes and causing foul smells and unsanitary conditions. The poor sanitation infrastructure leads to increased risk of waterborne diseases. The lack of regular cleaning and maintenance further compounds these issues, leaving residents vulnerable to health hazards.

d. Sadar sofa

Similar to Kumbaroni, the settlement faces recurring flooding of sewage water into homes during heavy rains. This not only creates unhygienic conditions but also damages household belongings. The absence of effective cleanliness drives or waste management programs worsens the problem, impacting overall quality of life.

Dharwad Region

e. CBT Area (Myadar and Vegetable Vendors)

The community heavily depends on bamboo handicrafts as a source of livelihood. However, the rainy season severely disrupts this work. Raw bamboo material availability declines because it gets spoiled by excess moisture. There is also no dedicated or proper storage facility to protect bamboo from rain damage. This forces artisans to halt work during the monsoon, leading to loss of income and economic insecurity. The heat during summer months also causes physical discomfort, adding to the challenges.

f. Gaul galli

The primary occupation is cattle rearing, but heavy rains cause damage to grasslands used for fodder. This affects cattle health and reduces milk production during the summer months. The lack of organized fodder storage facilities and drainage management further complicates cattle maintenance.

g. Dhobi Colony

The washing and laundry work, which forms the main livelihood, is severely affected during heavy rains. Waterlogging and flooding inside homes make it difficult to perform daily chores. The community experiences income loss as laundry work is disrupted. Additionally, extreme heat during summer leads to health problems such as eye irritation, sore throats, and back pain. Water scarcity worsens in the summer, intensifying hardships.

h. Jannath Nagar

Residents face frequent flooding due to increased rainfall, with both rainwater and sewage entering homes. This creates an unhealthy environment, especially hazardous for young children.

Employment opportunities diminish during the rainy months, sometimes for as long as three to four months, causing severe financial distress. Many households rely on small-scale vegetable trading, which is heavily impacted by spoilage and poor market conditions during extreme weather.

i. Churmuri Bhatti

Water intrusion during heavy rains causes structural damage to homes. Flooding poses health risks and disrupts daily life. Residents express urgent need for government intervention, including better drainage infrastructure and preventive measures to mitigate flood damage.

j. Laxmisinganakeri

Houses in this settlement suffer from leaks and water seepage during the rainy season. Despite improvements in roads and drainage, some homes are still vulnerable to water damage. This affects residents' comfort and safety during monsoons.

k. Saraswatapura

Extreme weather events, especially heavy rains during the monsoon season, have caused significant problems for residents—particularly for those working as scrap dealers. Materials like cardboard, paper and certain types of plastic often get soaked and damaged, making them unsellable. In some cases, stagnant rainwater collects around the scrap storage areas, leading to foul smells, mosquito breeding, and even the growth of fungus and frogs in the waste. Such conditions result in financial losses and pose serious health and hygiene risks. To cope, some try to cover their scrap with plastic sheets or store materials indoors, but space limitations and inadequate infrastructure make it difficult to fully protect their livelihoods.

Have you or others faced health issues related to climate change, such as waterborne diseases, heat exhaustion, or breathing problems?

Hubballi Region

a. Jagadeesh Nagar

Residents face multiple health problems related to changing climatic conditions. The quality of drinking water is poor and sometimes contaminated with worms, causing gastrointestinal illnesses. Waterborne diseases are common due to unsafe drinking water and poor sanitation. Heat exposure also aggravates these health concerns.

b. Myadar oni

Seasonal changes contribute to an increase in respiratory ailments such as colds, coughs, and fevers, especially during the rainy season when humidity and mosquito breeding rise. The community is vulnerable to illnesses linked to damp and wet conditions.

c. Kumbaroni and d. Sadar sofa

Fever, colds, and coughs are prevalent among residents. Many diseases stem from contaminated water sources and stagnant water that promotes mosquito breeding. Malaria and dengue risks are significant concerns due to poor drainage and sanitation.

Dharwad Region

e. CBT Area (Myadar and Vegetable Vendors)

Headaches and fevers are common, particularly during hotter months. Waterborne diseases spike during the rainy season when water contamination increases. To avoid illness, residents boil drinking water before consumption. Mosquito-borne diseases are frequent because of waterlogging and inadequate drainage systems.

f. Gaul galli

Heat and climate changes have affected livestock productivity, notably milk production from cows, indirectly impacting community nutrition and economy. The rise of packet milk in the market has also reduced traditional dairy business opportunities.

g. Dhobi Colony

During the rainy season, minor fevers, mosquito bites, malaria, and dengue cases rise sharply. Summer heat causes fever and general fatigue, particularly among young children. Health expenses increase significantly during these periods, putting economic pressure on families.

h. Jannath Nagar

Summer heat leads to frequent fever accompanied by vomiting and fatigue. Those engaged in physically demanding jobs such as in the auto industry are particularly affected by heat exhaustion and related health problems.

i. Churmuri Bhatti

Residents frequently suffer from asthma, colds, and fever. Working in the Mandakki Bhatti (a local processing unit) exposes them to dust and pollutants that exacerbate respiratory illnesses.

j. Laxmisinganakeri

The community emphasizes the need for rebuilding homes and improving drainage systems to reduce health risks. Cleanliness and sanitation improvements are also necessary to prevent disease outbreaks related to climate change.

k. Saraswatapura

During extreme heat, scrap collectors and spice sellers often struggle to work outdoors for long hours, leading to headaches, dizziness, and heat exhaustion. During the rainy season, stagnant water around homes and scrap storage areas creates a breeding ground for mosquitoes. This has led to an increase in mosquito-borne illnesses such as dengue, malaria, and viral fevers. In addition, damp conditions often cause colds, fevers, and other waterborne infections, further affecting the health and productivity of the community.

Summary

Across these areas, climate change has manifested in health challenges mainly through:

Waterborne diseases: Resulting from poor water quality, contamination, and inadequate sanitation infrastructure.

Respiratory issues: Including asthma and increased coughs, often linked to dust, pollutants, and changes in humidity.

Heat-related illnesses: Such as heat exhaustion and fever, especially affecting outdoor workers.

Vector-borne diseases: Increased mosquito breeding due to stagnant water causes malaria and dengue outbreaks.

Economic Impact: Rising health expenses strain family finances, particularly during hot and rainy seasons.

What sources of energy (like electricity, gas, wood, solar) do you use at home and for work? Are there any problems with cost, reliability, or access?

Hubballi Region

a. Jagadeesh Nagar

Most households use electricity for lighting and basic appliances. LPG gas is the primary fuel for cooking; however, many residents still rely on wood to heat water for bathing. There is no use of solar energy in this area. Residents expressed concerns about the rising cost of LPG gas, which affects their monthly budget.

b. Myadar oni

Electricity is available for household use. Firewood and wood stoves are widely used, especially for heating purposes. LPG gas is used for cooking but is supplemented by traditional wood stoves for heating water and other tasks.

c. Kumbaroni and d. Sadar sofa

Electricity supply is present in all homes, and LPG is commonly used for cooking. Wood stoves remain important for heating water and sometimes for cooking. This dual use of energy sources reflects reliance on both modern and traditional fuels.

Dharwad Region

e. CBT Area (Myadar and Vegetable Vendors)

Homes have access to electricity and LPG gas. Wood (including bamboo sticks) is also used alongside gas for heating water and other household needs. Solar energy is not used in this community. There are no specific complaints about reliability, but the mixed use of fuel indicates a cautious approach toward energy sources.

f. Gauli galli

While electricity is installed in all homes, wood stove usage is very high. LPG use is comparatively low, possibly due to cost or availability factors.

g. Dhobi Colony

Some homes lack electricity access, making residents rely on LPG gas and wood stoves. This energy insecurity affects their daily activities, especially for laundry and cooking.

h. Jannath Nagar

Electricity supply problems are common, causing difficulties in daily life. LPG gas is the primary fuel for cooking, but unreliable power supply is a frequent complaint.

i. Churmuri Bhatti

Electricity is unavailable in some households, leading to reliance on LPG and wood stoves for cooking and heating.

J Laxmisinganakeri

Electricity is installed in all homes, but wood stoves are extensively used. LPG usage remains low, possibly due to cost or accessibility issues.

k. Saraswatapura

Most households in the settlement use electricity as their primary source of power. However, a few houses still do not have proper electricity connections and rely on solar energy as an alternative. For cooking, families commonly use LPG cylinders, though some continue to use firewood due to affordability or availability issues. While electricity is generally accessible, power cuts occasionally occur. The cost of LPG cylinders can be a burden for low-income households, and those relying on firewood face health risks from indoor smoke, as well as challenges in sourcing the wood regularly.

Have you or your community made any changes to adapt to climate impacts or improve energy access? What kind of support (from government or others) would help?

