Drivers of climate change vulnerability at different scales in Karachi

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Karachi, a city of around 20 million people, is facing a crisis of governance that is reflected in the poor state of service delivery, and unplanned and unsustainable urbanisation. The city's development shortcomings, and attendant social, economic and environmental challenges, have created vulnerabilities at different scales that are likely to exacerbate the impacts of climate change-related weather events taking place within the city and elsewhere in the country. This report is a step towards identifying and highlighting some of these vulnerabilities (and linkages), in the hope of initiating a discussion and prompting action on climate change adaptation measures.

Contents

Acronyms

ACCCRN	Asian Cities Climate Change Resilience Network
CDGK	City District Government Karachi
EIA	Environmental Impact Assessment
EPA	Environment Protection Agency
– FAFood and Agriculture Organisation	
GDP	Gross Domestic Product
HBFC	House Building Finance Corporation
IEE	Initial Environmental Examination
IPCC	Intergovernmental Panel on Climate Change
KBCA	Karachi Building Control Authority
KDA	Karachi Development Authority
KMC	Karachi Metropolitan Corporation
KPT	Karachi Port Trust
KWSB	Karachi Water and Sewerage Board
– LGLocal Government Ordinance	
MGD	Million Gallons Daily
– MPGMaster Plan Group of Offices	
MQM	Muthaida Quami Movement
NFC	National Finance Commission
– NGNon-Governmental Organisation	
O&M	Operations and Maintenance
OPP–RTI	Orangi Pilot Project–Research and Training Institute
p/ha	Per hectare
PPP	Pakistan People's Party
PEPA	Pakistan Environmental Protection Act
SDG	Sustainable Development Goals
SITE	Sindh Industrial and Trading Estate
SLGA	Sindh Local Government Act
SSWMB	Sindh Solid Waste Management Board
WSP	Water and Sanitation Programme

Summary

Background

According to the Intergovernmental Panel on Climate Change (IPCC), climate change impacts will influence flooding of settlements and infrastructure, heat-related deaths, and food and water shortages in urban South Asia. This is of immense significance for Karachi, where a very large majority of its population lives in informal settlements in poorly designed housing with inadequate services. The report's warning is that climate change impacts will be amplified for those "*who live in informal settlements and in hazardous areas and either lack essential infrastructure and services or where there is inadequate provision for adaptation*" (Revi *et al*., 2014, p.538).

Given Karachi's economic linkages with, and importance for, the rest of Pakistan, it is hard to overstate the adverse consequences for the rest of the country when Karachi is negatively affected by climate change. However, as Karachi is struggling to manage and deliver basic services for approximately 20 million residents, dedicating scare resources to plan for uncertain future climate change-related events is seen, by decision makers, as a low priority. But there is no escaping the fact that the effects of climate change – such as the heatwave event of 2015 – will only intensify in the coming years, and those responsible for managing Karachi will have to start paying attention to ways of coping with and adapting to the grim reality of climate and related weather uncertainties.

The purpose of this report is to initiate an informed conversation on adaptation, by highlighting some of the drivers of vulnerability, which, hopefully, can provide some avenues for investigation under a more detailed, multi-stakeholder vulnerability assessment and climate change adaptation strategy formulation in the future.

Karachi's urbanization

Karachi's major shortcomings in realizing the full potential of urbanization, similar to the achievements of some cities in Southeast Asia, have been its inadequate provision of infrastructure and basic urban services along with insufficient and poor quality housing, and a failure to deal with pollution. There are three interrelated trends that are contributing to the vulnerability of low-income groups in Karachi: densification, poor governance and in-migration.

Densification

Availability of land in a suitable place and at affordable cost has not been possible in Karachi because there is no enforcement of the by-laws or zoning regulations that restrict or control speculation. As a result, the land market is driven primarily by the anticipated value of land, and areas most suitable for low-income housing development are appropriated for commercially lucrative projects. Housing demand in Karachi is 120,000 units per year. The formal sector supplies an average of 62,000 units, another 32,000 are in *katchi abadis (*informal settlements) and the remaining 26,000 are accommodated through densification of existing plots/ structures. Case studies of settlements in the inner-city areas of Karachi and previously peripheral areas show that densities have increased from 600 persons per hectare to 4,000 persons per hectare, and from 200 persons per hectare to 1,195 persons per hectare, respectively. The extensive and unplanned densification is giving rise to a number of physical and social problems and is adversely impacting the city's ecology.

Poor governance

Karachi is beset by a fragmented and disempowered local governance structure, which is most visible in the dysfunctional nature of core urban systems and services. Karachi is a non-Sindhi-speaking capital city of a Sindhi majority province, while most of the city's population comprises non-Sindhi migrants. Given its economic predominance, major political entities want to exercise control over the city. The Sindhi-speaking majority of the province cannot control the city except through a highly centralized system, while the migrant majority of the city can only exercise control over it through a decentralized governance system. This tussle lies at the heart of governance dysfunction in Karachi, which has given rise to a situation where universally accepted functions of local government have been appropriated by the provincial government. In itself, this appropriation might not have been problematic were it not for the ineptitude of the provincial government on multiple counts, which has raised concerns about its capacity and intent. This situation raises serious questions about building an effective climate change adaptation capacity in an institutional environment where effective urban governance and basic services delivery have become intractable.

In-migration

Karachi is a migrants' city. It has been the destination for, and home to, millions within and outside Pakistan – both economic migrants and refugees fleeing war and natural disasters and their aftermath – for decades. Consequently, migration has played an important role in shaping Karachi's urban development trends and its socioeconomic and political character. Of the estimated 3.35 million 'illegal' immigrants in Pakistan, 75 per cent (or 2.5 million) are settled in more than 100 migrant-concentrated residential areas in Karachi. Living conditions in these settlements are mostly cramped, and services such as clean drinking water, sanitation and solid waste disposal are hard to come by. Research from the region suggests that processes and structures of unplanned rapid urbanisation, environmental change and social exclusion reinforce urban vulnerability for migrants. Poor skills and limited livelihood assets, accompanied by weak enforcement of workers' rights, contribute to migrants' vulnerability. Also, migrant workers have very limited opportunities to reduce their vulnerabilities and participate in risk reduction and development planning. Moreover, adverse impacts of climate change on agriculture and food production in the rural hinterland will have serious consequences for Karachi, not only in terms of increasing food insecurity but also for the potential increase in the number of involuntary migrants to an already crowded city struggling to provide basic services for its existing population. This means climate change adaptation and risk reduction will need to evolve as an interlinked process, incorporating adaptation strategies for both rural areas and the city.

Survey findings

As a counterpoint to the discussion on vulnerability at the institutional level – in terms of governance challenges and the politics guiding it – four working-class settlements were selected to assess drivers of vulnerability at the community level. The survey showed that: people are living 'hand-to-mouth' with little or no financial resources to draw on in times of need; they are experiencing poor living conditions and/or inadequate nutrition, both of which contribute to household vulnerability; the poorest and most affected (including recent flood affected) are the most socially and economically vulnerable; poor services are an indicator of government apathy towards the poor; and there are low levels of trust/faith in government in the event of natural disasters.

Conclusions

The report conclusions are centred on: enhancing capacity, capability and political support for organizational and institutional reforms; bringing state land into the low-cost housing market; private and public sector cooperation in health and housing provision; raising awareness of and technical support for adopting simple principles of heat avoidance and the use of traditional designs and materials; and establishing horizontal linkages between various organisations of the state, academic institutions and NGOs dealing with urban environmental issues as well as climate-related (hazardous) events. The key point going forward is that adaptation does not necessarily require discrete measures unrelated to current development challenges. Addressing shortcomings in basic services delivery and empowering local government and urban development institutions are necessary preconditions for meaningful climate change adaptation.

1 Introduction

1.1 Background

For more than two decades, there has been a crescendo of warnings issued by climate scientists and researchers about the likelihood and severity of adverse climate change impacts on cities around the world – especially in developing countries. Based on growing evidence of predicted climate scenarios coming to pass, international development and policy institutions warn of the need for cities to plan and prepare for anticipated climate change if the worst outcomes are to be avoided. But many of the cities in the developing world – Karachi included – lack the financial and technical resources and institutional arrangements that such planning and preparation demands.

Karachi, the subject of this report, is struggling to manage and deliver basic services for its approximately 20 million residents, and hence dedicating scare resources to plan for uncertain future events is seen as a low priority by decision makers. But there is no denying that the effects of climate change – such as the heatwave event of 2015 – will only intensify in the coming years and those responsible for managing Karachi will have to start paying attention to ways of coping with and adapting to the grim reality of climate and related weather uncertainties.

Going forward, the key point is that adaptation does not necessarily require discrete measures unrelated to current development challenges. Rather, effective climate change adaptation will necessarily be premised on robust and flexible systems and institutions that are responsive to basic needs of the present, and an empowered and informed citizenry that can be active partners in the development process. In short, addressing shortcomings in basic services delivery and empowering local government and urban development institutions are necessary preconditions for meaningful climate change adaptation.

The process whereby institutions and key decision makers come to terms with the need to plan and prepare for impending climate change realities is going to be a long and resource-intensive one. The purpose of this report is to initiate an informed conversation on the topic of adaptation by highlighting some of the drivers of vulnerability, which hopefully can provide some avenues for investigation in a more detailed, multi-stakeholder vulnerability assessment and climate change adaptation strategy formulation in the future.

1.2 Objectives

- Analyse the interplay between governance (or lack thereof) and the drivers of urbanisation that are shaping socioeconomic vulnerability of low-income communities in the city – in terms of secure housing and availability of basic urban services – and how future climate change events are likely to exacerbate current difficulties being faced by low-income households.
- Identify some steps that the city/government will need to adopt to address sources of people's vulnerabilities and (thereby) increase their resilience to future climate-related shocks (events).

1.3 Methodology

In phase I of the project, a desk review of the literature on urban climate change vulnerability and related topics was carried out and four low-income settlements were selected for a community survey. All four settlements were visited with a view to understanding their layout, the lived experience of people residing there, and the social, economic and related issues and challenges facing the residents. The assessment was made through informal interviews, observation, photographs, identification of socio-physical features and the mapping of key infrastructure. In the second phase, a survey of 200 households was carried out (50 households chosen at random in each of the four settlements). Prior to the start of the survey, the questionnaire was refined and adjusted through field testing. Interviews with key stakeholders affiliated with government, civil society and academia were conducted after completion of the survey to solicit perspectives on the challenges and issues facing Karachi, and on issues facing people living in low-income and poorly serviced communities in particular, and the steps being taken by the city to address their development challenges.

1.4 Structure of the report

Section 2 is based on existing literature dealing with climate change impacts, while Section 3 discusses urban vulnerability and presents a broad framework for assessing this. Section 4 presents a brief profile of Karachi; Section 5 discusses the state of basic services and the vulnerability this engenders; and Section 6 discusses specific city trends that are increasing the vulnerability of residents and the city as a whole. Section 7 presents a sketch of the four settlements and the main development challenges they face. Section 8 analyses the results of the field survey and Section 9 presents conclusions and recommendations.

2

Climate change in South Asia

The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) states that South Asia's climate – like that of other regions – is already changing and the effects are already being felt. According to the report, the future will have widespread impacts on society and its interaction with the natural environment. For urban areas in South Asia, climate change impacts will influence flooding of settlements and infrastructure, heat-related deaths, and food and water shortages (IPCC, 2014). Of immense significance for Karachi – where a very large majority lives in low-cost and poorly designed housing with inadequate services (*The News*, 2016) – is the report's warning that climate change impacts will be amplified for those "*who live in informal settlements and in hazardous areas and either lack essential infrastructure and services or where there is inadequate provision for adaptation*" (IPCC, 2014, p.18).

Given the interdependence between countries in today's world, the impacts of climate change on resources or commodities in one place will have far-reaching effects on prices, supply chains, trade, investment and political relations in others. Thus, climate change will progressively threaten economic growth and human security in complex ways in the South Asia region and across the world (IPCC, 2014). One example is the flooding in Bangkok during 2011, which affected global computer and motor vehicle supply chains for several weeks (Masahiko Haraguchi and Lall, 2014). While Bangkok is far more integrated with global commerce than Karachi, its example does give an idea of how impacts of extreme climate events in one geographical location can have far-reaching consequences in faraway places.

In broad economic terms, a report by the Asian Development Bank estimates that climate change will have widespread impacts on societies in South Asia and on their growth and development prospects, to the extent of reducing GDP by two per cent per annum (Ahmed and Suphachalasai, 2014). According to another estimate, climate impacts could cost South Asia 9–13 per cent of GDP a year by 2100 (Ellis and Roberts, 2016). Given Karachi's economic linkages with and importance for the rest of Pakistan, it is hard to overstate the adverse consequences for the rest of the country of the effects of climate change on the city.

BOX 1: KARACHI HEATWAVE

In 2015, a short and intense heatwave killed more than 1,300 people in Karachi (BBC, 2015). Most of those who died or suffered heat strokes belonged to low-income households. Exact statistics are not available but newspaper and anecdotal accounts suggest that the affected included men and women, old and/or infirm and those who had no option but to be outdoors – such as daily wage earners. The city authorities were completely unprepared to deal with the sudden onset of a nearly week-long heatwave, while public sector hospitals found themselves unexpectedly overwhelmed by a surge of people affected by the heat.

While heat and high humidity were ostensibly the main reasons for the high number of deaths, other accentuating factors such as cramped and airless living conditions in low-income settlements, prolonged power outages and it being the month of Ramzan – in which many people who do not fast are reluctant to be seen as not fasting and hence are unlikely to ask for or drink water in public – probably all played a part in compounding the outcome. Future climate change is likely to bring about more frequent occurrences of heatwaves, which will primarily affect the poor and vulnerable more severely.

The IPCC report has observed the following trends in South Asia's climate and made predictions, as summarised below.

Climate-related disasters: The Asia region as a whole experienced the most weather- and climate-related disasters in the world between 2000 and 2008 and suffered the second highest proportion (almost 30 per cent) of total global economic losses. In terms of loss of life, the risk of deaths due to flooding is highly concentrated in Asia (IPCC, 2014).

Temperature trends and projection: Warming has occurred at a country scale across most of South Asia over the 20thcentury and into the 21st, and there have been more temperature extremes. It is also likely that the number of cold days and nights has decreased and the number of warm days and nights has increased across most of Asia since 1950. Heatwave frequency has also increased since the middle of the 20th century in large parts of Asia, and the frequency of hot days in South Asia is likely to increase further in the future (IPCC, 2014).

Rainfall trends: Rainfall trends, both increasing and decreasing and including extremes, have been observed in different parts of Asia, and more frequent and heavy rainfall days are predicted over parts of South Asia. The future influence of climate change on tropical cyclones is likely to vary by region, but there is agreement among models that rainfall will probably be more extreme near the centres of tropical cyclones making landfall in South Asia. An increase in extreme rainfall events related to monsoons is very likely in the region, and more frequent and heavy rainfall days are projected over parts of South Asia (IPCC, 2014).

Sea level rise: The rate of sea level rise in the future will very likely exceed that experienced in the past three decades. The magnitude of sea level rise by the century's end implies significantly increased risks for South Asia's coastal settlements as well as for coastal economies, cultures and ecosystems, particularly if combined with changes in the frequency or intensity of cyclones. Low-lying, densely populated coastal areas in South Asia will be at increased risk of storm surge, putting many millions of people at risk (IPCC, 2013). The main risks facing urban South Asia from above-mentioned climate change will likely include:

- **Damage to infrastructure, livelihoods and settlements** from urban floods linked to extreme rainfall events, rising sea level, sea surges and cyclones (Revi *et al*., 2014).
- **Water and food shortages** linked to rising temperatures, extreme temperatures and drying trends. As a result, the urban poor could experience rises in food prices, as occurred globally and in urban areas of Pakistan during 2007–2008. In such a scenario, certain categories of urban dwellers, such as urban wage labourers, women, children and the elderly would be particularly vulnerable (Revi *et al*., 2014).
- **Increased morbidity and mortality due to heat** (rising and extreme temperatures) will become a major public health concern across Asia. This considerable threat could undermine the progress that South Asian countries have made in tackling disease, malnutrition and early deaths, together with gains in agricultural productivity. The incidence of many diseases increases at higher temperatures because pathogens and parasites can multiply faster. Dengue and Japanese encephalitis outbreaks in South Asia have been associated with temperature rise and frequency of rainfall (Revi *et al*., 2014).

The urban poor, on whom the burden of climate-sensitive diseases is already high, are most likely to be affected (Kovats and Akthar, 2008). In urban areas where child mortality is high, extreme temperatures have led to more deaths. Mental disorders and post-traumatic stress syndrome have also been observed in disaster-prone areas. Research indicates that precipitation in Karachi has been decreasing over the last four decades, while temperatures have been rising, a trend that is likely to continue as climate change impacts intensify (Sadiq and Qureshi, 2010).

While it is hard to predict the precise impacts of climate change on any one region or location over a period of time, it is clear that societies and economies at all levels everywhere will have to prepare for the impending climate uncertainty. Adapting to an uncertain climate may be difficult to achieve, but it is essential if the worst possible outcomes are to be avoided. If cities are to make progress in paving the way for climate-resilient urban development, they must improve their understanding of natural hazards and the climate change-induced risks they face, and the factors that influence vulnerability. The focus of this report will be on discussing the latter in the context of Karachi (see Annex 1 for details of the climate change/adaptation terms used by the IPCC).

3

Urban climate change vulnerability

Natural hazards caused by extreme weather events can be particularly damaging to urban areas due to the interdependencies of their networks (Tromeur *et al.*, 2012). Extreme weather-related events in urban centres can also contribute to environmental health problems (for example, health outcomes due to flooding or the spread of disease vectors due to high temperatures) and may concentrate risk in vulnerable locations due to reasons related to densities (Dodman, 2009). Vulnerability is commonly defined as a function of natural hazard risk, the level of exposure of physical assets and people to those risks, and their adaptive capacity to plan for and respond to systemic shocks.

The extent to which weather-related hazards impact people in any given area depends to a great extent on both the magnitude of climate events, trends and extremes and also the vulnerabilities of exposed communities and/or systems (ie, livelihoods, infrastructure, governance systems, land use patterns, systems of social exclusion and ecosystem services) (IPCC, 2014). Class, income levels, gender, ethnicity and age all contribute to vulnerability of social groups through features such as the quality of housing, location and access to services or social support networks (Satterthwaite *et al.*, 2007).

BOX 2: IPCC DEFINITIONS OF VULNERABILITY AND ADAPTATION

Vulnerability is "*the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes*", while **adaptation** is explained as "*adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.*"

Source: Adapted from IPCC, 2014.

Assessing vulnerability to climate change is important for identifying overall risks, vulnerable areas, sectors and social groups. It is critical for cities to better understand these risks and how they vary across time scales and spatially across geographical locations, and how they can affect city-level development sectors such as infrastructure, municipal finance and other public and private functions and assets (Parikh *et al.*, 2014).

Decisions taken about city development, for example large-scale infrastructure investments, have implications for the present and the future. Infrastructure and associated institutional mechanisms that have implications for the long term are referred to as 'lock-ins' (Byravan, 2016). Hence, cities need to plan for immediate and long-term development on the basis of possible climate change impact lest they get 'locked in' to a situation where undoing or reversing the effects of such investments proves difficult, costly or impossible. Thus, fundamental decisions about development in a city such as Karachi need to go beyond imperatives of economic growth, and consider surviving and recovering from extreme events, living in a warmer world and inclusivity given that an overwhelming majority of its inhabitants are poor.

3.1 Framework for vulnerability assessment and strengthening resilience

In the face of climate conditions that will become increasingly variable, dynamic and uncertain, local planners will face difficulty in accessing and/or using historical climate data or future projections to identify likely impacts of climate change. And so, instead of focusing on discrete measures to adapt to specific perceived future climate risks, it may be more effective for cities to consider the problem as one of building resilience. This would mean, among other measures aimed at climate-proofing infrastructure and services, setting up an open web-based platform for accurate and timely monitoring and relaying of information that has a bearing on the city's capacity to respond and adapt to climate change. Such a monitoring mechanism would need to be housed in a research-oriented institution that has the ability to craft climate data into actionable recommendations for decision makers at different levels.[1] For instance, city authorities would have less cause not to be prepared if actionable information about an impending heatwave or heavy precipitation event had been provided well before the event.

The definition of resilience used by the IPCC when applied to the urban context means "*the ability of urban centres (and their populations, enterprises and governments) and the systems on which they depend to anticipate, reduce, accommodate or recover from the effects of a hazardous event in a timely and efficient manner*" (Revi *et al*., 2014, p.547). In its original conception, 'resilience' implies strength and resistance, but in its more recent usage in ecology, socio-ecological systems, disaster management and urban sustainability, resilience has come to emphasize flexibility, learning and change. In the case of urban climate adaptation, an approach based on resilience encourages practitioners to consider innovation and change to aid recovery from stresses and shocks that may or may not be predictable.

Although there is some disagreement in the literature on cities and climate change about how to define and measure resilience, there is broad consensus that cities must become resilient to a wider range of shocks and stresses in order to be prepared for climate change; and that efforts to foster climate change resilience must be bundled with efforts to promote urban development and sustainability (Leichenko, 2011).

The Asian Cities Climate Change Resilience Network (ACCCRN), funded by the Rockefeller Foundation, developed a resilience framework that was used for adaptation planning and implementation in ten Asian cities. The framework provides a detailed and comprehensive template for assessing vulnerability and building resilience, and describes three elements of urban resilience that can be operationalised for local planning, namely: systems, agents and institutions (described below).

This report has used key elements of the framework to highlight the main drivers of vulnerability at the scale of institutions, where we look at local governance structure, the politics that make it what it is and the resulting outcomes in terms of service delivery and urban development issues that it has generated; and at the level of communities, in terms of their coping strategies and perceptions of service delivery and climate change. In other words, we have focused on *agents* (specifically low-income households and geographically distinct communities) and *institutions* (main local government structure and service provision agencies) because we believe that it is at these two levels that key drivers of vulnerability operate.

[1] The Master Planning Department of the City District Government of Karachi, as it existed in the past, would have been a good candidate for taking on the role of an information clearing house of climate change data for urban planning and management but, stripped of its powers and resources as it currently stands, the Department cannot take on such a role.

3.1.1 Systems

Cities require high levels of (often interdependent and interconnected) infrastructure to deliver essential services. They are also connected at multiple levels to other man-made and natural systems – such as canals delivering water; energy generated using distant hydropower sources and conveyed through a lengthy transmission system; or food production – which, in turn, depend on varied ecosystem services. At the global level, cities are connected to trade and investment patterns that have a bearing on local employment, livelihoods and the supply of goods and essential items such as food and medicines. It is therefore important to acknowledge that many of the systems that underpin a city's functioning lie outside the control of city authorities and that interconnectedness between systems means that disruption in core urban systems (for example, transport, water and sanitation, energy, shelter or food supply) can cause failures in linked systems (Tyler and Moench, 2012).

BOX 3: SYSTEMS

Characteristics that contribute to providing a new way of thinking about systems and building their resilience include:

Flexibility and diversity: Ability to perform essential tasks under a wide range of conditions and convert assets or modify structures and processes.

Redundancy, modularity: Spare capacity for contingency situations to accommodate increasing or extreme pressures or demand.

Safe failure: Ability to absorb sudden shocks or the cumulative effects of slow-onset stress in ways that avoid catastrophic failure.

Source: Adapted from Tyler and Moench, 2012.

3.1.2 Agents

Agents or actors in urban systems include individuals (for example, consumers); households (as units for consumption, social reproduction, education, capital accumulation); and private and public sector organisations (government departments or bureaus, private firms, civil society organisations) (Tyler and Moench, 2012). Resilience in relation to hazard assessment and disaster risk reduction in cities is premised on flexibility and diversity, and on capacity for learning and innovation (Leichenko, 2011). Hence, the role of agents is an important pillar of urban climate resilience assessment and strengthening.

In order to work effectively with agents, it is important to recognise the opportunities and constraints they face and the incentives to which they respond. Agent behaviour can be changed, but depending on the circumstances this may not be any easier than modifying complex technical infrastructure systems (Tyler and Moench, 2012).

The main stock of asset categories that people draw upon to sustain and advance their well-being include financial assets (wealth or access to credit), physical assets (house, possessions), natural assets (land or rights to ecosystem services such as fish or water), social assets (family or clan networks) and human assets (health and skills) (Moser, 2006).

Agents' ability to act is facilitated by adequate resources and by access to supporting systems (and institutions), including the ability to access resources provided by other agents. Agents may develop these capacities through experience, gradually acquiring a repertoire of responses to stresses and shocks. The awareness of hazards, the ability to learn new responses and the ability to acquire information needed to assess hazards and outcomes are important elements of resilience capacity of agents. Another sign of resilience is people's ability to self-organise and engage in collective behaviour towards a common objective – be it repairing a local drain, solving a water supply problem or assisting community members affected by a natural disaster (Tyler and Moench, 2012).

BOX 4: AGENTS

Capacities of agents that reflect (or can be enhanced to strengthen) resilience:

Responsiveness: Capacity to organise; ability to identify problems, anticipate, plan and prepare for a disruptive event or failure and to respond quickly in the aftermath.