Hubballi Region

a. Jagadeesh Nagar

No significant action has been taken to improve energy access or climate adaptation. A major concern is the improper sewage and waste management—people dispose of waste into drains, causing clogging, foul smells, and mosquito breeding, which worsens health issues. There is an urgent need for better sanitation infrastructure and waste management.

b. Myadar oni

There has been no government support to address energy or climate-related challenges. The decline in bamboo availability and competition from cheaper substitutes has led to a reduction in traditional bamboo crafts. Many works in construction-related jobs, and women engage in pounding areca nuts. The community faces irregular water supply (once every 8-10 days) and frequent house repairs. They express a pressing need for employment opportunities and infrastructure repairs.

c. Kumbar oni

No community-led adaptation steps have been taken; development is expected to come only through government intervention. People here, mostly Muslims, work in bricklaying, labor, small businesses, and construction. Poor drainage results in foul smells and vermin infestations, worsened by waste disposal into drains. Some households lack toilets, and road construction remains incomplete. Awareness about cleanliness needs to be increased.

d. Sadar sofa

Similar to Kumbaroni, no proactive steps have been made. Development depends heavily on government support. The community works in shops and construction, but poor sanitation and road conditions persist.

Dharwad Region

e. CBT Area (Myadar and Vegetable Vendors)

The community demands financial and technological assistance. There is a huge demand for bamboo, but lack of workspace and proper housing limits production. No measures have been taken to support them so far.

f. Gaul galli

No community or government support has been received. Training and support from the government could help development. The drainage system is poor, manure storage is insufficient, and cattle lack proper space. Closure of local water sources has caused water scarcity, and milk production suffers due to low prices.

g. Dhobi Colony

The community requests subsidized loans to buy washing machines, which would help commercialize their laundry business. Training in use of equipment is also desired to increase income. Unemployment remains a serious issue, and there is a need for equipment like ironing boards and washing machines.

h. Jannath Nagar

The community seeks government action to prevent sewage water from entering homes during rains, which would improve living and working conditions. Awareness of government schemes like Pradhan Mantri Awas Yojana is low, but people are willing to build houses if loan support is available.

i. Churmuri Bhatti

The area needs government help urgently. Buildings are in poor condition, lighting is inadequate, and health problems are widespread. There is a strong demand for solar energy solutions (solar panels, motors). They also rely on external rice supply for basic needs and ask for improved facilities.

j. Laxmisinganakeri

No community initiatives for climate adaptation or energy improvements have been reported. They rely completely on government intervention for any development.

k. Saraswatapura

Some households in the community have started using solar power as an alternative energy source, especially where electricity connections are unavailable or unreliable. During the rainy season, a few families try to protect their homes and scrap materials by using plastic sheets or temporary covers. However, these are short-term solutions and often not very effective. To better adapt to climate impacts and improve energy access, the community needs stronger support from the government and other agencies.

This includes Providing reliable electricity connections to all households, Distributing affordable solar energy systems, Improving drainage and waste management infrastructure, Offering subsidized LPG cylinders to reduce dependence on firewood, Training and financial aid to upgrade housing, especially for those with tiled roofs prone to leakage

FGD questions and responses – Related to Livelihood functioning

What is the nature of the livelihood activity that you or your community is engaged in?

Hubballi Region

a. Jagadeesh Nagar

In Jagadeesh Nagar of the Hubballi region, the primary sources of livelihood include informal sector jobs such as auto driving, vegetable vending, running small kirana shops, and working as construction laborers. Auto drivers begin their day as early as 6 AM, working long hours based on demand, while vegetable vendors source produce from wholesale markets and sell it locally. Construction laborers typically work from 8 AM to 5 PM. These occupations generate daily wages ranging from ₹300 to ₹500 or small profits, relying heavily on physical labor and interpersonal skills.

b. Myadar oni

In Myadar Oni, traditional bamboo craft has been the mainstay, but due to the scarcity of raw materials, many have shifted to alternative informal work such as cutting jobs and domestic labor. Bamboo artisans work from home when materials are available, earning ₹200–400/day. Domestic workers, mostly women, leave for work early and return by evening, earning ₹2,000–3,000 per household monthly. Craftsmanship and physical endurance are essential here.

c. Kumbar Oni

Kumbar Oni residents engage in carpentry, welding, tile laying, beedi tying, and garage work. Construction workers follow a routine of leaving early and returning by evening, while women often roll beedis from home, earning ₹150–200/day. Income mainly depends on contractors or middlemen, and livelihoods require skilled labor and manual dexterity.

d. Sadar sofa

In Sadar Sofa, people earn through construction activities like bricklaying and centering, or operate home-based businesses such as tailoring or cloth selling. Construction laborers earn ₹300–500 daily, while home-based business owners make modest profits of ₹100–200/day through local sales. Masonry and basic tailoring are the key skills required.

Dharwad Region

e. CBT area (Myadar & Vegetable Vendors

In CBT area (Myadar& Vegetable Vendors), livelihoods include bamboo craft, vegetable vending, and employment in private companies. Bamboo artisans work intermittently, earning ₹200–400/day when possible, while vegetable vendors earn ₹200–300/day by selling produce in local markets or near the bus terminal. These activities demand bargaining skills and craftsmanship.

f. Gauli Galli

Gauli galli is primarily engaged in dairy farming, a traditional occupation. Daily routines involve early morning milking, grazing, and selling milk door-to-door or to cooperatives. Income comes from milk sales at ₹30–40/liter, but earnings have declined due to rising competition. Cattle rearing knowledge is crucial for this work.

g. Dhobi colony

In Dhobi Colony, laundry work remains the primary source of income, with families involved in washing and ironing clothes. Their day starts early with washing, followed by ironing in the afternoon. They earn ₹10–20 per garment, amounting to ₹5,000–7,000 per month. The work requires specialized skills in washing and ironing.

h. Jannath Nagar

Jannath Nagar livelihoods revolve around domestic work and small-scale vegetable trading. Domestic workers leave home early and return in the evening, earning ₹2,000–3,000/month per household. Vegetable traders operate within local lanes, making small daily profits, often without access to larger markets.

i. Churmuri Bhatti

In Churmuri Bhatti, puffed rice (churmuri) production and vending is the main occupation. Early morning preparations are followed by street vending throughout the day, with daily profits around ₹200–300. Roasting and seasoning skills are essential here.

j. Laxmisinganakeri

In Laxmisinganakeri, livelihoods include domestic work by women and construction labor or security work by men. Women typically work as maids from 7 AM to 1 PM, while men work full-day shifts. Monthly income ranges from ₹2,000–4,000 for domestic work and ₹300–500 per day for labor. Household management and manual labor skills are essential.

k. Saraswatapura

Saraswatapura is primarily engaged in informal livelihood activities such as scrap collection and dealing, hair collection, spice selling, running small stationery shops, and working as auto drivers. A typical workday involves collecting recyclable materials like cardboard, plastic, and paper from various areas, sorting them, and selling them to dealers for income. Spice vendors prepare and sell their goods locally or travel to nearby villages. Income is generated through daily cash sales, with little to no formal contracts or steady employment. The work is labour-intensive and highly dependent on weather conditions—extreme heat and rain significantly affect productivity and

income, especially for scrap collectors whose materials often get damaged. These activities rely on basic resources like pushcarts, weighing scales, packaging materials, and in some cases, solar lighting due to unreliable electricity. The community depends on experience, traditional knowledge, and informal networks to sustain their livelihoods amidst various socio-economic and environmental challenges.

Across both Hubballi and Dharwad, most livelihoods are informal, unstable, and dependent on seasonal or market factors. Traditional skills are in decline due to resource shortages and competition, while women primarily engage in low-paying domestic or home-based work with limited economic mobility.

What are the key resources, materials, or services required to run this livelihood?

Hubballi Region

a. Jagadeesh Nagar

In the Jagadeesh Nagar area of Hubballi, livelihoods revolve around auto driving, vegetable vending, kirana shops, and construction labor. Auto drivers rely on daily fuel purchases and vehicle maintenance, but rising fuel prices and lack of credit for repairs strain their income. Vegetable vendors source produce early from APMC markets and face challenges such as transportation costs, lack of cold storage, and seasonal price fluctuations. Kirana shop owners purchase stock from wholesale markets like Rajendra Market but struggle with limited storage and competition from supermarkets. Construction laborers often receive tools from contractors, with costs deducted from wages. However, lack of proper safety equipment makes them vulnerable to injuries.

b. Myadar Oni

In Myadar Oni, bamboo craft, once a traditional occupation, is now in decline due to forest access restrictions and the high cost of raw bamboo bought through middlemen. Artisans lack storage facilities, making their stock prone to rain damage. Domestic workers here face unstable income and the absence of fixed wages or benefits. Cutting labor is also prevalent but low-paying and informal.

c. Kumbar Oni

Kumbar Oni residents engage in carpentry, welding, and beedi rolling. Carpenters and welders face high input costs and frequent power cuts that hamper productivity. Beedi workers, primarily women, are supplied with materials by contractors and paid per thousand beedis rolled. They often face exploitation through wage deductions for so-called “low quality” and suffer from health hazards due to prolonged exposure to tobacco dust.

d. Sadar sofa

In Sadar Sofa, construction workers share similar challenges with other areas, relying heavily on contractors. Home-based tailors source fabric in small quantities from Gandhi Bazaar, limiting their ability to benefit from bulk discounts, and thus operate on thin profit margins.