Resourcefulness: Capacity to mobilise various assets and resources, including means to access financial and other assets for self and other agents and systems through collaboration.

Capacity to learn: Ability to internalise past experiences, avoid repeat failures and innovate to improve performance and learn new skills.

Source: Adapted from Tyler and Moench, 2012.

3.1.3 Institutions

Institutions are the third element of the resilience framework. These are defined as "*social rules or conventions that structure human behaviour and exchange in social and economic interactions*" (Tyler and Moench, 2012, p.315). These are created to "*reduce uncertainty, maintain continuity of social patterns and social order and to stabilise forms of human interaction in more predictable ways*" (Tyler and Moench, 2012, p.315). Institutions can be formal or informal, overt or implicit. They condition the way that agents and systems interact to respond to different situations, including climate stress (Tyler and Moench, 2012).

Institutions are closely related to the process of social marginalisation – whereby some social groups are excluded either formally or informally from access to critical services or resources. Institutions can engender marginalisation (and vulnerability) by enabling or constraining people's ability to organise and/or be involved in decisions that affect their lives. Those whose voices are heard as part of the decision making are more likely to have their interests advanced compared to those whose opinions go unheard. Standards (for example, building codes) also strongly influence whether these meet the needs of all the users or if they privilege one type of user over another. The pricing of urban services similarly influences access to infrastructure systems and the resilience they offer, particularly for the urban poor (Tyler and Moench, 2012). Thus, "*institutions may enable and support or constrain and inhibit capacities of the vulnerable urban groups*" by legitimising or denying their claims to services (Tyler and Moench, 2012, p.315).

Governance (term for the process of decision making) is an important element in building people's resilience. If decision-making processes foster participation and inclusivity, these will likely contribute towards enhanced resilience. If, instead, governments are unaccountable to marginalised groups and discriminate against them, it will likely contribute to their vulnerability (Tyler and Moench, 2012). Timely and accurate dissemination of public information (for example, advice on how to respond to different kinds of climate change-related threats) is also an important component of an institutional environment that builds resilience, as are avenues of learning and sharing (for example, the outcome of applied research and its dissemination). Adaptive capacity is a critical determinant of overall system resilience, and the adaptive capacities of individuals, communities and regions are a determinant of a city's 'resilience landscape' (Chelleri *et al.*, 2015).

BOX 5: INSTITUTIONS

Key aspects of institutions that enhance or constrain resilience include:

- Rights and entitlements linked to system access: Institutions that constrain rights and entitlements can limit access to systems or services and thus reduce resilience for marginalised groups.
- Decision-making processes: Decision-making processes related to urban development and systems management follow accepted principles of transparency, accountability and responsiveness, and provide ample opportunities for input of marginalised groups.
- Information flows: Households, enterprises, community organisations and other decision-making agents should have ready access to credible and meaningful information to enable judgments about risk and vulnerability, and to assess adaptation options.
- Application of new knowledge: Institutions facilitate generation, exchange and application of new knowledge that enhances resilience.
- (Politics of governance – which determines the structure of institutions.)

Source: Adapted from Tyler and Moench, 2012.

In brief, climate change vulnerability occurs when "…*fragile, inflexible systems and/or marginalised or low-capacity agents are exposed to increased climate hazards, and their ability to respond or shift strategies is limited by constraining institutions*" (Tyler and Moench, 2012, p.388). Relatedly, resilience is strong when "…*robust and flexible systems can be accessed by high-capacity agents and where that access is enabled by supportive institutions*" (Tyler and Moench, 2012, p.388). By building resilience, through intervening with agents, systems and institutions, vulnerability is reduced and well-being strengthened. In terms of sequencing activities aimed at climate change adaptation, a vulnerability assessment is undertaken first so that subsequent resilience-building interventions can focus on those groups or systems that are most vulnerable to the anticipated climate hazards (Tyler and Moench, 2012).

4

Profile of Karachi

4.1 Economy

Karachi is the capital of Sindh province. It plays a vital role in Pakistan's economy and is the industrial, financial, commercial and (to a decreasing extent) manufacturing centre of the country. The economic predominance of Karachi has made it a magnet for large and steady in-migration (JICA, 2007). There are no official Pakistani statistics for GDP by city but according to one report by Pricewaterhouse Coopers (PwC), the GDP of Karachi City for the financial year 2008–2009 was US$ 8.9 billion. The same report placed Pakistan's third and fourth largest cities, Lahore and Faisalabad, at US$ 4 billion and US$ 1.4 billion, respectively. Karachi accounts for nearly 54 per cent of total revenue collection, produces about 30 per cent of value added in large-scale manufacturing and contributes 20 per cent to the GDP of Pakistan (JICA, 2012).

4.2 Geography

Karachi is located mostly on flat or rolling plains. Several small natural drainage channels pass through various parts of the city, with general drainage running from western and northern areas to the south into the seasonal Lyari and Malir rivers – which carry the city's sewage. The southern limit of the city is the Arabian Sea. The total land area of Karachi district is approximately 3,527 km2, of which about 1,300 km2 is built-up area (JICA, 2005; CDGK, 2007).

4.3 Demography

Karachi houses nearly 10 per cent of the national population of Pakistan, 30 per cent of the total provincial population and nearly 63 per cent of Sindh province's urban population (World Bank, 2015). The population and demographic distribution of Karachi has changed greatly over its lifetime. From a small coastal trading post 150 years ago, to a city of 450,000 in 1947 at the time of the birth of Pakistan, Karachi has grown into one of the world's' largest megacities with a population of about 20 million (CDGK, 2007); and it is expected to grow to 27 million by 2020 (CDGK, 2007). Its population growth rate of around five per cent is largely the result of rural–urban internal migration, besides natural growth (JICA, 2005). In addition, Karachi has been playing host to a very large number of Afghan refugees since the Soviet invasion of Afghanistan in 1979, and also economic migrants from Bangladesh. Migration has been a key determinant in the growth of the city throughout its history, and transnational migration has been particularly important at critical junctures – in the 1940s and then again in the 1980s and 1990s (Gazdar, 2005).

4.4 Topography

Karachi may broadly be divided into two parts: hilly areas in the north and west and an undulating plain and coastal area in the southeast. The hills are offshoots of the Kirthar Range and the highest point in Karachi is about 528 metres, in the extreme north. All the hills are devoid of vegetation and have wide intervening plains, dry riverbeds and water channels. Karachi has a long coastline in the south, and famous sea beaches include Hawks Bay, Paradise Point, Sands Pit and Clifton. China Creek and Korangi Creek provide excellent calm water channels for rowing and other water activities, and away from the shoreline are small islands, including Shamsh Pir, Baba Bhit, Bunker, Salehabad and Manora (Hasan and Mohib, 2002).

4.5 Climate

Karachi has a moderately temperate climate with a generally high relative humidity that varies from 58 per cent in December (the driest month) to 85 per cent in August (the wettest month). There is a cool breeze most evenings, which is a boon to the inhabitants. The winds, including the monsoons, blow southwest to northeast for half the year and northwest to southeast in the winter. The hottest months are May and June, when the mean maximum temperature reaches 35°C, and January is the coolest month of the year. During the rainy season, in July and August, it is cloudy almost every day with generally scant rainfall. However, there are surprising variations from year to year. The average annual rainfall is 256 mm, but in certain years rainfall is higher and it may rain heavily within a short span of 48 hours (Hasan and Mohib, 2002).

5

State of basic services as an indicator of city and community vulnerability

Urbanisation represents a fundamental transformation of people's lives in terms of employment, livelihoods and values. The character of urbanisation, as determined by land use policies and practices, quality of infrastructure and mode of governance are key elements that determine not only the prosperity and well-being of a city and its inhabitants but also individual and group vulnerability. Karachi, like other megacities in South Asia, has made significant advances over the last couple of decades in generating wealth and enhancing productivity. The number of poor in Karachi, as measured by deprivations that individuals face in education, health and standard of living, is less than 10 per cent and is among the lowest in the country (Ellis and Roberts, 2016). This partly explains why, in spite of serious law and order problems in the last decade and more, Karachi continues to attract economic migrants from across the country.

Karachi's major shortcomings in realising the full potential of urbanisation similar to the achievements of cities in Southeast Asia have been its inadequate provision of infrastructure and basic urban services along with insufficient and poor quality housing, and a failure to deal with pollution. (Ellis and Roberts, 2016).

Lack of decent and affordable housing, for example, not only impairs quality of life for millions but also foreshadows adverse health outcomes for household members and for female participation in the labour force (Ellis and Roberts, 2016). And it is not only the poor who are denied affordable and safe housing – in many instances, the middle class has also been priced out of the market.

Karachi's urbanisation, like that of its counterpart cities in South Asia, has been 'messy' and 'hidden', partly because it has struggled to deal with population pressures on infrastructure, basic services, land and housing, and on the environment. By fostering this 'messy' and 'hidden' urbanisation, these forces are also constraining the potential of powerful economies of agglomeration to bring about faster improvements in prosperity and livability of the city (Ellis and Roberts, 2016).

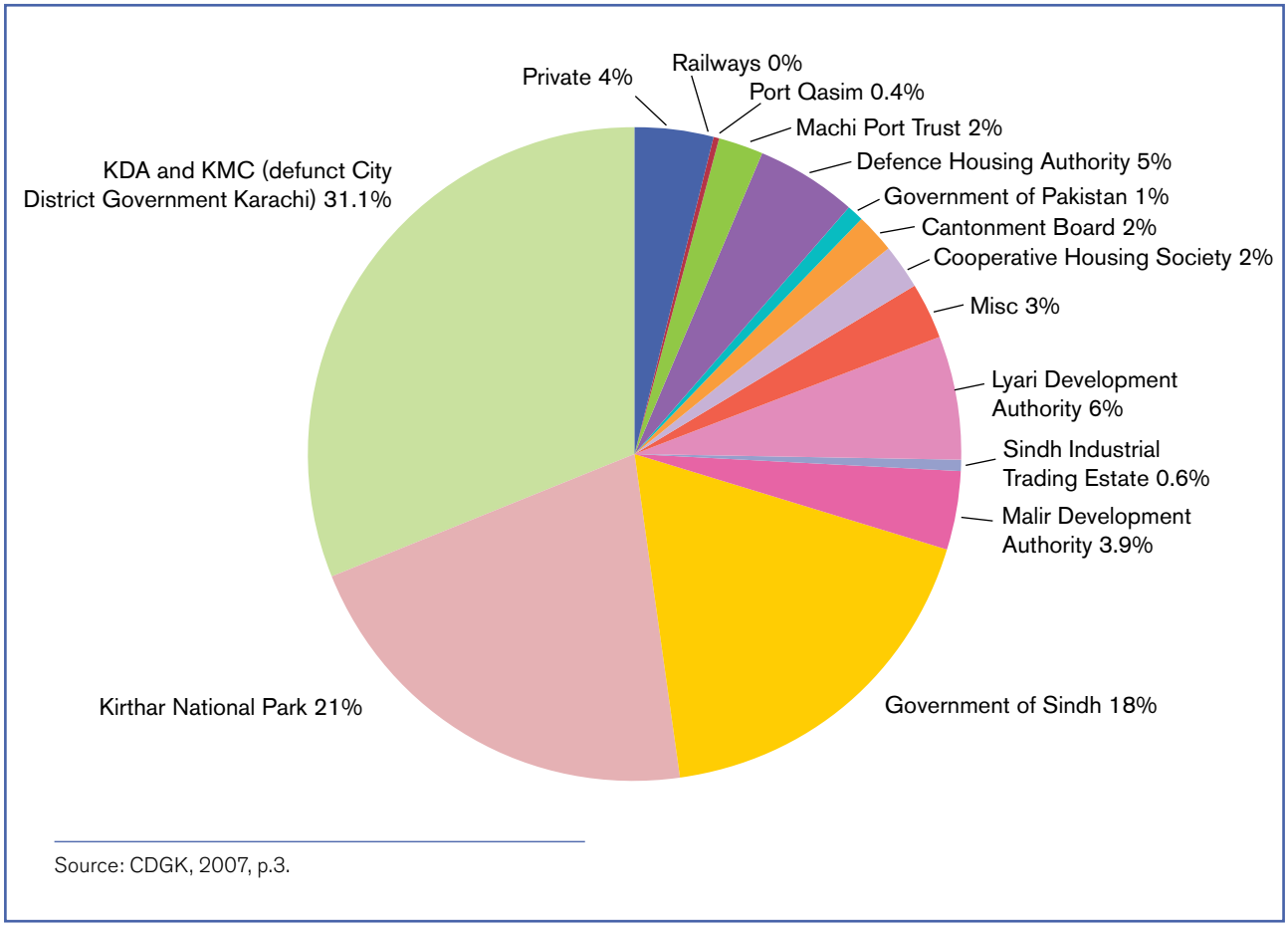
Poor implementation of land use plans and fragmented municipal control characterise Karachi's management. About 13 different federal, provincial and local agencies own and administer land in the city, with overlapping powers and poor to little coordination between them

(Ellis and Roberts, 2016). The local government authority exercises control over 31 per cent of Karachi's land area, while the rest falls under different federal and provincial agencies and military-related institutions (such as cantonments). Figure 1 shows the range of formal landowners in Karachi. They have many, often conflicting, claims on the land and their reluctance to work together is compounded by the absence of a coordinating authority among the landowning agencies. While the Master Plan Group of Offices (MPGO) is technically the centre of control, officials are mostly unclear about how they are supposed to seek its input and approval. They seem to view contact with the office as voluntary rather than compulsory (Ellis and Roberts, 2016). This fragmented and uncoordinated approach to management and the scant regard to livability issues are evident in the environmental health dimensions of the city and the state of basic services delivery.

5.1 Environmental health issues

Karachi ranked 67 out of 69 in the world's urban livability index (based on stability, health care, culture and environment, education and infrastructure) published by the Economist Intelligence Unit (Economist Intelligence Unit, 2012). Ambient air pollution – primarily small particulate matter (PM), sulphur dioxide (SO2) and nitrous oxides (NOx) from vehicular emissions and urbanisation-related activities – is a growing problem in the city (Sanchez-Triana *et al*., 2015) that will likely increase with expected climate change (Kovats and Akhtar, 2008). Major causes of vehicular pollution are poor quality fuel, the non-enforcement of vehicular emissions standards (which are quite rudimentary to begin with), inadequate traffic management combined with poor driving, which frequently results in traffic jams, and the explosive growth in the number of motorcycles and private cars. For example, the number of registered

Figure 1: Profile of land ownership and control in Karachi



Source: CDGK, 2007, p.3.

public buses went down by more than 55 per cent between 2011 and 2014 even though 60 per cent of daily trips are undertaken using public transport, while the number of motorcycles rose from 400,000 in 1990 to 500,000 in 2004 to 1.65 million in 2013 (Hasan *et al*., 2015).

Satellite images show that since 2000 there has been a marked reduction in green cover in the city (Qureshi *et al*., 2010), which coincides with the period when major development works (ie, road transport infrastructure, wastewater drains and the like) were undertaken. In addition to the felling of trees to make way for development works, green cover and open spaces have reduced in areas with high land values (DAWN, 6 August 2016). While more than 20 per cent of the land within the administrative boundary of Karachi district comprises the Kirthar National Park (see Figure 1), it lies at a considerable distance from the population centres. The supply of poor quality water is also a serious health risk for people in the city, and is the result of an old, leaky and inadequate pipe infrastructure (see section below on water and sanitation for details).

The federal government took more than a decade to get the Pakistan Environmental Protection Ordinance 1983 passed by the National Assembly, which it did on 6 December 1997, when it became the Pakistan Environmental Protection Act 1997 – thereafter, known as PEPA 1997 Act. The purpose of the Act was to facilitate the conservation of renewable resources, the establishment of environmental tribunals and the appointment of environmental magistrates, and to oversee the review process of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA). The Act mandated the establishment of Environmental Protection Agencies (EPAs), environmental tribunals and the appointment of environmental magistrates in all the provinces. Post the devolution of powers from the federal to the provincial governments under the 18th Amendment to the constitution, environmental protection is now solely the responsibility of provincial governments. However, little to no political interest in environmental conservation/protection and limited financial and technical capacity of the EPAs has severely hindered their ability to properly implement IEE and EIA or operationalise environmental tribunals (Iqbal *et al*., 2014). Moreover, neither the IEE nor EIA processes have been updated to incorporate climate change and related considerations.

5.2 Solid waste management

Only around one-third of the solid waste generated in the city finds its way to the two dumping sites (Gond Pass and Jam Chakro) situated on the outskirts of the city (DAWN, 4 October 2016), while the rest is disposed of in drains, empty plots, by the roadside, and informal dumping areas along the creeks. As both dumping sites are situated far from the city, the authorities dump waste close to where the informal recycling industry operates and alongside creeks, but also supplies it to informal land developers in places such as Machar Colony and Rehri Goth (two of the areas surveyed for this report) for land reclamation purposes. The abysmal state of solid waste management in the city – now recognised by even the highest officials in the province (DAWN, 23 August 2016) – is nearing crisis proportions (DAWN, 23 July 2016; DAWN, 12 August 2016). In addition to encroachments, solid waste is a major source of blockage of water and drainage channels (Zahidi, 2015).

5.3 Water and sanitation

5.3.1 Water

Karachi's subsoil water is brackish and so the only reliable water source is the Indus River, 130 kilometres away, which supplies around 650 MGD (million gallons/day) to the city. The other, minor, source, the Hub dam, used to supply between 30 and 50 MGD but has run dry due to insufficient rainfall in recent years. Typically, water does not reach all areas of the city, often due to high levels of loss and theft, which are reported to be around 40 per cent of total supply. Current water demand is estimated to be 1,080 MDG, indicating a shortfall of 430 MGD (World Bank, 2015). The rising incidence of individual and group violence related to water shortages in the city, and regular protests by affected people attest to serious distribution problems in the city, especially in low-income areas (Mustafa *et al*., 2013).

As a result of the shortfall, many urban dwellers – rich and poor, in settled areas as well as those living on the periphery – rely on informal sector water vendors[2] for their daily needs on a regular basis. A survey undertaken by the WSP–World Bank in 2010 showed that 37 per cent of all main water supply users were using illegal means to access water (World Bank, 2010). Poor communities can pay as much as 40 times more per unit of water than middle-income or high-income users pay. The poor end up paying more due to their limited purchasing power and a lack of storage facilities. Hence, buying water from a donkey cart vendor can cost four times more than buying it from a commercial tanker vendor. Moreover, where households have no or limited storage capacity, they may end up buying water in smaller quantities from a middleman who stores water and sells it by the bucket or container. The cost of purchasing water in this way might be 40 times more than what other higher-income groups pay for water delivered by the Karachi Water and Sewerage Board (KWSB) (UNDP and the World Bank, n.d.).

Some of the bulk users, such as industries in the Sindh Industrial Trading Estate and Korangi areas, are also known to siphon off water illegally from the water mains.[3] Forty-five per cent of respondents reported seasonal water scarcity, with periods of little or no water supply lasting five or more days during the preceding year. The summer months, especially June, are a time of acute water scarcity (World Bank, 2010).

A core problem facing the KWSB is the low recovery rate of user charges, which currently stands at 52 per cent from regular/retail users and 62 per cent from bulk customers (Karachi Water and Sewerage Board (KWSB), n.d.). Bulk consumers, including federal ministries, provincial government departments, military cantonments and government corporations such as the Karachi Port Trust and Pakistan Railways are some of the biggest defaulters of the KWSB (Karachi Water and Sewerage Board (KWSB), n.d.). The inability to recover user charges has in turn diminished the utility's ability to undertake routine and necessary operations and maintenance (O&M) work and has made it dependent on the provincial government for handouts to meet shortfalls. Due to years of neglect of O&M requirements, major portions of the water supply and sanitation infrastructure in the city are old, dilapidated and in urgent need of replacement.[4]

The only major investment planned by the KWSB to increase current supply is the much-delayed K–IV project, which is expected to provide an additional 250 MGD of water to the city. The project, which was designed more than a decade ago, is based on population figures that are now outdated. Combined with approximate losses and theft of around 35 per cent (World Bank, 2015), it can be reasonably surmised that the planned additional supply under the project will bridge much less than half the current demand–supply gap.[5]

5.3.2 Sanitation

There is a large network of underground sewage systems in Karachi. However, maintenance is a major issue and expansion has not kept pace with rapidly growing demand. In the absence of public sewerage networks, a large number of urban residents have resorted to ad hoc arrangements, including the construction of house- and street-level septic tanks or connecting household sewerage to the nearest municipal drain, natural drains or water bodies, thus creating huge health and environmental hazards. With the exception of the Orangi Pilot Project–Research and Training Institute (OPP–RTI) – a non-government organisation working with low-income communities to design and execute local sanitation improvement projects through the provision of technical advice and institutional support – people rely on small contractors to design and implement local sewage disposal systems, which are often poorly designed. In recognition of OPP–RTI's pioneering work, the government of Sindh adopted its low-cost sanitation model for the provincial sanitation strategy.

According to official estimates, the sewage system serves only 40 per cent of the city's population, while barely 12 per cent of the 435 MGD of sewage generated undergoes basic primary treatment. Current installed capacity for the treatment of wastewater is 150 MGD; meanwhile, nearly all the wastewater generated goes untreated into the Arabian Sea. In addition to the untreated domestic waste, a very large percentage of hazardous industrial waste is also discharged untreated into water channels, drains and the open sea. A planned project, known as S–III, will take total treatment capacity to 500 MGD when operational, but the project has been delayed for many years and it is yet to be seen whether it delivers on the planned result. (Siddiqui, 2014).

[2] Vendors use different modes of water delivery, including large and small tankers, donkey carts, pushcarts and bicycles.
[3] Interview with Professor Noman Ahmad, NED University.
[4] Interview with Mohsin Raza, KWSB.
[5] Interview with Professor Noman Ahmad, NED University.

BOX 6: SOLID WASTE MANAGEMENT IN KARACHI

In the past 14 years, nine studies have been carried out on suggested improvements to solid waste management (SWM).

6,500 tonnes of solid waste are generated every day:

- 800 tonnes per day are separated at source by housewives
- 1,500 tonnes per day are recycled (inclusive of material separated at source)
- 450 tonnes per day are burnt as fuel for kilns
- 250 tonnes per day are used as land fill for reclamation

There are (approximately) 435 recycling units

Yearly turnover is Rs. 1.2 billion (estimated)

Employment is generated for approximately 40,000 families:

- 15,000 *kabaris* (informal recyclable waste materials traders)
- 800 middle dealers
- 20,000 street pickers
- 1,000 dump pickers

Waste is not removed from the *kutchra kundis* (informal waste collection/dump sites) because scavengers/contractors pay municipal staff not to collect it. Instead, the waste is taken to informal recycling units rather than to the two designated dumping sites. Municipal staff also pocket fuel expenses for vehicles that are supposed to collect and transfer city waste to the designated sites. None of the nine studies on SWM improvement in Karachi have incorporated the role of the informal sector – which partly explains why the SWM situation has not improved in spite of repeated efforts. The figures given above are nearly 15 years old and current estimates of daily solid waste production in Karachi is 12,000 tonnes (http://dailytimes.com.pk/indh/31-Oct-16/six-new-garbage-transfer-stations-to-be-set-up-in-city-says-dr-sajnani).

Source: Adapted from Ali and Hasan, 2001.

5.3.3 Institutional constraints

Overall, weak capacity and the absence of performance-based management has stymied the water, sanitation and sewerage functions. The inability to raise tariffs and poor cost recovery force the KWSB to rely heavily on large annual subsidies. Own-source revenues are limited and the new Local Government Act does not delegate much financial authority either. There have been a few attempts to engage with the private sector through public–private partnerships or through incentives – which is a serious gap constraining the sector in keeping up with demand. Political in-fighting, turf wars over the control of local governments and the inability to agree on who redraws constituencies have all contributed to the impasse and have left an institutional vacuum. Unsurprisingly then, it has been difficult to initiate sector reforms against a national backdrop of instability and waves of centralisation and decentralisation. Under conditions of high water stress, it is imperative to adopt a holistic approach to water management because unbridled use of water with little regulation or planning can have grave consequences for the city in the future (World Bank, 2015).