Dharwad Region

e. CBT area (Myadar Oni & Vegetable Vendors)

In the CBT area (Myadar Oni & Vegetable Vendors) of Dharwad, livelihoods mirror those in Myadar Oni, with bamboo artisans facing raw material issues and vendors dependent on APMC markets. The lack of direct links to farmers and high commissions to middlemen significantly reduce their profits.

f. Gauli galli

Gauli galli is centered around dairy farming. Farmers rely on fodder from local markets and private veterinary services, both of which are costly, especially during summer. The absence of grazing land adds to fodder expenses, and the milk prices set by cooperatives leave little room for profit.

g. Dhobi Coloby

In Dhobi Colony, laundry workers face inconsistent water supply and rising coal costs. The absence of mechanization forces reliance on manual labor, and they depend on intermediaries to secure bulk orders, reducing their earnings.

h. Jannath Nagar

Jannath Nagar residents, particularly women, engage in domestic work and vegetable vending, facing the same sourcing and market access challenges seen in Jagadeesh Nagar.

i. Churmuri Bhatti

In Churmuri Bhatti, puffed rice production involves procuring rice, oil, spices, and firewood. Seasonal price hikes and the lack of storage facilities prevent bulk procurement, thus limiting earnings.

j. Laxmisinganakeri

In Laxmisinganakeri, domestic workers and construction laborers operate under conditions similar to other localities—dependent on contractors, lacking formal benefits, and working with minimal safety provisions.

k. Saraswatapura

Saraswatapura, the key resources required for livelihoods in the community include recyclable materials like scrap metal, cardboard, paper, and plastic, which are collected from various local areas and sometimes from nearby neighbourhoods. Scrap collectors often source these materials directly by gathering discarded waste, relying on their knowledge of collection points and informal networks. For spice sellers and small shop owners, the products are procured from wholesale markets or local suppliers. Many community members face challenges in protecting their materials, especially during the rainy season when water damage can spoil collected scrap, causing losses. Intermediaries such as middlemen and dealers play a crucial role in the value chain by purchasing scrap and other goods from collectors and vendors, facilitating access to broader markets. However, limited storage space and inadequate infrastructure complicate the handling and safeguarding of materials, making the livelihood vulnerable to environmental and economic shocks.

Across all locations, several common issues persist. Artisans and vendors face exploitation from middlemen and inflated input costs. The absence of cold storage, warehouses, and proper workspaces leads to frequent spoilage and loss. Power cuts, water scarcity, and lack of direct market

access further reduce productivity and income. To address these systemic challenges, government and NGO interventions are needed—such as subsidizing raw materials (like bamboo and fodder), establishing cold storage units, and providing skill training to help workers and small entrepreneurs bypass exploitative supply chains and access markets directly.

How does your livelihood connect with other activities or sectors within the community? (E.g., farming, retail, manufacturing, etc.)

Hubballi Region

In the Hubballi region, livelihoods across neighborhoods such as Jagadeesh Nagar, Myadar Oni, Kumbar Oni, and Sadar Sofa are heavily embedded in informal economies, reliant on daily operations and fragile networks. In Jagadeesh Nagar, auto drivers depend on fuel stations, local mechanics, and a steady flow of commuters such as students and workers. Vegetable vendors source early morning produce from APMC markets and cater to households, street food vendors, and eateries. Construction laborers operate under informal contracts with real estate developers, cement suppliers, and hardware stores, making them susceptible to delays in payment and lack of job security. In Myadar Oni, declining access to raw bamboo has disrupted the traditional bamboo craft, pushing artisans into construction work. Some artisans still collaborate with wedding decorators or furniture shops, but most sell in local markets, often undercut by middlemen. Kumbar Oni features carpenters and welders servicing construction sites and garages, while beedi workers, predominantly women, remain tied to contractors who provide tobacco and control market access, leaving little room for profit or negotiation. In Sadar Sofa, construction workers are part of a wider informal real estate labor network, while tailors and cloth sellers depend on materials from Gandhi Bazaar and serve neighborhood shops and walk-in customers.

Dharwad Region

In the Dharwad region, neighborhoods like CBT, Gavaligalli, Dhobi Colony, Jannath Nagar, Churmuri Bhatti, and Laxmisinganakeri show similar patterns of informality and vulnerability. In CBT, bamboo artisans operate near transport hubs and markets, selling to traders and festival organizers, while vegetable vendors target households and food stalls. Gavaligalli's dairy farmers sell milk to households and sweet shops, sourcing expensive fodder from agricultural markets, further linking them to broader rural supply chains. Dhobi Colony’s traditional washermen serve families and small hostels, but income has dropped due to the spread of washing machines. Rising coal prices also eat into profits. In Jannath Nagar, domestic workers find employment via word-of-mouth in middle-class households, while vendors struggle against supermarket competition. Churmuri Bhatti’s vendors purchase rice from local mills, roast it using firewood, and sell to schools and roadside stalls; however, fluctuations in raw material prices reduce their margins. In Laxmisinganakeri, domestic work and construction labor mirror the trends in other regions, where women rely on community referrals for jobs and men depend on real estate contractors.

FGD questions and responses - Climate impacts on Livelihood

How has climate change affected your livelihood?

In the Hubballi region, climate change is already having a tangible and damaging impact on livelihoods. In Jagadeesh Nagar and Shikkaligartanda, auto drivers and street vendors face a sharp drop in income during extreme heat, often avoiding work during midday hours to escape the scorching sun. Heavy rains bring waterlogging, which blocks access roads and drastically reduces customer footfall. For construction workers, rain stops work entirely due to unsafe and wet conditions, while summer heat causes dehydration and fevers, further affecting their ability to earn.

In Myadar Oni, the traditional bamboo craft has been hit hard. Droughts and deforestation have reduced bamboo availability, and stored bamboo often gets damaged in monsoons, causing financial loss. As a result, many artisans have shifted to daily wage labor in the construction sector, which is itself vulnerable to rain-related work stoppages and heat stress.

In Kumbar Oni, welding and construction workers report unbearable heat that makes metalwork difficult and unsafe, while rains flood work areas and delay projects, leading to loss of daily wages. Beedi workers, mostly women working from home, face another climate-related challenge: high humidity in the monsoon spoils tobacco leaves, affecting the quality of beedis and reducing their earnings.

In Sadar Sofa, heavy rains cause flooding and sewage overflow, damaging tools and raw materials used by both construction laborers and small traders. These disruptions translate into lost workdays and additional costs for material replacement.

Moving to the Dharwad region, CBT's bamboo artisans suffer during both summer and monsoon. The extreme heat makes bamboo brittle, increasing breakage during crafting, while persistent rain prevents drying, bringing production to a standstill. Vegetable vendors also face losses due to spoilage of perishables like tomatoes and greens in high temperatures. Unpredictable rainfall patterns affect supply, causing price instability and shrinking profit margins.

In Gavaligalli and Attikolla, dairy farmers are experiencing fodder and water shortages. Droughts reduce grazing land, compelling them to buy expensive fodder, while heat stress in cattle leads to lower milk yields. When it rains heavily, stored fodder often gets spoiled, compounding their difficulties.

In Dhobi Colony, washermen suffer from both water scarcity and intense heat. During droughts, insufficient water delays their work, and in summer, high evaporation rates mean they need to refill water more often. Working under the sun also causes skin problems, dehydration, and body aches due to the physical strain.

In Jannath Nagar, domestic workers find tasks like cooking and cleaning physically more taxing during heatwaves. Vegetable vendors are impacted by erratic monsoons that disrupt sourcing, causing reduced supply and lower profits.

In Churmuri Bhatti, the puffed rice producers struggle during the rainy season, as they cannot properly dry the rice, which leads to reduced output. Firewood—essential for roasting—is also becoming more expensive due to deforestation, further straining margins.

Lastly, in Laxmisinganakeri, construction laborers report frequent breaks due to unbearable heat, which lowers their daily wages. Monsoon rains regularly flood their workspaces, delaying projects and cutting off income for days.

Climate change has significantly impacted the livelihoods of the community in Saraswatapura, especially those engaged in informal work like scrap collection and vending. Residents have noticed increasing temperatures, which cause heat-related illnesses such as headaches and dizziness, making it difficult to work long hours outdoors. During the rainy season, heavy and irregular rainfall often leads to water entering homes and scrap storage areas, damaging collected materials like cardboard and paper, and reducing their resale value. Flooding and stagnant water also promote the growth of fungi and attract mosquitoes, increasing health risks and causing frequent illnesses such as fevers and colds. These climate-related disruptions lead to reduced productivity and a drop in income, as workers are forced to take breaks or spend money on healthcare. Overall, climate change has introduced new challenges that affect the reliability and sustainability of their daily work.