BOX 7: KARACHI WATER AND SEWERAGE BOARD: CRISIS OF GOVERNANCE

The Karachi major utility agency, the Karachi Water and Sewerage Board (KWSB), serves essentially as an executing agency for the provincial government, without any real powers to make its own investment and operational decisions. The organisation has been running a multi-billion rupee annual deficit for many years and, hence, requires regular bailouts from the provincial and federal governments. There is no independent and robust monitoring of its performance and no established mechanism for holding it accountable beyond the managing director being summoned sporadically by the provincial executive or the superior judiciary to explain perceived lack of performance. Sector investments and key decisions are often decided on political grounds rather than on technical or needs-based criteria. As a result, the utility is faced with a deep-rooted crisis of governance, which has worsened following the dissolution of local governments six years ago. Moreover, opportunities for sector reforms as a result of passing the 18th Constitutional Amendment (that granted greater rights to provinces to manage their own affairs) and the National Finance Commission (NFC) Award (that granted greater fiscal resources to provinces) have yet to be realised. Some key areas of concern related to the KWSB include:

- Legal ambiguities, a dysfunctional governance structure, a lack of technical support, tariff imbalances and a persistent financial crisis characterise the KWSB's operating environment. This predicament is compounded by a lack of accountability, transparency and operational autonomy. The lack of any proper planning and investment strategy perpetuates poor performance and has resulted in a dilapidated network. Investments made tend to increase only production and transmission, and neglect efficiency improvements, rehabilitation and maintenance.
- The absence of a regulatory framework has made it difficult to hold the KWSB accountable for its performance. The operational environment is fraught with systemic weaknesses – and the illegal routing of water to retailers is pervasive. A large number of consumers access water by paying illicit fees to KWSB frontline staff working with organised networks who benefit from illegal connections.
- Low tariffs, the lack of influence over the setting of tariffs, poor collection rates and a growing pattern of overheads that cannot be sustained by the utility are of concern. While the KWSB regularly tries to update tariffs, any request is refused by the provincial government due to a fear of public backlash. The utility has no metering system, thus a 'land area-based' versus 'water usage-based' flat rate tariff is prevalent in all areas, while collection rates remain poor at around 62 per cent for all users billed during any given year.
- Relationships with consumers and wider civil society are almost non-existent. Inappropriate services, the lack of any suitable response to consumer priorities and complaints and ineffective communication have alienated consumers and the public in general, thus making it difficult to mobilise public support for action against illegal connections, encroachment of pipelines and other malpractices that undermine operations.
- There are no provincial sector targets and no visioning or planning document to guide the sector. Current trends indicate that the goal of universal coverage under the SDGs would be difficult to achieve for either water supply or sanitation without bringing about radical changes in levels of investment and delivery of services.

Source: Adapted from World Bank, 2010; World Bank, 2015.

5.4 Public transport

Transport-related problems in Karachi have increased considerably over the past few decades, which has had an enormous impact on the lives of its citizens, not least of which is a decline in productivity. The growing number of vehicles on the roads and traffic congestion have contributed to increased air and noise pollution, leading to health problems, high accident rates and environmental degradation. It has also resulted in a decline in living standards as, in order to avoid long commutes, people's livelihood choices have become more limited and this has determined where they live. This in turn often results in a drop in income and a decrease in personal security, which affects the vulnerable the most, especially women (Hasan and Raza, 2015). The current public transport woes of the city are primarily an outcome of complex institutional and organisational issues. The lack of a proper mass transit system authority and coordination between the various stakeholders as well as insufficient funding have hindered improvement and development of a mass transit system in Karachi (JICA, 2012).

The seriousness of the situation can be gauged from the fact that the number of public transport-registered buses declined from 22,313 in 2011 to 12,399 in 2014, of which only 9,527 are operative. As a result of this reduction, people are forced to travel on the roofs of old, badly maintained and decrepit buses and have to wait at bus stops for long periods to get a ride. Furthermore, in 2011 only 0.85 per cent of vehicles in Karachi were buses and 4.04 per cent three-wheeler motorised rickshaws, whereas cars constituted 38.21 per cent of vehicles and motorcycles 49.59 per cent. Yet, 60 per cent of the 24.2 million trips generated in Karachi every day are realised through the existing public transport sector consisting of buses and auto-rickshaws. Following international standards for the number of 100-seat buses needed for a population of its size, Karachi has a shortfall of more than 8,700 buses (Hasan *et al*., 2015).

To overcome this crisis, the informal private sector inducted about 60,000 *qingqis*[6] some years back, many of which were not registered and as such functioned illegally, but at their peak they provided 360,000 seats a day at zero subsidy from the state. The Sindh High Court ruled their operation illegal in early 2015 but a year later allowed them to operate again (Baloch, 2016), presumably because they provide an essential service in the absence of an alternative. As Karachi expands spatially, commuting problems are growing.

In response to the growing problems associated with safe, affordable and efficient mobility, a number of bus rapid transit corridors are being planned and implemented in the city; but even if all these lines run to their full planned capacity – in itself, doubtful – they will carry no more than 8.7 per cent of the commuting public, not least because of the inadequate planning for feeder routes, which in essence deliver the passengers needed for a system to function optimally.[7] In brief, no single project or initiative will likely come close to solving the city's transport problems. Instead, what is needed is a holistic approach incorporating different modes of mobility, traffic management measures and institutional revamping that is embedded in a larger framework of city planning.

[6] A *qingqi* is a 70cc two-person motorcycle converted into a vehicle for carrying six people. Transport experts considered these to be neither safe nor reliable or durable.
[7] Calculations by the lead author.

6

City characteristics and trends and implications for vulnerability

This section briefly discusses three key and interrelated urbanisation trends that are contributing to the vulnerability of low-income groups in Karachi. These are: densification, poor governance and in-migration. In discussing these, this section sets the stage for an analysis of the field survey results in Section 8.

6.1 Densification

Housing is related to the availability of land in a suitable place and at an affordable cost. This has not been possible in Karachi because there are no by-laws or zoning regulations that restrict or control speculation, so the land market in driven primarily by the anticipated value of land. Hence, areas most suitable for low-income housing development are appropriated for commercially lucrative projects. Neglect of the housing needs of low-income groups is also reflected in residential land usage. Karachi's total residential area is 36 per cent of the total area of the division; 74 per cent of this is developed formally for 38 per cent population, while 22 per cent has been developed informally for 62.2 per cent of the population. Houses on 120 square yards or less constitute 88 per cent of the housing stock, while houses on 400 to 2,000 square yards constitute only two per cent of the housing stock. The figures indicate the inequalities that exacerbate Karachi's class and ethnic tensions (Hasan, 2013a).

If the 2011 pre-census house count for Karachi – which is contested by both major political entities in Sindh – is to be believed, then Karachi is the fastest-growing megacity in the world, both in percentage and in number terms. Its population has increased by more than 100 per cent from 11 million (the 1998 census figure) to 22 million, when the last house count was conducted (Cox, 2012). As such, Karachi comprises ten per cent of the population of Pakistan and 22 per cent of its urban population. With economic liberalisation in the 1990s, old contraband smuggling organisations, with their international links, became inoperative because of the removal of restrictions on the movement of capital and previously taxed goods. These groups, along with a larger group with unknown sources of money, turned to real estate investments, which led to massive national and expatriate investment in property and resulted in strong speculative, anti-poor trends. The state has responded to these market pressures and has made land available for development through

land use conversions, new development schemes and regulations, the bulldozing of low-income settlements and the relocation of victims to distant locations with no infrastructure or services. Activists who have lobbied against these changes have, in many instances, been killed. The murder of OPP–RTI Director, Perween Rahman, and Nisar Baloch are two of the more high-profile killings of activists opposing anti-poor land practices.

6.1.1 Post-liberalisation government housing policy

The government's policy has rested on the belief that the best way to provide people with affordable and decent housing is through the market. The government facilitated this by liberalising credit terms, and the main beneficiaries have been the organised developers. Individual households, mainly middle class, have benefited from this policy but not the poor, who do not access formal channels for loans because banks and the House Building Finance Corporation (HBFC) (now the House Building Finance Company) require collateral, which the poor cannot put up. Moreover, banks and the HBFC require that applicants own the land on which they plan to build their house and must provide evidence of a stable income, ie proof of a formal sector job. However, there is no credit available for the poor to buy land and 72 per cent of Karachi's population work in the informal sector, so these conditions can't be met either. The developers typically do not cater to lower-income groups because they are seen as 'risky'. But where they do, in order to make it affordable the product they offer measures between 16 and 20 m2, creating multi-storey 'slums' where living conditions are much worse than in the old informal settlements.

Housing demand in Karachi is 120,000 units per year. The formal sector supplies an average of 62,000 units a year; another 32,000 are accommodated in *katchi abadis*,[8] while the remaining 26,000 are accommodated through densification of existing plots/structures. *Katchi abadis* house more than 62 per cent of Karachi's population. Unlike before, creating *katchi abadi*s is difficult and living there is problematic. Previously, when the city was small, land was cheap, there was no middle-class demand for land and the city periphery was near to city workplaces. Now, the city periphery, where cheap land is available, is far away from work areas. Hence, living on the periphery involves serious travel time, social and financial costs, in addition to the lack of nearby jobs and social amenities. Middle-income housing and elite gated communities occupy the immediate periphery, pushing new *katchi abadis* further away from work areas. With increasing demand for land for middle-income housing, informal settlements are increasingly being established far away from residents' places of work, recreation, entertainment and social sector infrastructure. This has led to intense pressure on expenditure and time due to long commuting times (Hasan, 2013a).

Table 1: Increase in housing costs 1991–2016

	COST PER SQUARE METRE	
	1991 US$ 1 = RS. 34 (APPROX.)	2016 US$ 1 = RS. 106 (APPROX.)
Land in new peri-urban *katchi abadi*s	Rs. 176 (US$ 5.17) or 1.7 times daily wage for unskilled labour	Rs. 2,085 (US$ 19.67) or 4.16 times daily wage for unskilled labour
Construction costs of semi-permanent house in *katchi abadi*s	Rs. 660 (US$ 19.40)	Rs. 10,000 (US$ 94.33)
Rent for semi-permanent house in *katchi abadi*s	Rs. 350 (US$ 10.30) or 2.5 times the daily wage for unskilled labour	Rs. 5,000 (US$ 47.17) or 10 times the daily wage for unskilled labour

Source: Lead author's research/calculations.

[8] The term ***katchi abadi*** is a popular local language term generally used by all residents of the city to define low-income as well as deprived settlements. These may be legal or illegal.

6.1.2 Informal market response

The informal sector's response to the failure of the formal sector to provide adequate and affordable housing in the city has been the densification of existing *katchi abadis* by changing one- or two-floor informally built homes into multi-floor buildings in three ways:

- house owners building upwards to accommodate the expanding family;
- house owners building upwards to create rental space for additional income;
- informal developers purchasing land from house owners and paying them in cash plus two apartments on the top floor.

6.1.3 Informal densification issues

To make accommodation affordable, increasingly smaller units are being built. Case studies of settlements in the inner-city areas of Karachi and of previously peripheral areas show that densities have increased from 600 persons per hectare to 4,000 persons per hectare and from 200 persons per hectare to 1,195 persons per hectare, respectively. In the case of inner-city informal settlements, high densities have created a number of physical and social problems: the number of persons per room sometimes exceeds 15; there is no private space for newly-wed couples; and children cannot be supervised so they often become involved in gangs and take drugs (Hasan *et al.*, 2010). None of the buildings – many of them 4–5 storeys high and in some places up to eight floors high – have lifts, which presents mobility and related problems for the elderly, the sick, women and children. Open spaces around housing areas are also being lost due to the narrowing of lanes and the sheer increase in the number of people living in an area – unlike in the past, many people don't know each other and hence, families are uncomfortable with women and children going outdoors.[9]

6.1.4 Karachi's residential land use...

Around 62 per cent (about 13 million) of Karachi's citizens live in informal settlements on 23 per cent of the city's residential land. Densities in these settlements range between 1,500 and 4,500 p/ha and continue to increase. Compared to this, 36 per cent (about 7.5 million) of Karachi's residents live in 'planned' settlements on 77 per cent of the city's residential land. Densities here can be as low as 80 p/ha and continue to decrease in new settlements. Around 30,000 hectares of gated housing for the elite are being developed on the city fringes and near outfalls[10] to the sea, complete with golf courses, clubs and five- and six-star hotels. Around 3,000,000 people are expected to live in these gated communities with a density of 98 persons per hectare. Expressways are being planned that will link these developments to the city work areas. All this while over 250,000 developed plots are lying vacant and 62,000 apartments are unoccupied in the city. Back in 2005–2006, an attempt by international capital to purchase 16 kilometres of Karachi's beaches for the development of high-end residential, recreational and commercial activities was resisted by citizens, fishermen's cooperatives, academia, NGOs and schools, which led to the cancellation of the project (Hasan, 2013a).

Table 2: Changing densities: Examples from two areas in Karachi

NAWALANE: INNER-CITY INFORMAL LOW-INCOME SETTLEMENT		PAPOSHNAGAR: FORMAL SECTOR LOWER-MIDDLE-INCOME SETTLEMENT	
Density in 1973	450 p/ha	Density in 1955	250 p/ha
Density in 2010	3,500 p/ha	Density in 2010	1,180 p/ha

Source: Field survey by lead author and by the NED University Urban Research and Development Cell.

[9] Calculations by lead author.
[10] Outfalls are places where water drains into the sea.

6.1.5 ...and its impact on ecology

- Past experience with city floods has shown that it is not the amount of precipitation that causes flooding but encroachment on the outfalls to the sea by both elite housing and land reclamation for informal settlements. So, flooding is primarily a consequence of encroachment and ill-considered land use.
- In 1985, 70 per cent of Karachi's vegetable/fruit requirements came from its rural areas. In 2013, the figure was down to ten per cent (DAWN, 17 August 2009).
- An estimated 60 billion cubic feet of sand and gravel have been illegally lifted for construction from the seasonal rivers, depleting the rainwater aquifer and making recharging impossible (Hasan, 2013b).

6.2 City governance

Current local government law is the Sindh Local Government Act (SLGA) 2013. The difference from earlier local government experience is that this law was instituted by an elected provincial government and not by a military ruler. In Pakistan's checkered democratic history, the military has seized power on four occasions, during which it introduced new local government systems, primarily as surrogates for parliamentary democracy. The new law, which is essentially an amended version of the 1979 Local Government Act – itself instituted by a military dictator – is "*fragmented and appears to be driven by considerations of maintaining the status quo [ie, provincial authorities making all decisions related to local development and delivery of urban services], rather than establishing effective local governance arrangements through the devolution of adequate political, fiscal and administrative power to local councils*" (UNDP, n.d., n.p.). Not only does the SLGA 2013 not devolve sufficient functions and powers to the local governments, but the provincial government has retained the authority to suspend or remove the heads of elected local governments. Moreover, control of the local government fund rests with the Provincial Finance Department and finance minister of the province (UNDP, n.d.).

Even though the 18th Constitutional Amendment mandates local governments, the provincial government of Sindh – and three other provinces – established the law and held elections only reluctantly and under pressure from the higher judiciary. All four provinces have opted to restore the older 'commissioner system', under which provincial governments manage local government functions directly through the provincial bureaucracy rather than continue with the devolution reforms enacted under the Local Government Ordinance (LGO), 2001.

The pace of demographic change and rapid urbanisation in Pakistan has made urgent the need for effective local governments, and there is a wide and growing realisation among civil society and the media that local governments are essential for efficient and accountable governance. A 2008 perception survey across urban and rural Pakistan showed a strong desire on the part of citizens to have basic services controlled by local governments (Arif *et al*., 2010).

An important reason why provincial governments – or legislators in the federal parliament – are not keen on local governments is that they don't want to share power with an additional tier of government, and in the process lose control over decisions regarding allocation of local development funds, which are an important source of graft and rents for all political and power players. In the case of Sindh, this tussle has an added ethnic dimension.

Karachi is a non-Sindhi-speaking city in a Sindhi majority province and the majority of the city's population comprises migrants. Karachi is resource rich, has the best educational and health facilities in the country, and is the hub of banking, industry, media and commercial activities. So, naturally, all political entities would want to exercise control over the city. On the one hand, the Sindhi-speaking majority of the province cannot control the city except through a highly centralised system; while the migrant majority of the city – represented by Urdu speakers whose parents and grandparents migrated from India, and people from former East Pakistan and from the rest of Pakistan – can only exercise control over the city through a completely decentralised system of governance.

The ruling dispensation, the Pakistan People's Party's (PPP), strength is based on support in rural areas, which elect nearly 70 per cent of the candidates to the Provincial Assembly (Provisional Assembly of Sindh, 2016). On the other hand, the PPP's main political opponent in the province, the MQM, dominates the urban centres of Karachi and Hyderabad. So, under the circumstances, where the ruling PPP cannot foresee winning elections in Karachi, it finds it politically unfeasible to give up control of the largest and richest city in the country and capital of the province to a political opponent. This tussle lies at the heart of the governance dysfunction in Karachi.

For instance, the Master Planning Department of the (now defunct) city government, which was supposed to oversee and coordinate development planning for the city, was itself made into a sub-department of the Karachi Building Control Authority (KBCA), after which the charter for the KBCA itself was changed so as to bring it under the control of the provincial government; it was thereafter renamed the Sindh Building Control Authority. In effect, Karachi currently has no master planning body to provide advice or technical input into

citywide development planning. Now, the institution is being used to advance the political agendas of whosoever is in power in the province, which is proving to be disastrous for the city and for any future prospects for correcting the wrongs of the past.[11] As there are no functional horizontal linkages between the various agencies and departments working in the city, meaningful coordination has become extremely difficult.[12] Add to this undefined spatial and subject jurisdiction between different agencies and organisations, and the scale of urban dysfunction becomes evident.

In a similar instance, the collection, transfer and disposal of solid waste has been taken away from the Karachi Metropolitan Corporation (KMC) and handed over to a newly created organisation, the Sindh Solid Waste Management Board (SSWMB), which will be managed by the provincial authorities. The finances of the KMC have also been allowed to deteriorate to such an extent that it is proving difficult for the agency to perform its basic functions. The provincial government releases funds to the agency on a monthly basis but only enough to pay its staff – so that they don't come out onto the streets in protest.[13] By way of comparison with the next biggest city in Pakistan, Karachi gets around Rs. 0.10 per capita for solid waste management compared to the US$ 5 per capita that the Punjab government is paying a Turkish contractor to remove and dispose of Lahore's solid waste.[14] Many of the functions that once were the purview of the Karachi Development Authority have now been given to a newly formed body, the Karachi Infrastructure Development Company.

This political tussle has given rise to a situation where universally accepted functions of local government have been appropriated by the provincial government. Some informed observers are of the view that the provincial government fears being discredited in the eyes of its electoral base if it cedes control of the city to rival political entities.[15] In itself, this appropriation of local government functions would not have been a problem were it not for the fact that the provincial government has on multiple counts proved itself incapable of effectively managing its own affairs, thereby raising concerns about its capacity and intent (Ahmed, 2016). For the purposes of this report, this situation raises serious questions about building an effective climate change adaptation capacity in an institutional environment where effective urban governance and basic services delivery have become intractable.

6.3 Migration

Waves of migration, starting with the large influx of refugees from India to the newly formed state of Pakistan, to the arrival of Afghan refugees as a result of the Soviet invasion in 1979, to economic refugees from Bangladesh in the 1970s, 1980s and 1990s and internal economic migrants from other parts of Pakistan throughout this period, along with socioeconomic and political changes accompanying these events, have played an important part in shaping Karachi's urban development trends.

Rapid urban expansion and haphazard growth patterns in Karachi are largely the result of rapid population growth, of which migration from other parts of Pakistan is a significant contributor. While the latest figures for Karachi are not available, available national figures based on the last census in 1998 provide some idea as to the rate of internal migration to urban areas. During 1951–1961, 45 per cent of urban growth in Pakistan was the result of internal migration; the rate came down to 20 per cent during 1981–1998 (Hasan and Raza, 2009). The main reasons for migrating are: socioeconomic conditions in the original rural abode, such as population growth and resulting land fragmentation and the inability to rely on agriculture alone to sustain livelihoods; greater educational opportunities for children (among those who intend to bring their families to the city once they have settled); better working conditions and higher income potential in urban areas; and freedom from caste or class-related oppression in the city (Hasan and Raza, 2009). According to a recent survey, of the estimated 3.35 million illegal immigrants in Pakistan, 75 per cent (or 2.5 million) are settled in more than 100 migrant-concentrated residential localities in Karachi. The majority of these migrants are from Afghanistan, Bangladesh and Myanmar (Burma) (Aligi, 2010).

Settlements housing migrants – both internal and foreign migrants – have been increasing in size and number and it has proved difficult for authorities to regularise such settlements or to improve living conditions there. Living conditions in such settlements are mostly cramped, and services such as clean drinking water, sanitation and solid waste disposal are hard to come by. There are a number of reasons why basic services are inadequate in informal settlements. First, regularisation programmes have been 'top-down', meaning there has been no involvement of intended

[11] Interview with Professor Noman Ahmad, NED University.
[12] Interview with Masood Alam, Director KMC.
[13] Interview with Professor Noman Ahmad (NED University) and Masood Alam, Director KMC.
[14] Interview with Masood Alam, Director KMC.
[15] Interview with Professor Noman Ahmad, NED University.

beneficiaries in the planning or implementation of schemes. Therefore, schemes are often not completed or are inappropriate to the needs of the people.

Another reason is that once the government has decided to regularise a settlement, the population feels secure about its land tenure so does not go through the process of getting leases for the land – mainly because the process is time consuming, convoluted and is not facilitated by the authorities. Even so, when services are provided by the authorities, these tend to be sub-standard or are left incomplete due to a shortage of funds. If they are completed, they are not maintained and therefore soon fall into disrepair. "*If they are road projects, they are washed out in the first rains. If they are sewage projects, they stop functioning within a year. The contractors who build them, unlike in the rich areas, are inexperienced and their workmen have poor skills*" (Hasan, 2012, n.p.).

While there are no detailed studies showing the extent of internal migration to Karachi and its social consequences for the migrants and the city itself, a study from a similar socioeconomic context in India provides useful insights. The study examined the vulnerability context of migrant workers in the informal sector in three Indian cities and suggests that processes and structures of unplanned rapid urbanisation, environmental change and social exclusion reinforce urban vulnerability for migrants. Poor skills and limited livelihood assets, accompanied by weak enforcement of workers' rights by the authorities and the employers contribute to migrants' vulnerability. Moreover, migrant workers have very limited opportunities to reduce their vulnerabilities and participate actively in risk reduction and development planning. The study shows that the context of migrants' vulnerability is complex and often unpredictable, and along with the traditional forms of vulnerability, migrant workers are exposed to new structures and processes that manifests into newer and more complex forms of vulnerability (Hasan, 2012).

A 21-year longitudinal survey looking at the relationship between weather events and long-term migration in Pakistan has shown that while flooding in different parts of the country had insignificant impact on migration, heat stress "*consistently increases the long-term migration of men, driven by a negative effect on farm and non-farm income*" (Mueller *et al*., 2014, p.182). Since Karachi is the prime destination for people across Pakistan migrating in search of livelihoods, and a rise in temperatures is expected elsewhere in the country, it will very likely mean a potential increase in the rate of in-migration to the city, adding pressure to housing and related urban services.

The Global Risks Report 2016 (World Economic Forum, 2016) ranks large-scale, involuntary migration as the most likely risk and the fourth most impactful as a result of climate change. It shows the risk as having strong connections to profound social instability and conflict, with regional consequences, state collapse or crisis. In other words, adverse impacts of climate change on agriculture and food production will have serious consequences for Karachi, not only in terms of increasing food insecurity but also regarding the potential increase in the number of involuntary migrants to an already crowded city struggling to provide basic services for its existing population. This, in effect, means that climate change adaptation and risk reduction needs to evolve as an interlinked process incorporating adaptation strategies for both rural areas and the city (Santha *et al*., 2015).

7

Sketch of four low-income settlements

As a counterpoint to a discussion of vulnerability at the institutional level – in terms of governance challenges and the politics guiding it – four working-class settlements were selected to assess drivers of vulnerability at the community level. The intent was to identify current household- and community-level (development) challenges and how these, combined with potential climate change-related challenges, will likely contribute to people's vulnerabilities. The assessment consisted of opened-ended interviews and a household survey. This section presents the main findings from individual and group interviews conducted with residents of the four settlements, and observations of key characteristics and features of the settlements by the survey team. Section 8 will present an analysis of the household survey that was carried out in each of the four settlements. This picture 'from below' will complement the analysis of governance at the macro level. The selected settlements are located in different parts of Karachi, have a diverse ethnic make-up and varying political affiliations, and are generally representative of Karachi's mixed population. Brief descriptions of the settlements, their key development challenges and related issues are highlighted below and are presented in detail in the Appendices.

7.1 Machar Colony

The Karachi Port Trust (KPT) owns the land on which Machar Colony is situated, and in the mid-1960s a small number of migrants from up-country came and settled here, working as labourers in the nearby seaport. These early squatters were followed by migrants from Bangladesh in the 1970s and, later, by others from the north of the country, south Punjab and Sindh. During the last 20 years there has also been an increasing migration of Rohingyas from Myanmar fleeing persecution. Migrants chose this area because of its proximity to the port and the fishing harbour (a source of direct and indirect employment) and because, as squatters, they did not have to pay for land. Subsequently, middlemen (ie, influential men in collusion with the docks police and KPT staff) appeared and started selling parcels of land, although the price of land here remained cheaper than comparable land elsewhere in the city until the mid-1990s.

Today, Machar Colony is a mixed ethnicity settlement with a population of between 700,000 and more than one million.[16] It covers about 4.5 km2, with a density 4–7 times higher than the average for Karachi. The congested settlement is poorly planned and

[16] As Pakistan has not conducted a census since the last one in 1998, population figures for localities and settlements are often 'guesstimates'.

inadequately serviced yet continues to expand as ever-greater numbers of poor migrants look for land for housing. This expansion takes the form of unofficial and haphazard land reclamation, and involves informal developers (or community members themselves) dumping solid waste to reclaim the land from the mangrove marshes and then building homes on it. Those who go to live on this reclaimed land tend to be migrants, hence the poorest and most marginalised.