Across all these neighborhoods, the impacts of climate change are consistent and severe: extreme heat reduces working hours, erratic rainfall disrupts supply chains and work schedules, and water scarcity and high humidity spoil materials and endanger health. Most workers report income reductions of 20–50% during extreme weather periods. Health issues such as heatstroke and waterborne diseases increase medical expenses. While some have attempted to adapt—such as bamboo artisans shifting to construction—these new livelihoods are also vulnerable to weather shocks.

To protect these communities, there is an urgent need for weather-resilient infrastructure like shaded markets and storage spaces, alternative livelihood training to diversify income, social protection schemes to compensate for climate-induced work loss, and sustainable water and energy solutions like rainwater harvesting and solar-powered tools. Without timely intervention, the livelihoods of Hubballi-Dharwad's urban poor may become unsustainable, pushing already marginalized families further into poverty.

How have climate events, such as storms, droughts, or heatwaves, impacted your supply chain (e.g., availability of materials, transportation, market access)?

Several livelihoods are facing serious challenges in sourcing materials. For instance, bamboo artisans in Myadar Oni and CBT report that prolonged droughts and deforestation have reduced bamboo availability, making it expensive and forcing many to abandon their craft. Beedi workers face issues during the monsoon when high humidity spoils tobacco leaves, affecting the quality and marketability of their products. Similarly, puffed rice producers in Churmuri Bhatti struggle to dry rice during the rainy season, reducing output and increasing spoilage.

How do disruptions like floods or storms affect the transportation of goods to markets? Flooding during the monsoon season severely disrupts transportation. In Jagadeesh Nagar and Sadar Sofa, waterlogging often makes roads impassable, preventing auto drivers and vegetable vendors from reaching their customers or sourcing fresh produce. These disruptions cause significant daily income loss. For construction workers, flooded sites mean halted projects and missed workdays. Additionally, laundry workers in Dhobi Colony face similar issues, as transporting washed clothes becomes difficult during heavy rains.

Are there periods when you are unable to conduct your livelihood activities due to climate disruptions?

Many workers report being completely unable to work during certain seasons. For example, bamboo artisans often stop production for months during the rainy season due to the inability to dry bamboo. Vegetable vendors lose stock quickly during heatwaves or face reduced supplies due to erratic rainfall affecting agriculture. Construction labourers commonly lose workdays during heavy rains, and auto drivers avoid peak afternoon hours during extreme heat to avoid health risks.

Have you experienced any changes in your income or profits due to climate change? Can you explain how these changes affect your financial situation?

Hubballi Region

a. Jagadeesh Nagar (Auto Drivers & Street Vendors)

Income reduces significantly during heatwaves as auto drivers avoid working during peak heat, and fewer commuters travel. During heavy rains, waterlogging limits mobility, reducing customers. Vendors also report spoiled goods due to humidity and reduced market activity, affecting daily sales.

b. Myadar Oni (Bamboo Craft)

Artisans here have suffered major income drops due to declining bamboo availability (caused by drought and deforestation). Unseasonal rains damage stored bamboo, rendering it unusable. Many have shifted to construction work, which is also disrupted by rain and heat, making income irregular and low.

c. Kumbar Oni (Welding, Beedi Work, Construction)

Welders and construction workers face income loss during extreme heat and rain. High temperatures reduce working hours, while flooding at sites halts projects. Beedi workers, mostly women, experience tobacco spoilage in humid weather, reducing their production quality and, therefore, earnings.

d. Sadar Sofa (Construction, Tailoring, Cloth Business)

Flooding and waterlogging during monsoons damage tailoring materials and construction tools. Frequent project delays due to rain directly reduce wages. Tailors also note fewer customers during harsh weather, impacting shop sales.

Dharwad Region

e. CBT Area (Myadar & Vegetable Vendors)

Bamboo artisans suffer from income loss during summer and monsoons—bamboo becomes brittle in heat and unusable in rain due to difficulty in drying. Vegetable vendors lose produce to heat spoilage and face price volatility due to erratic rainfall, reducing both supply and income.

f. Gauli galli (Dairy Farming)

Milk production drops in summer due to heat stress on cattle and water scarcity. Fodder becomes costlier during drought, increasing expenses. During floods, stored fodder gets damaged, further squeezing profits. These seasonal income dips are becoming more frequent.

g. Dhobi Colony (Laundry Work)

Income fluctuates sharply due to water shortages in summer and delays from heat exhaustion. Rainy seasons limit drying of clothes, reducing turnaround time and daily customers. Rising coal prices (due to scarcity) also reduce profit margins.

h. Jannath Nagar (Domestic Work, Vegetable Selling)

Domestic workers report that longer work hours in heat without proper rest or cooling leads to exhaustion, and some families temporarily suspend services during extreme weather. Vegetable vendors struggle to maintain supply and face competition from supermarkets when local produce fails due to rain disruptions.

i. Churmuri Bhatti (Puffed Rice Business)

Rainy weather completely halts production, as drying rice and roasting with firewood become impossible. Firewood prices are increasing due to forest pressure, and these factors combined cause long periods of income stagnation or loss.

j. Laxmisinganakeri (Domestic Work, Construction)

Construction laborers lose wages frequently due to site flooding and heat-induced fatigue. Domestic workers say they experience worsening working conditions and sometimes job loss when employers relocate or cut back during extreme events.

k. Saraswatapura (Scrap Collectors)

Many community members have experienced changes in their income and profits due to climate change. For example, during heavy rains, scrap dealers often lose income because materials like cardboard and paper get damaged and become unsellable. Scrap iron is sold at around ₹25 per kg, plastic at ₹7–8 per kg, and other materials at ₹8–9 per kg. When these materials get soaked or spoiled due to rain or flooding, dealers face direct financial losses. Extreme heat also reduces the working hours for scrap collectors and spice sellers, lowering their productivity and earnings. Moreover, demand for goods and services drops during adverse weather, exacerbating seasonal income fluctuations and creating greater financial uncertainty for family's dependent on informal livelihoods.

Across all these communities, climate change is leading to 20–50% income loss during peak weather events. These losses are often compounded by increased expenses (buying water, fodder, firewood, or replacing spoiled goods). As a result, workers are forced to take loans, switch to informal and unstable jobs, or reduce household spending, including on children's education and healthcare.

How has the health of your workforce or community been impacted by changing climate conditions?

Hubballi Region

a. Jagadeesh Nagar (Auto Drivers & Street Vendors)

Workers report a rise in heat-related illnesses such as dehydration, dizziness, and fatigue. During monsoons, waterborne diseases like diarrhea and skin infections are common due to prolonged exposure to stagnant water. Auto drivers especially suffer from respiratory issues because of traffic-related pollution worsened by heat.

b. Myadar Oni (Bamboo Craft)

Artisans working with bamboo report cuts and infections made worse by humid conditions. As many shift to construction labor, they experience heatstroke and joint pains from extended exposure to sun and rain. The lack of protective gear worsens their vulnerability.

c. Kumbar Oni (Welding, Beedi Work, Construction)

Welders face burn risks and eye strain, which intensify with higher temperatures. Beedi workers, working indoors without ventilation, suffer from chronic coughs, eye irritation, and worsened asthma symptoms due to humidity and tobacco dust. Construction workers report increased muscle fatigue and fever during summer.

d. Sadar Sofa (Construction, Tailoring, Cloth Business)

Tailors report sweat rashes and headaches during long hours in poorly ventilated workspaces. Construction laborers have suffered injuries from slips on muddy or flooded sites. Poor sanitation during floods has caused several cases of skin infections and fevers in this community.

Dharwad Region

e. CBT Area (Myadar Oni & Vegetable Vendors)

Bamboo artisans report breathing problems from prolonged exposure to bamboo dust, which worsens during dry heat. Vendors suffer heat exhaustion and body aches from standing for hours in open markets. Rain also brings fungal infections due to wet clothes and shoes.

f. Gauli galli (Dairy Farming)

Dairy farmers report body aches, dehydration, and fatigue due to long hours in the sun and lack of rest. Cattle too suffer from heat stress, reducing milk yields and affecting farmer income. Mosquito-borne illnesses like dengue have also risen in flooded areas.

g. Dhobi Colony (Laundry Work)

Washermen experience severe back pain, blisters, and skin infections from constant contact with water, especially during the rainy season. The use of coal for ironing in closed spaces adds to respiratory issues. Many report no access to medical insurance or regular treatment.

h. Jannath Nagar (Domestic Work, Vegetable Selling)

Domestic workers experience fatigue and dehydration from continuous household chores during summer. Standing over stoves in unventilated kitchens increases heat stress. Vendors complain of cough, colds, and joint pain during monsoon season due to wet clothes and poor shelter.

i. Churmuri Bhatti (Puffed Rice Business)

Workers face burns and breathing problems from exposure to firewood smoke. The humid environment during rains increases risk of fungal infections and allergic reactions from moldy rice. Continuous exposure has caused reduced stamina and frequent sick days.

j. Laxmisinganakeri (Domestic Work, Construction)

Construction laborers and domestic workers suffer frequent fevers, weakness, and headaches during summers. Flooding increases the risk of cholera, dysentery, and mosquito-borne diseases. Lack of health services nearby makes treatment costly and delayed, affecting work attendance.

k. Saraswatapura (Scrap Collectors)

The health of the community and workforce has been noticeably affected by changing climate conditions. There has been an increase in heat-related illnesses such as headaches, dizziness, and exhaustion among scrap collectors and spice sellers, especially during extreme heatwaves, which limits their ability to work for long hours. After heavy rains and flooding, mosquito-borne diseases like dengue and malaria have become more common due to stagnant water around homes and work areas. Respiratory problems and frequent colds also rise during the rainy season because of damp and unhygienic conditions. These health issues reduce the productivity of workers and increase medical expenses for families. To manage these risks, people try to avoid working during the hottest parts of the day or use simple protective measures, but access to proper healthcare remains limited, affecting their overall well-being and livelihood stability.