Large parts of the settlement are situated on what used to be mangrove forest and marshland, hence subsidence is an issue. Although people spend significant amounts of money on reclaiming land by purchasing and dumping debris and solid waste, they often start building before the in-fill has compacted. As a result, houses built on this land begin to subside over time and, in many instances, sink so low that windows reach the level of the street/lane. As a consequence, new house construction is more elevated compared to older/lower-level houses in the same lane, which are more prone to flooding. Given the low quality of building components, design advice and technical supervision of homes and community buildings, how will climate change affect the living conditions within the home? How can the quality of future housing be improved? Given the fact that the area has been reclaimed and is in the process of subsiding, what effect will sea level rise have on the settlement and what mitigation measures can be taken? Sea breezes, especially in the evenings, provide relief from high temperatures in summer months, but planting is not possible because reclaimed land is fallow.

The provision of potable water is a serious issue. Almost every house has a groundwater borehole but the subsoil water is brackish, so people use this for cleaning and washing while having to purchase drinking water. This is provided by private contractors with tanker trucks and donkey carts. A 3,000-gallon tank costs Rs. 2,000 and is usually shared by three or four households and lasts for up to 20 days; however, the water is not fit for drinking purposes.

Education levels, especially among boys, are low mainly because of the seasonal nature of livelihoods. Between April and August, there is a ban on fishing and subsequently a downturn in seafood-processing and related businesses – a major source of income for Bengali households in particular. Community members therefore have to earn more in the peak season to save for the fishing ban period, and hence want the maximum number of household members to work as they are paid by the contractor for each piece of fish/shrimp cleaned. In the absence of a proper education system and curriculum, how can future generations deal with issues related to the environment, disasters and climate change?

As there are no proper sewers (either primary or secondary), pit latrines are prevalent. Wastewater drains into the sea but then washes up into the settlement at high tide. During the monsoons, the solid waste and the mud that results from accumulated rainwater combine to form a stinking sludge that creates problems for pedestrians. The absence of a sewage, water and waste collection system has a negative impact on the social and physical environment and has serious health implications.

A large percentage of residents of Machar Colony do not enjoy political patronage – because they cannot acquire a national identity card since they are not recognised as Pakistan citizens. Hence they can't vote in local, provincial or federal elections and so are of little value to political parties. The land on which Machar Colony is situated has assumed strategic importance and commercial value over the years, hence the chances of residents being given ownership/tenant rights are low to non-existent. Given these two factors, residents of Machar Colony will likely continue to face an uncertain future.

The leadership in Machar Colony has emerged from the continuous struggle by residents for recognition as citizens of Pakistan. This means interacting with government agencies to acquire national identity cards and other facilities such as health and education for the settlement. However, there is little participation from the community except in pressurising the leadership.

7.2 Pahar Ganj

In the early 1960s, around 15 to 20 displaced families from Miran Shah Bridge (Shershah) came to settle in Pahar Ganj, which is situated in the foothills northeast of the city. At around the same time, labourers working in North Nazimabad (a newly emerging planned settlement at the time) also started to settle here. Land records show that the land was originally allocated to the Social Welfare Department for the construction of a public hospital, but the previous local government granted the settlement the status of residential area. Some families claim to have titles to their plots of land, and the estimated population of the settlement is around 28,000.

Today, the settlement largely houses Pashtun Muslim migrants from the north of Pakistan and Christians from the Punjab. Pashtuns are politically influential due to their connections with local chapters of Pashtun-dominated national political parties, while the Christian community has strong links that are centred on the various denominational churches. A number of natural drainage channels cross the settlement, but these have been encroached upon over time, resulting in

flooding incidents in the settlement. The inhabitants are economically upwardly mobile and the area has relatively high and rising land values.

Water for the area used to come from the Hub dam, situated on the Sindh and Balochistan border, but it has since dried up and residents have had to resort to other means. In some instances, households in the adjacent, planned neighbourhood of Nazimabad allow residents to fill jerry cans of water for free; there is also a KSWB pumping station nearby from where some residents get their water. For the most part, residents purchase water from various types of informal water vendors. There is a thriving settlement-wide retail water business, whereby some households with underground water tanks buy and store water and resell it to other residents at a small premium.

Solid waste disposal is a major concern for residents. Some 15 years ago, sweepers, as deputed by the then Karachi Municipal Cooperation (KMC), used to come twice a week. Now, they come once a week but not with any regularity. At the main entrance to the settlement, close to a sports stadium, is an unofficial garbage transfer station where solid waste from the settlement, as well as from the planned Nazimabad area, is dumped for further transfer to the landfill site, which for the most part does not happen. Thus, huge mounds of garbage can be found here at all times. Needless to say, the large quantities of rotting solid waste are not only a source of foul smells but also a breeding ground for disease vectors and a general nuisance for the residents. In their attempt to handle ever-growing quantities of solid waste, municipal staff regularly set fire to the garbage heaps, which release smoke and toxic, nauseous fumes that adversely impact residents' health.

The settlement's stormwater drain has been encroached upon, with some homeowners extending their homes and others building shops over it. The drain also carries sewage from households that have connected to it. It is difficult to clean on a regular basis and is generally a source of foul smells. During the monsoons it overflows, filling the streets with wastewater and solid waste. When the drain is cleaned, this is paid for through contributions from the residents, who pay a contractor to carry out the work.

During the heatwave in 2015, four people from the settlement were reported to have died due to heat exhaustion/sunstroke. Houses are built of unplastered and unpainted concrete blocks, which absorb and let off heat. The high-density settlement comprises houses built very close together and only accessible through narrow passageways. Due to the rising costs of housing in the city, second and third generations from within households end up constructing additional floors to live in in the same house. Green cover in the settlement, which has a cooling effect, has decreased markedly over the years. Until the mid-1980s, there used to be large numbers of trees along the roadsides and in the area itself. Now only a couple are left. Land values are increasing in the settlement and there is pressure on inhabitants to sell and move out. How the community withstands the pressure will be an important determinant of their vulnerability, because alternative locations will mean moving to emerging settlements on the outskirts of the city – where, once again, they will have to contend with poor basic services and insecure tenure in addition to the social and economic costs of living far away from work areas and social facilities.

The Pahar Ganj leadership has evolved over two generations. Initially, their aim was the acquisition of water and sanitation, and subsequently for improvements in the area. Different ethnic and religious areas have different leaders, who also help settle domestic, property and inter-ethnic disputes. The Pahar Ganj population holds its leadership accountable and also participates actively in local, provincial and national elections.

7.3 Rehri Goth

Rehri Goth is a historical fishing village that has now become part of metropolitan Karachi. The village has a history dating back to the 13th century and consists entirely of fishermen who have a traditional system of local governance and dispute resolution. Ethnically, its inhabitants are Sindhi speakers, some of whom have lived there for generations; others have moved there in recent years, coming from villages in and around the Indus delta that have dried up or been badly affected by sea intrusion resulting from the upstream construction of dams and irrigation systems. The approximate population of the settlement is 45,000. Officially, the land on which the settlement is located is owned by the Karachi Port Trust.

Solid waste collection and disposal is a major problem in the area. Rehri Goth and neighbouring villages drain their raw sewage and dump their solid waste directly into the sea. The waste collection trolley operated by the city administration comes only once a week or sometimes once a fortnight. However, the solid waste is also a resource in that it is being used to reclaim land from the sea to build houses on. The housing stock is of poor quality and laid out haphazardly. Some of the houses are below road level and are flooded in the monsoon season.

Unemployment is a growing problem in the area. One of the factors is a reduction in fish catch over time, and people have attributed this to increasing levels of coastal water pollution and commercial fishing by local and foreign trawlers. Residents are of the opinion that these have all but destroyed subsistence fishing. In addition to the disposal of raw sewage into the sea, other sources of local pollution include raw waste from

a nearby buffalo colony and untreated wastewater from the nearby Korangi Industrial Estate.

Over the years, fishing activity has undergone a lot of change. Originally, the indigenous population was relatively caring towards the marine environment as their social and cultural life revolved around the sea. The sustainability of marine life was in their interests. However, post-1968, through an FAO-supported programme, support to the fishing industry was provided through bank loans. As a result, subsistence fishing activity was replaced by commercial fishing and the Rehri Goth fishermen became employees; this included the migrants who came and settled on the periphery of Rehri Goth and who were interested in fishing mainly as an economic activity. Commercial fishing practices were not in keeping with sustainability principles. They introduced small dragnets (which entrap marine life that is caught, killed and then thrown back into the sea) and disregarded off-season/fish spawning periods. Moreover, as there is no clear demarcation of the sea boundaries between India and Pakistan, fishing boats in search of ever-elusive fish periodically drift into Indian waters, where they are promptly captured by the Indian coastguards. This has had a profoundly disturbing effect on many of the households as a number of fishermen have spent years in Indian prisons.

Although the local government has provided water supply infrastructure to the settlement, this provides hardly any water and, just like residents of many other similar settlements in Karachi, people rely on informal water vendors for their potable water needs.

It was reported that between 15 and 20 people died in the heatwave of 2015. Some of the dead were sick, old and infirm, and the majority were reportedly women and children.

Originally there were a limited number of radios in the area but now every home has a TV and a cable connection.

The settlement used to be surrounded by mangrove forests but cover has greatly decreased over the years due to grazing by livestock, illegal felling, use as fuel and a reduction in the flow of 'sweet' water due to upstream canal and irrigation infrastructure.

Since Rehri Goth is an old Sindhi settlement, it has been patronised by Sindhi-speaking politicians and bureaucracy. Its leadership consists of people who can act as intermediaries between these and the local population. Many of the leaders are part of commercial fishing enterprises as well.

7.4 Labour Square

Labour Square is a social housing project of the government of Sindh for low-income groups. Since 2010, it has been inhabited/encroached upon by flood-affected people from different parts of Sindh.[17]

In 2010, displaced persons affected by the severe floods in the Sindh province interior were asked, through public announcements by the Sindh government, to seek shelter in the vacant flats of Labour Square (a Sindh government housing scheme for the working class). It was meant to be a temporary arrangement and it was believed that people would return to their villages/homes once the flood waters had receded. But six years on, the residents have showed little inclination to return to their villages and homes. This unwillingness is based on the realities of their former lives as peasants.

Over the years, most of these people had accumulated huge debts by borrowing from their landlords for various kinds of emergencies and household expenditures. Working ten-hour days, they were paid a bare minimum that barely covered their subsistence needs, and so many ended up borrowing from landlords at exorbitant mark ups. So, having lost their homes and meagre assets in the floods, and with debts to repay, remaining in Karachi – where they were not beholden to a local landlord – proved an attractive prospect. The temporary settlement in Karachi of Sindhi-speaking flood-affected people was also facilitated by a 'strongman' Minister of Home Affairs in the ruling PPP, who at the time was in the midst of a political tussle with the urban-based (non-Sindhi) MQM.

Other factors that meant these people remained in Karachi involved food and rations support from local NGOs; free accommodation in Labour Square; and employment opportunities as daily wage labourers in the nearby fruit and vegetable supply market – Karachi's biggest – and other places looking for unskilled workers. These circumstances provided unprecedented opportunities for economic independence and unimagined (relative) prosperity, as well as being free of debt. An equally important element related to security and dignity. In Karachi, unlike in the rural areas, they were paid market rates for their labour and were not subjected to threats and humiliation, which was their daily fare at the hands of landlords in rural areas. So, a perceived sense of dignity and newly acquired economic independence were important determinants in their decision to remain in Karachi.

[17] In the third week of November 2016, the Sindh government launched a drive to evict the flood-affected people who were living in Labour Square. Latest reports suggest that nearly all the occupied apartments have been cleared. See: https://www.thenews.com.pk/print/166400-Amid-protest-800-illegally-occupied-flats-vacated.

Still, fear of displacement from Labour Square was a cause of anxiety. When, in 2012, pressure from the Labour Department to vacate the Labour Square flats increased, the inhabitants formed an association and filed a lawsuit against the Labour Department, but the final court ruling went against the migrants. They also continuously lobbied with the ruling PPP legislators and relevant government officials but no permanent assurance was given.

Due to their uncertain status, none of the government departments have been willing to provide the inhabitants with facilities and services. As solid waste is not collected regularly by agencies and as sewage overflows, the area has become a breeding ground for diseases. Hepatitis, typhoid, pulmonary diseases, malaria, diarrhoea and dermal infections are common complaints from the residents. Because of stagnant sewage, foul smells fill the air between the blocks and inside the flats.