Common Trends & Follow-up Insights

Increased Health Burden: Almost all groups report a rise in health issues, especially during summers and monsoons.

No Formal Health Coverage: Most informal workers lack access to regular healthcare or health insurance.

Reduced Productivity: Health issues lead to missed workdays, lower output, and increased financial stress due to medical expenses.

Community Coping Strategies: Some use home remedies or visit local clinics, but costs are often unaffordable.

Has climate change caused damage to the infrastructure you rely on (e.g., markets, roads, storage facilities, etc.)?

Hubballi Region

a. Jagadeesh Nagar (Auto Drivers & Street Vendors)

Frequent flooding during monsoons leads to waterlogging on roads, making it difficult for auto drivers to operate. Damaged road surfaces and potholes increase vehicle wear and tear, raising repair costs. Street vendors often lose their wooden carts and umbrellas in storms, reducing their capacity to operate during extreme weather.

b. Myadar Oni (Bamboo Craft)

Lack of proper storage spaces means bamboo gets soaked and damaged during rains. Most artisans store raw material in open sheds, which collapse or leak during storms. Many have lost tools and finished goods, affecting their income. Inaccessible roads also delay transport of goods to markets.

c. Kumbar Oni (Welding, Beedi Work, Construction)

Workshops suffer roof leakages and flooding, especially in tin-roofed structures. Welding equipment has been damaged due to water seepage, leading to expensive replacements. Beedi workers operate in home-based units that often get damp and moldy, ruining raw tobacco stock.

d. Sadar Sofa (Construction, Tailoring, Cloth Business)

Construction sites are often waterlogged, with materials like cement and sand getting spoiled. Temporary shelters and storage rooms for tailors often collapse or leak, damaging machines and cloth. This leads to project delays and income loss.

Dharwad Region

e. CBT Area (Myadar & Vegetable Vendors)

Open market areas have no proper drainage, causing flooding and spoilage of vegetables. Bamboo artisans lack covered selling spaces, and their stalls are often washed away or damaged. Poor road conditions during the rainy season delay market access, especially for small traders.

f. Gauli galli (Dairy Farming)

Floods destroy fodder storage sheds and lead to contamination of water sources, increasing disease risk among cattle. Makeshift animal shelters collapse under heavy rain or winds, and dairy farmers lose equipment like milking buckets, feed containers, and occasionally livestock.

g. Dhobi Colony (Laundry Work)

Washermen rely on open washing spaces and basic storage for coal and clothes. These areas flood easily, damaging washed clothes and making coal unusable. Makeshift drying lines collapse in storms, forcing delays in deliveries and compensation for ruined clothes.

h. Jannath Nagar (Domestic Work, Vegetable Selling)

Street-side vegetable sellers report damage to carts and awnings during storms. Domestic workers who live in low-lying areas experience water entering homes, leading to temporary relocation and work absenteeism. This further disrupts income stability.

i. Churmuri Bhatti (Puffed Rice Business)

Rain damages the firewood storage, making it hard to roast rice. Processing units often have mud floors, which get slippery and unsafe during rains. There are also reports of contaminated rice stock due to damp conditions and poor sealing.

j. Laxmisinganakeri (Domestic Work, Construction)

Poor drainage leads to flooded streets and construction sites, halting work for days. Domestic workers lose access to reliable transport as autos and buses avoid submerged roads. Materials left in open construction zones are often washed away or spoiled.

k. Saraswatapura (Scrap Collectors)

Climate change has caused noticeable damage to the infrastructure that the community in Saraswatapura relies on for their livelihoods. Roads in the area often become flooded or badly damaged during heavy rains, making it difficult for scrap collectors and vendors to transport their goods to markets. Storage facilities for scrap materials are frequently exposed to waterlogging and leaks, especially in houses with tiled roofs, causing spoilage and loss of valuable materials like cardboard and paper. These damages not only increase costs for repairing or replacing equipment but also disrupt daily work routines and reduce income opportunities. The lack of proper drainage and maintenance worsens the situation, making it harder for residents to sustain their livelihoods during extreme weather events.

Are there any investments you've made in your livelihood that have been lost or devalued due to climate change?

Hubballi Region

In Jagadeesh Nagar and Shikkaligartanda, frequent flooding and waterlogging during monsoons cause severe disruptions for auto drivers and street vendors. The poor condition of roads, with potholes and damage, increases vehicle maintenance costs and reduces the ability of drivers to operate efficiently. At Myadar Oni, bamboo craft artisans face significant losses as bamboo raw materials and finished products get soaked due to the lack of proper storage. Open sheds frequently collapse or leak during storms, and many artisans have lost tools, directly affecting their incomes. In Kumbar Oni, workshops used for welding and beedi work suffer from leaking roofs and flooding, damaging expensive welding equipment and raw tobacco stocks stored in damp conditions. Similarly, in Sadar Sofa as well.

Dharwad Region

At CBT, Medar Oni and vegetable vendors face open markets with poor drainage, causing flooding that spoils vegetables and damages bamboo stalls. Flooded roads delay market access, particularly harming small traders. In Gavaligalli and Attikolla, dairy farmers lose fodder storage sheds and milking equipment due to storms, and contaminated water sources increase cattle disease risks. Makeshift animal shelters often collapse under heavy rains, further impacting livestock health and productivity. Washermen in Dhobi Colony rely on open washing spaces that flood easily, damaging clothes and coal supplies, which delays deliveries and forces compensation payouts. In Jannath Nagar, vegetable sellers lose carts and awnings during storms, while domestic workers living in low-lying areas face water entering their homes, causing temporary relocation and absenteeism that disrupt income stability. The puffed rice business in Churmuri Bhatti suffers from damaged firewood storage and unsafe, slippery mud floors, while rice stock often becomes contaminated due to dampness.

FGD questions and responses - Coping Strategies and Adaptation

Most people across the Hubballi and Dharwad regions have not been able to significantly adapt their livelihoods to the changing climate conditions. Despite facing frequent disruptions from flooding, storms, and waterlogging, many continue to work through adverse weather simply because there are no alternative job opportunities available. They have not modified their working methods or implemented new strategies to cope with extreme weather events. For example, auto drivers, street vendors, artisans, and daily wage workers persist in their regular activities even during monsoons, often risking damage to their equipment and health. Due to the lack of resources, knowledge, or support systems, these communities are largely forced to endure the impacts rather than proactively adapt. This absence of effective coping mechanisms highlights the urgent need for intervention through training, infrastructure improvements, and livelihood diversification programs to help build resilience against climate-related disruptions.

Are there any support systems in place to help you and others in your community adapt to the effects of climate change? (e.g., government programs, NGO support, community networks)

Most people in the Hubballi and Dharwad regions report having little to no knowledge about government schemes or external support programs that could help them adapt to climate change impacts. Due to a lack of awareness and information, many have not accessed any financial, technical, or social assistance from government agencies, NGOs, or other organizations. Additionally, there is a widespread perception that only those with strong political connections or influence are able to benefit from available schemes, leaving the most vulnerable without support. This gap in outreach and equitable access means that many community members continue to cope with climate-related disruptions on their own, without the necessary resources or guidance. To improve adaptation, they express the need for greater awareness campaigns, transparent and inclusive distribution of aid, accessible training programs, and practical resources such as improved infrastructure, financial aid, and technical support tailored to their specific livelihood challenges.

What do you think could be done at the community, local level to reduce the impacts of climate change on your livelihood?

To reduce the adverse effects of climate change on livelihoods in Hubballi and Dharwad, several community and local-level interventions could be highly effective. Addressing extreme heat, which reduces working hours and causes health problems for auto drivers, vendors, and construction workers, could involve creating shaded rest areas and promoting heat-resilient work schedules. For erratic rainfall that causes flooding, work stoppages, and supply chain disruptions affecting bamboo artisans, vegetable vendors, and dairy farmers, improved drainage systems and flood-resistant market infrastructure are essential. Water scarcity impacts dhobis, dairy farmers, and street vendors by increasing costs and delaying work; therefore, community-based water management initiatives such as rainwater harvesting and better access to clean water sources would help mitigate these challenges. Additionally, increased humidity leads to spoilage of raw materials for beedi workers and puffed rice makers; local efforts to provide better storage facilities with moisture control would protect goods from damage. Overall, strengthening local infrastructure, improving awareness, and fostering

community cooperation in resource management and disaster preparedness would enhance resilience and reduce livelihood vulnerabilities to climate hazards.

FGD questions and responses – Energy Dependencies

Hubballi Region

a. Jagadeesh Nagar

Residents involved in livelihoods such as auto driving, kirana shops, and vegetable vending primarily rely on electricity and LPG. Autos run on LPG, while shops and vendors need electricity for lighting, fans, and refrigeration. Electricity interruptions during rainy seasons disrupt their operations, especially for cold storage and early morning or evening sales. High electricity costs are a burden for small shopkeepers. There is limited exploration of renewable energy due to cost and awareness. Energy dependency directly affects their daily income, especially during outages. In such times, work slows down or stalls completely. Expanding businesses is difficult without reliable electricity, and there is little local support or incentives for energy access improvements.

b. Myadar Oni

Bamboo artisans use electricity for lighting and for operating small power tools like drills and cutters. Raw bamboo is sourced from rural areas, but the work depends on a stable electricity supply, which can be disrupted during storms. These interruptions delay production, particularly when fulfilling large orders. High electricity bills and lack of efficient tools raise production costs. Solar energy has been considered, but affordability and lack of technical knowledge are challenges. No specific energy support is available from the government or community. Energy disruptions limit production capacity and the ability to scale up operations.

c. Kumbar Oni

This area hosts welders, tile layers, and centering workers who rely heavily on electricity to power welding machines and tools. Lighting is also needed during early morning or indoor construction tasks. Power cuts during rain or grid failures affect productivity, sometimes forcing workers to delay or cancel tasks. Electricity costs are high, and energy inefficiencies come from outdated equipment. Renewable energy options are not widely considered due to financial and technical constraints. No government incentives are known locally. Energy unreliability makes it hard to meet client deadlines, affecting job opportunities and income stability.

d. Sadar Sofa

Cloth businesses and construction workers here depend on electricity for sewing machines, lighting, and occasionally water pumping at sites. While contractors typically handle energy for large construction projects, home-based tailors face the brunt of electricity outages, which delay order completion. Power cuts during rains are common. Operational costs are high due to electricity use. Solar energy has not been adopted widely due to lack of subsidies or technical knowledge. There's minimal local support for improving energy infrastructure. Energy reliability is key for expanding these small businesses, and without it, growth is restricted.

Dharwad Region

e. CBT Area (Myadar Oni & Vegetable Vendors)

Vegetable vendors require electricity for lighting during early hours and evenings, while bamboo artisans use electricity for crafting. Power cuts affect market timing and production schedules. Some use battery-powered lights as backups. Firewood is not typically used here, and fuel is sourced locally. High costs and inefficiencies, such as reliance on old wiring and bulbs, increase operational burdens. Renewable energy is considered impractical due to setup costs and space limitations. There's no significant government support. Energy-related challenges reduce competitiveness in peak hours and limit the ability to operate consistently during monsoons.

f. Gauli galli

Cattle rearers rely on electricity for water pumps and occasionally for dairy storage. During power outages, especially in summer and monsoon seasons, watering livestock becomes difficult. They sometimes use manual labor or diesel generators. Inefficient energy use, like outdated motors, adds to costs. Renewable solutions like solar-powered pumps are known but unaffordable. No local schemes assist with energy upgrades. Energy shortages reduce dairy output and income, and expanding to larger-scale dairy operations is hard without reliable electricity and water access.

g. Dhobi Colony

Laundry workers depend on electricity for washing and lighting, and coal or LPG is used for ironing. Energy needs are crucial and time-sensitive. Frequent power outages disrupt washing schedules, and rising coal prices add to financial stress. During rains, drying clothes is a challenge, and many rely on backup manual washing. Renewable energy is largely unexplored due to awareness and cost barriers. Government or community support is lacking. Energy disruptions cut down daily earnings and prevent business scaling, especially during festive or high-demand seasons.

h. Jannath Nagar

Vegetable sellers use electricity for lighting during evening sales, while construction workers typically rely on contractors for energy needs. Sellers face difficulties during power cuts as evening business slows. High bills and inefficient lighting raise costs. No backup systems are used due to cost. Renewable energy remains out of reach financially. There are no visible schemes to support energy improvements. Energy dependency affects sales windows, especially during peak hours, and limits the ability to grow businesses like vegetable vending.

i. Churmuri Bhatti

Street vendors making churmuri use firewood for roasting puffed rice and electricity for lighting and preparation. Firewood is sourced from local markets, but price fluctuations and availability issues occur. During the rainy season, wet firewood and power cuts hinder preparation. Firewood is inefficient and polluting, yet alternatives are unaffordable. Renewable energy is considered unrealistic due to the small scale of operations. No incentives or support are available. Energy-related barriers, especially during events or festivals, impact income and limit expansion opportunities.

j. Laxmisinganakeri

Domestic workers depend on electricity and other appliances available in the homes they work in. Their own homes rely on firewood for cooking and heating water, especially in the absence of gas. Power cuts during the rainy season affect their home routines, although not their workplace directly. There is no direct link between energy and income, but unreliable electricity affects their comfort and daily chores. Renewable energy is not considered due to low income. There's no local energy support. While not energy-intensive, energy access indirectly affects their quality of life and ability to balance household and livelihood duties.

k. Saraswatapura

The community in Saraswatapura relies on a mix of energy sources for their livelihoods, including electricity, LPG for cooking, firewood, and in some cases, solar power where electricity access is limited. Energy is needed primarily for household use and small-scale vending activities, such as cooking spices or running small stationary shops. However, electricity supply is not fully reliable, with some households lacking access and others facing intermittent outages, which affect daily work routines. Climate-related events like heavy rains and storms sometimes disrupt fuel deliveries and electricity supply, increasing dependence on alternative sources like firewood or solar. High energy costs, especially for LPG and electricity, put financial pressure on families and small businesses. Some community members have adopted solar energy as a partial solution, but challenges remain around affordability and consistent access to technology. Currently, there is little government or local support specifically targeting energy access improvements for livelihoods. Energy shortages or disruptions reduce productivity and profitability, limiting the ability of individuals to expand their work. During power outages or extreme weather, people often adjust by reducing working hours or switching to less energy-dependent activities, but this also limits income generation. Overall, energy dependency is a critical factor influencing the competitiveness and resilience of livelihood activities in the community.

Apart from all these issues, people living in underserved urban settlements face numerous health challenges due to inadequate housing, poor sanitation, and limited access to clean water and healthcare services. Women in these communities are especially vulnerable, often experiencing problems such as delayed menstruation and poor menstrual hygiene. These are primarily the result of a lack of privacy, insufficient sanitary facilities, and irregular water supply, all of which make it difficult to maintain hygiene and increase the risk of infections and other reproductive health concerns.

Men in these communities also face seasonal health problems, particularly during the summer months. High temperatures, overcrowded living environments, and poor sanitation contribute to infections in the genital area, including skin and fungal infections. In addition to these health concerns, the lack of health education, irregular waste disposal, and exposure to polluted environments further aggravate the situation. Overall, the absence of basic infrastructure and limited awareness about hygiene continue to contribute to a wide range of health problems for both women and men in these marginalized urban populations.

Detailed key informant interviews – During reconnaissance survey

Key insights from discussion with Mr. Hanumanth G Hariwan, Local political party member

Stakeholder Access & Institutional Channels: Highlighted the importance of engaging the HDMC leadership—particularly the Commissioner, Mayor, and corporators—for data access and field coordination. Emphasized that the Commissioner's office be central for gathering slum-level administrative data.

MLA and Political Landscape: Identified Mr. Arvind Bellad, MLA of Hubballi-Dharwad West, as a key figure overseeing many slum neighborhoods in Dharwad. The settlements under his constituency include Jannath Nagar, Nehru Nagar, Gollara Oni, Haveri Peth, and Anjaneya Nagar—suggested as focus areas for fieldwork. Out of these five slums, three were shortlisted for focused study.

Potential Field Contacts: Shared that community leaders and corporators like Satish Surendrasa Hanagal (Ward 32), Ashok Murugeshwaragi (Ward 33), and others (e.g., Ashok Kwalikar, Mahesh Chandri, Satya J, Mahesh G) are prominent in slum areas like Ramalingeshwara Nagar, and can be mobilized to facilitate access.

Detailed Settlement Characteristics:

- Ramalingeshwara Nagar: Spans 36 acres, has an estimated population of 10,000. The Karnataka Slum Development Board counts 6,732 individuals here. The area includes a mix of housing types, predominantly semi-pucca and pucca houses.
- Ambedkar Nagar (Kunchikoror plot): Known for communities engaged in pig rearing.
- Pendar Oni: Muslim-majority locality with a mix of informal occupations.
- Lakshmisinganakeri: Characterized by a high number of scrap dealers.

Livelihood Patterns:

- Heggere: Residents are primarily engaged in auto driving, construction labour (Gaondi), centring and loading/unloading work (chakdi and amalika).
- Ramalingeshwara Nagar: Occupations include kirana store owners, barbers, construction workers, auto and car drivers, and scrap dealers. Many also participate in informal vending—especially in the weekly rotating APMC market (operating across different parts of the city each week).

Infrastructure Development & Gaps:

- The Commissioner's team noted substantial improvements in infrastructure in many notified slums—such as paved roads and better water access.
- However, they admitted that there is no updated slum database, and called for a fresh survey to accurately capture current demographics, service access, and settlement status.

Referral for Further Coordination:

- Mr. Hariwan recommended connecting with Mr. Praveen, Assistant Executive at the Slum Development Board, for updated data and history of development interventions.

Key Insights from Discussion with Dr. S.V. Hanagodimath – Centre for Multi-Disciplinary Development Research (CMDR)

Institutional Expertise: CMDR has conducted extensive research on regional imbalances in Karnataka, using methods like index construction (e.g., based on the Global Hunger Index). Their work includes analyzing fiscal allocations to rural and urban local bodies and tracking how state finance is distributed.

Urban–Rural Funding Dynamics: Although the Urban Local Bodies (ULBs) like HDMC have higher own-source revenues, they receive only 25% of state-transferred funds, compared to 75% for Rural Local Bodies (RLBs).

Data-Driven Allocation Model: CMDR uses panchayat-level deprivation indices—based on indicators like literacy rates, agriculture participation, and irrigated land—to influence fund allocations. A similar framework could help assess and prioritize urban informal settlements for targeted support.

Experience with Marginalized Groups: Their recent impact assessment of the SCSP/TSP scheme (Scheduled Caste Sub-Plan and Tribal Sub-Plan) spanned 7000 households in 13 districts, reflecting a deep understanding of socio-economic vulnerabilities among marginalized communities.

Identified Slum Clusters for Focus: Shared a list of key settlements across Dharwad and Hubballi:

- Dharwad: Jannath Nagar, Nehru Nagar, Gollara Oni, Haveri Peth, Anjaneya Nagar.
- Hubballi: Heggere, Doddakere, Krishna Colony, Pendar Oni.
- Suggested covering 2–3 key sites in each city for in-depth comparative analysis.

Livelihood Specifics in Settlements: Provided community-level insights:

- Gauli Galli (Dharwad): Dairy-based economy—milk production, informal milk networks, and cattle rearing.
- Jannath Nagar: Dominated by scrap dealers and construction workers.
- Churmuri Bhatti (near CBT): Manual puffed rice producers.
- Myadar Oni: Bamboo artisans engaged in selling baskets, ladders, and other hand-crafted bamboo items.
- Lakshmisinganakeri: Another prominent scrap trading area.

Potential Stakeholders for Further Engagement: Recommended several knowledgeable individuals for deeper institutional and political perspectives:

- Prof. Kadekodi (Former CMDR Director – for academic and policy-level insight)

- Mr. Arvind Bellad (MLA – already involved in development planning)
- Mr. Jagadeesh Shettar (MP) and Mr. Naintara Naik (specialist in water access and urban services)

Key Insights from Discussion with Mr. Praveen, AEE – Karnataka Slum Development Board

Slum Notification and Criteria

- Slums are notified based on the presence of kutcha or semi-permanent housing, lack of basic amenities, and majority populations engaged in the unorganized sector.
- Slums can exist on government, private, or municipal lands, but private land ownership complicates official recognition—a major issue for several unnotified slums in Hubballi-Dharwad.

Historical Development of Slum Services

- The first water schemes for slums date back to 1972, even before the Slum Board's official establishment in 1975.
- Successive housing schemes such as VAMBAY, RAY, PMAY, and HUDCO have improved access to housing, with PMAY Phase I near completion and Phase II to begin in 2026.

Livelihood Development Efforts

- Past efforts under IHSDP (2008) included Information, Education and Communication (IEC) campaigns to promote home-based livelihoods, especially for women (e.g., paper bags, incense sticks).
- However, impact was limited due to:
    - Short-term participation (certificate-seeking)
    - Lack of capital, raw materials, and market access
    - Space constraints within slum homes for productive activity

Upgraded Housing and Gated Communities

- Notable examples like Bellad Nagar have been created as low-income housing colonies under PMAY using land provided by ULBs. These aim to offer improved living conditions, sanitation, and water access for the homeless or relocated slum dwellers.

Unrecognized Slums and Land Rights

- Earlier slum declarations were easier because landowners rarely objected—this has changed due to rising land values.
- A recent policy reform in 2022 granted Hakku Patras (property documents) to residents, improving tenure security.
    - Example: Jannath Nagar residents received legal ownership with a condition—they can only sell land after 10 years of official notification.

Infrastructure and Sanitation Improvements

- In most notified slums, the HDMC has provided concrete roads, drainage, and drinking water connections.
- Under Swachh Bharat, household toilets were added post-2014. Prior to that, public toilets were constructed under the National Bharat Abhiyan (2013).

7. Ongoing and Planned Developments

- Example: Chandrakant Project – 676 housing units planned, 336 already constructed, under Phase II of PMAY.
- Each year, a few slums are taken up for 15-year development plans, aiming for full infrastructure coverage during that period.

8. Site-Specific Observations

- Ramalingeshwar Nagar is built on 36 acres of government land with an estimated population of 10,000 and a housing mix of 50% pucca and 50% semi-pucca homes.
- The loss of tree cover due to infrastructure projects like Bus Rapid Transit (BRTS) has contributed to increased urban heat.
- Waterlogging is a recurring issue in sloped areas where road levels are higher than home foundations—especially in Tejaswi Nagar, Attikolla, Rajiv Gandhi Nagar, and Ram Nagar.

The broad project objectives were introduced by INDE team followed by a brief discussion regarding contacting and reaching out for stakeholders particularly the commissioner, Mayor and corporators of respective wards.

Few inputs from him were about the wards of Dharwad and Hubli, and he mentioned that this specific information can be addressed with the commissioner and Mayor at Hubli Dharwad Municipal Corporation (Location - Ward No 47, Sir Siddappa Kambli, Road, Lamington High School Rd, beside Mini Vidhan Soudha, Deshpande Nagar, Hubballi, Karnataka 580020)

Arvind Bellad who is the MLA of Hubli-Dharwad west constituency is in charge of most of Dharwad's neighbourhoods which have slums settlements at Jannath Nagar, Nehu Nagar, Gollara Oni, Haveri Peth and Anjaneya Nagar.

These 5 slums have been shortlisted in that 3 will be selected. Mr. Hanumanth mentioned that he can get the network of the people working in those areas.

Hubli has slums at Ramalingeshwara Nagar which has 36 acres and 10,000 population (6732 numbers as per Karnataka Slum Development Board). Kunchikoror plot slums have selling pigs, and the name of the slum is Ambedkar Nagar.

Satish Surendrasa Hanagal a ward council member was mentioned for ward number 32. Ward 33 has Ashok Murugeshwaragi, few other people named Ashok Kwalikar, Mahesh Chandri, Satya J, Mahesh G were mentioned. Total 4 prominent area leaders are present who are located in Ramalingeshwara Nagar.

Inputs about Heggere was broadly mentioned that people are engaged in works like auto drivers, Gaondi (construction workers), centering work, Chakdi works(mostly carts), Amalika (luggage labourers).

Pendar Oni has muslim communities. Ramalingeshwara nagar is 36 acres and has Kirani shops (small family-owned shops), Gaondi (construction and cantering work), Barbers, centring work, Auto and car drivers, Scrap dealers and vegetable sellers in a weekly market - APMC market (Each week has one area covered, sometimes on corporation road). Lakshmisinganakeri which is located in ward 17, has scrap dealers.

Key Insights from Discussion with Prof. Kadekodi – CMDR, Dharwad

Energy Access and Urban Poverty

- Urban poor communities in Dharwad face a multi-dimensional poverty trap, especially in terms of energy access and traditional livelihood sustainability.
- Reliance on biomass fuels like firewood and dung cakes remains high, particularly in marginalized communities such as Gauli Galli, exposing residents—especially women—to chronic indoor air pollution and health risks.

Gauli Galli – Livelihood Decline in Dairy Sector

- Gauli Galli, once prosperous due to its dairy economy, has seen economic decline.
- Earlier, milk distribution was linked to temples and informal networks. With the breakdown of institutional support, households are now limited to direct, local sales with low profit margins.
- Despite economic marginalization, milk production continues, primarily at a subsistence level.

Renewable Energy Opportunities

- Solar lighting in cattle sheds was suggested as a strategic entry point for improving animal care, safety, and productivity.
- Solar cookers could reduce firewood dependency, but designs must be adapted for dense urban areas with limited sunlight exposure.
- Any energy transition must be deeply contextualized, integrated with livelihood systems, and treated as a long-term intervention rather than a one-off installation.

Churmuri Bhatti – Stagnant Traditional Livelihood

- This settlement relies on manual puffed rice (churmuri) production, continuing despite availability of modern alternatives elsewhere.
- The persistence of traditional methods is less about cultural choice and more about lack of viable economic alternatives.
- Spatial limitations and low affordability hinder introduction of cleaner technologies or mechanization, though the area provides a test case for upgrading traditional livelihoods without erasing them.

Myadar Oni – Decline in Bamboo-Based Livelihoods

- The Myadar community, known for bamboo ladder and basket making, faces severe livelihood stress due to:
    - Declining demand for bamboo products (due to plastic)
    - Inconsistent bamboo supply
    - Lack of dedicated workspaces
- Earlier attempts to relocate them to Kayaka Nagar (artisanal settlement) failed due to poor adoption and inadequate support.
- There's potential to revive artisanal livelihoods through market linkages and product innovation—but only if done with community-sensitive design.

Karwar Road Settlement – Representative of Urban Marginalization

- The settlement along Karwar Road exhibits classic signs of urban slums—insecure housing, low basic service access, and fragile livelihoods.
- Identified as a potential pilot site to test climate-adaptive and energy-focused interventions in low-income urban settlements.

Youth and Education as Change Agents

- Schools like Kalkeri Sangeet Vidyalaya could serve as platforms for solar awareness, training youth in climate and energy literacy.
- Such interventions could embed long-term behavioral change by engaging younger generations from marginal communities.

Systemic Intervention Over Pilot Projects

- Any climate or energy-related intervention (especially solar) must be designed as a sustained system that fits into the rhythm of daily life and livelihood.
- Without continuous engagement and community ownership, one-off technology installations are unlikely to succeed.

Key Insights from Discussion with Mr. Arvind Bellad – MLA, Hubballi-Dharwad West

Improved Living Conditions in Slums

- Over the last decade, slums across Hubballi-Dharwad have seen significant infrastructure upgrades, especially in roads, drainage, sanitation, housing, and 24x7 water supply, driven by schemes like PMAY and Smart City Mission.
- These developments have resulted in improved living conditions, reduced household stress, and increased productivity among low-income families.

Rising Incomes through Construction Work

- Many slum residents now engage in construction-related work (centering, labour, plastering) for 15–20 days a month.

- Some households reportedly earn over ₹1 lakh/month collectively, due to multiple family members contributing.
- This shift has raised purchasing power and led to better asset ownership.

Persistent Land Tenure Insecurity

- Despite infrastructure improvements, many residents still lack formal land tenure, which prevents them from investing in or selling property.
- For example, Dhobi Ghat settlement remains in legal limbo due to its location in a catchment zone, despite being inhabited for decades.
- Lack of tenure also increases vulnerability to displacement and weakens residents' bargaining power.

Tenure Reforms through Slum Board

- A new policy under the Karnataka Slum Development Board is offering property rights (Hakku Patras) for residents on government-owned land in lower charges.
- Registration fees are significantly lowered (₹4,000–₹6,000), making formal land ownership more accessible and reducing dependence on informal power brokers.

Rural-Urban Governance Gap

- Several settlements within HDMC jurisdiction (e.g., Navalur, Suthagatti, Rayapur, Tadisinkoppa, Gamangatti, Nuggekere) have a rural character but fall under urban governance, excluding them from rural welfare schemes like MGNREGA.
- These areas lack appropriate urban employment support, creating a policy vacuum.
- Targeted schemes for such transitional settlements are urgently needed.

Gendered Livelihood Patterns

- Women in many of these settlements are engaged in informal occupations such as housekeeping, vending, and dairy-related work.
- In Navalur, livelihood diversity among women was noted as a strength.
- Gender-sensitive policy design and occupational mapping can improve outcomes.

Livelihood-Specific Challenges and Opportunities

- In Dohar Kakaya Nagar, leather workers produce bags and accessories, but lack of market access hinders income generation.
- A practical suggestion was to connect local artisans with seasonal demand, such as producing school bags during academic year openings, which are currently imported.

Livelihood-Focused Infrastructure

- A proposed 4-km cattle corridor from Gauli Galli to Nuggekere aims to reduce commuting stress and improve safety for dairy workers and their animals.

- This is part of a broader road development plan supporting traditional livelihoods with purpose-built infrastructure.

Integrated Poverty Alleviation Strategy

Mr. Bellad emphasized that meaningful poverty reduction must involve progress in four key areas:

- Education – Beyond enrolment, quality education must be ensured.
- Housing – Durable two-bedroom units for low-income families.
- Healthcare – Improved access and financial protection via schemes like Ayushman Bharat
- Marriage Costs – Provision of community marriage halls to reduce financial pressure on families.

Key Insights from Small Group Discussion – Ms. Jyothi Patil, corporator & Others

Livelihood Overview in Gauli Galli and Attikolla

- Gauli Galli is home to the Gauli community, engaged in cattle rearing and milk sales, including door-to-door supply (e.g., to areas like Yemmekere).
- Women from the community work as domestic workers in nearby localities like Malamaddi and CB Nagar.
- Cow dung is used in multiple ways: fuel (dung cakes/kull), natural fertilizer (gobbara), and to make incense sticks (agarbatti).

Myadar Community and Bamboo Livelihoods

- The Myadar community, skilled in bamboo craftsmanship, is located in Myadar Oni.
- They make baskets, bamboo ladders, and ice cream sticks, sourcing bamboo from Dandeli, Haliyal, Ulavi, and Annavar.
- They face raw material shortages and lack market space, due to both supply chain changes and urban regulations.

Pourakarmikas and Construction Workers

- Communities involved in sanitation work (Pourakarmikas) and construction labour live in Marmaddi, Nehru Nagar, Jamwan Nagar, Lakshmisinganakeri, Rajiv Gandhi Nagar, and Jannath Nagar.
- These occupations remain critical sources of income but are often tied to low wages and poor job security.

Climate Variability Observed

- Summer temperatures now rise up to 42–43°C.
- Notable increase in heat over the past 2–3 years, post-COVID.

Urban Expansion and Vulnerable Communities

- Rapid urban expansion (e.g., new layouts like Nehru Nagar, Anjaneya Nagar) is driving deforestation and rising temperatures.
- These areas are inhabited by marginalized communities like Alwara Samaja and Siddagadu Siddaru, traditionally engaged in hunting or temple related occupations.
- Many transitioned from temporary shelters to semi-formal housing, still facing infrastructure gaps.

Traditional Livelihoods Under Transition

- In Gollara Oni, a few Churmuri Bhattis (puffed rice units) are still active, though livelihoods are gradually shifting.
- Ramalingeshwar Nagar has benefited from Smart City upgrades, with improved basic services.

Key Insights Small Group Discussion – Myadar Community, Nehru Nagar

Livelihood Based on Bamboo Craft

- The Myadar community in Nehru Nagar traditionally specializes in bamboo-based craftsmanship—including making baskets, bamboo ladders, and ice cream sticks.
- Bamboo work has been a core source of income for generations, deeply tied to their identity and cultural practices.

Disruption in Bamboo Supply

- Earlier, bamboo was supplied through the Forest Department from regions like Dandeli and Haliyal.
- Around 10 years ago, the Forest Department shifted focus to supplying bamboo to paper mills, causing a chronic shortage for the community.
- Currently, the community relies on informal networks to source bamboo from places like Sankeshwara, Nippani, and Gauli Galli, often at higher costs.

Loss of Market Spaces

- Previously, they sold products in street markets near KCC Bank, which offered good footfall.
- Due to urban restrictions and removal of informal vending spaces, access to traditional sales locations has significantly declined, reducing visibility and income.

Lack of Working Space

- The community lacks proper workspaces. Most artisans are forced to work on the roads outside their homes.
- Bamboo weaving requires a minimum of 10x10 feet of working space due to the length of raw materials (up to 5 feet long).
- Absence of dedicated artisan zones affects both productivity and dignity of work.

Market Decline Due to Plastics

- The rise of plastic products has decreased demand for traditional bamboo items.
- This shift has directly impacted their economic viability, pushing some members to diversify into agarbatti (incense stick) production as an alternative livelihood.

Community Size and Structure

- The Myadar community here includes around 25 households, comprising nearly 200 people.
- A central old shrine (devi) located in the middle of the road holds spiritual importance, reflecting the strong cultural cohesion of the community.

Table 21 List of primary engagement undertaken for the study

Type of engagement	Number	Person/location
Small Group discussions	**2**	Mr. Jyothi Patil – Corporator interview
		Myadar Community at Nehru Nagar - Dharwad
Key Informant Interviews	**6**	Mr. Hanumanth G Hariwan – local politician
		Mayor and commissioner of HDMC
		Mr. Dr. SV Hanagodimath CMDR
		Mr. Praveen – Slum Board AEE
		Prof. Kadekodi - CMDR
		Mr. Arvind Bellad, MLA
Transect Walk	**11**	Lakshmisinganakeri
		Jannath Nagar
		Anjaneya Nagar
		Nehru Nagar
		Masalgdar Oni
		Jagadeesh Nagar Heggere
		Maruthi Nagar Heggere
		Kumbar Oni
		Sadar Sofa
		Kolikere Plot
		Saraswatapura
		Pendar Oni
House hold Survey	**179**	In selected areas and slums
FGD's	**13**	In selected area and slums