Piped water is not available and so is purchased from water tanker operators. A 3,000 gallon tanker costs Rs. 2,800 and is shared by around 30 flats. Each flat pays Rs. 100 a day to pump water for 6–10 minutes and a member of the community monitors pumping to ensure a just distribution.

Eight people in the compound lost their lives during the 2015 heatwave.

8

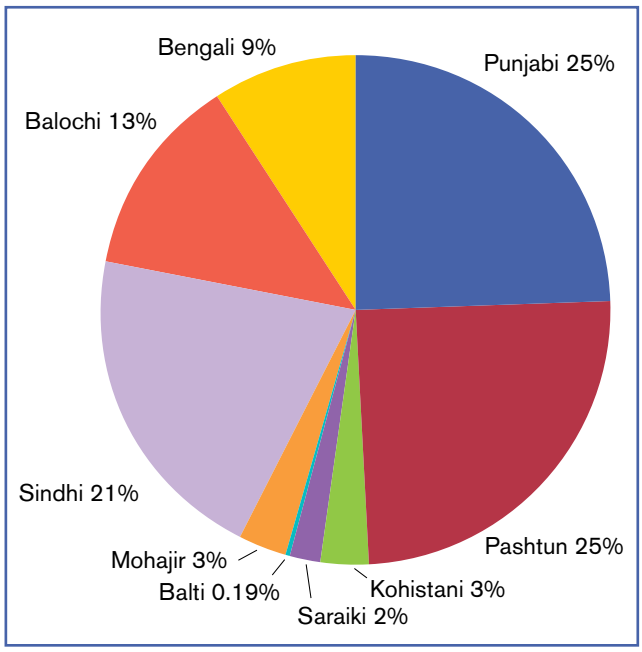
Survey findings from the four low-income settlements[18]

8.1 Demographics

8.1.1 Ethnic composition

The ethnicity of the respondents in the four settlements is shown in Figure 2. Punjabis and Pashtuns combined formed 50 per cent of the sample and Sindhis 21 per cent. Pahar Ganj and Machar colony have a large Pashto-speaking population, whereas Rehri Goth and Labour Square are dominantly Sindhi-speaking. Pahar Ganj has a significant number of Punjabi-speaking residents as well.

Figure 2: Ethnic composition of the four settlements



[18] The numbers in all the tables/figures are rounded up/down, so totals may not all add up accurately.

8.1.2 Religious affiliation

Fifty-two per cent of the 200 households surveyed were Muslims; Christians accounted for 36 per cent and Hindus 11 per cent. Pahar Ganj has a substantial Christian population, while Rehri Goth is home to a considerable number of Hindus.

8.1.3 Literacy levels

The mean literacy level among respondents was lowest in Labour Square at 8.86 per cent, and highest in Rehri Goth at 15.86 per cent. The comparatively lower rates for Labour Square could be because it comprises recent flood-affected migrants from rural areas, where educational levels are low compared to established urban communities.

Table 3: Literacy levels (%)

PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH
15.34	8.86	14.92	15.86

8.2 Livelihoods, income and expenditure

Ninety-four per cent of respondents mentioned that because of Karachi's economic prospects they felt economically secure, whereas four per cent said they did not. Fifty-six per cent of respondents said there was more than one working member in the household, while 44 per cent said they didn't have any other working member in the household.

With the exception of Machar Colony, none of the respondent households had other family members involved in home-based work. Labour Square residents are recent migrants from rural areas and live on the outskirts of the city; they have no links with, or skills to offer, local businesses, which explains their non-involvement in home-based work. The community in Rehri Goth are almost exclusively fishermen, with a small number working in the service sector, while the more upwardly mobile community in Pahar Ganj are engaged either in private service or small businesses.

Asked about the three biggest monthly household expenditures, 33 per cent overall said food, 23 per cent health and 22 per cent cited utilities. While food expenditure ranked highest in all four settlements, water was the next highest expenditure for Labour Square residents, indicating the difficulties in accessing water. Education and utilities were the second highest expenditures for Pahar Ganj residents, indicating their upwardly mobile status and aspirations. Health constituted the second highest expenditure in Machar Colony and Rehri Goth, which is likely a reflection of the poor environmental conditions in these two settlements.

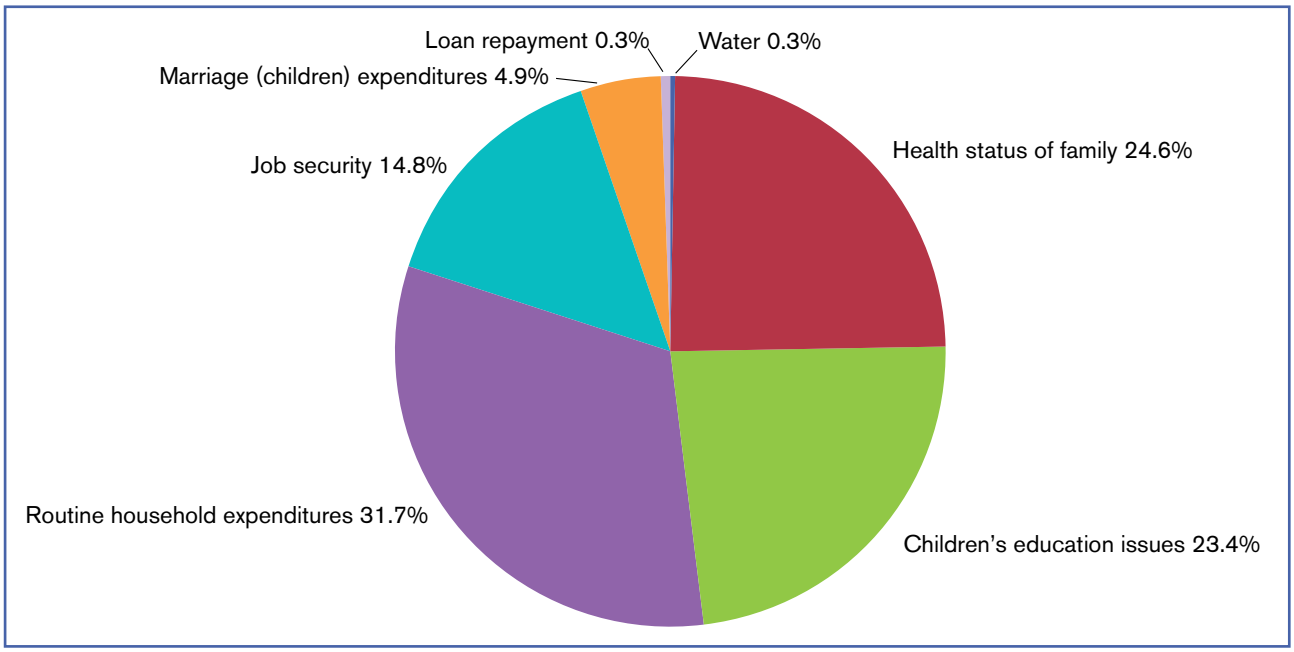
Beese (a kind of informal savings committee) is not a popular means of saving in the surveyed settlements, as only four per cent mentioned that they were part of such a group. This suggests that most households do not have enough disposable income to participate in a savings group.

Just over 31 per cent of all respondents in the four settlements said that their biggest worry was meeting routine household expenditures; 24.6 per cent were worried about the health status of their family; 23.4 per cent were concerned about their children's education; and 14.8 per cent about job security.

Table 4: Three biggest monthly household expenditures (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Food	33	33	33	32	33
Health	13	17	32	28	23
Utilities	27	8	28	24	22
Education	27	13	5	16	15
Water	0	28	0	0	7

Figure 3: Main concerns of households in the four settlements



8.3 Housing and basic services

More than half the respondents overall said they lived where they did because of proximity to friends and relatives, while 18 per cent cited proximity to their place of work and 11 per cent affordability as the main criterion. Affordability was the second most common reason for people in Pahar Ganj and proximity to the workplace for respondents in Machar Colony – a large number of whom either worked from home or in seafood-processing units situated in Machar Colony.

Ninety-five per cent of all respondents in the four surveyed areas did not think that their streets had been encroached but they were unanimous in thinking that there was a lack of adequate and safe walking space (footpaths) and a lack of green cover. Only 12.5 per cent mentioned that there were parks available that they could access – all these respondents were from Rehri Goth. Thirty-two per cent of respondents mentioned that they didn't have an airy room in the house, while 53 per cent said they had one or two rooms with cross-ventilation.

Around 41 per cent of respondents said they had airy kitchens in their homes, whereas 60 per cent said they did not. The higher than average percentage of respondents without a properly ventilated kitchen is indicative of the (visibly) cramped living conditions in Machar Colony. Given that respondents live in the same/similar kinds of apartments in Labour Square, perhaps different perceptions or the prevailing wind direction vis-à-vis the apartment explains why 38 per cent there responded yes, while 62 per cent said no.

Table 5: Reasons for selecting current abode (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Close to relations/friends/ community	46	76	54	51	54
Close to workplace	11	0	37	17	18
Affordability	24	2	10	6	11
By birth	2	0	0	21	7
Security	2	14	0	3	4
Close to shopping/commercial centres	2	0	0	0	1
Close to transport facilities	0	8	0	0	1
Upon marrying	12	0	0	2	4

Figure 4: Green cover and encroachment in the four settlements

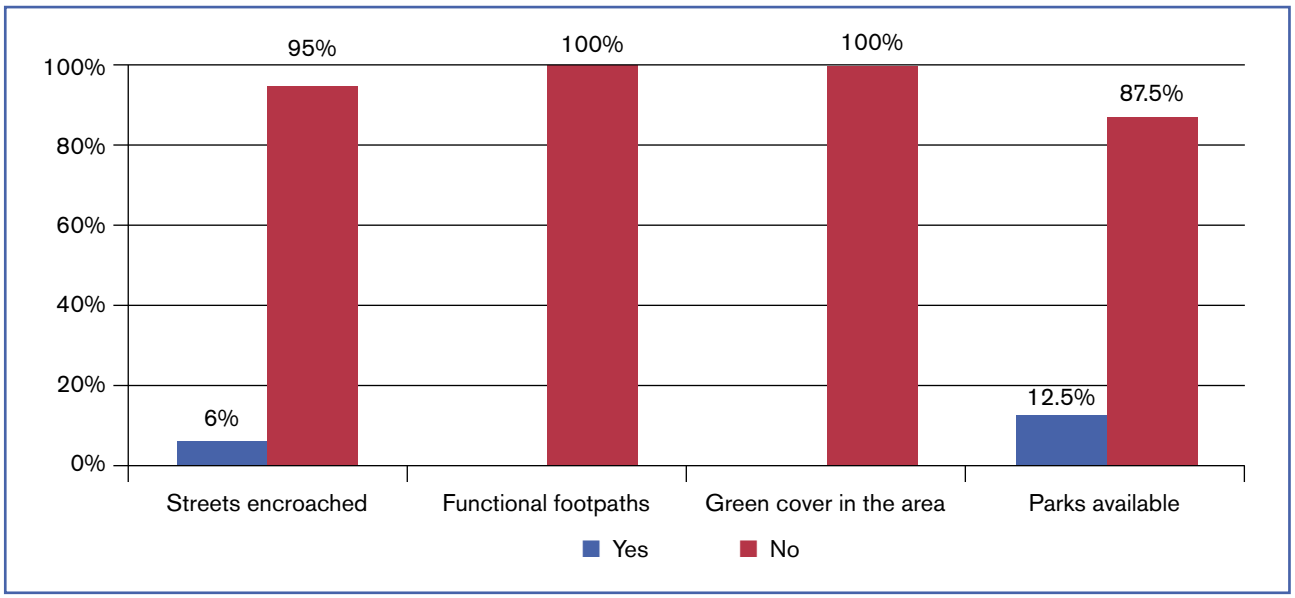


Table 6: Number of airy rooms (%)

NUMBER OF ROOMS	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
0	20	44	36	28	32
1	22	6	30	26	21
2	26	50	22	28	32
3	16	0	4	10	8
4	14	0	4	6	6
5	2	0	4	2	2

Table 7: Is the kitchen airy? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Yes	46	38	28	50	41
No	54	62	72	50	60

Table 8: Do you fear being evicted? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Yes	0	72	16	4	23
No	100	28	84	96	77
Total	100	100	100	100	100

Less than a quarter of the respondents said they lived in fear of being evicted. Unsurprisingly, the highest and second highest percentages of such respondents were from Labour Square and Machar Colony – both settlements with insecure land tenure. Virtually none of the respondents in Pahar Ganj and Rehri Goth feared eviction. The former likely due to political connections or expected support from within the community against any eviction drive, and the latter due to it being an old and well-established settlement.

Table 9: Do concerned authorities collect garbage regularly? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Yes	14	0	6	38	15
No	86	100	94	62	86

Figure 5: Where do you dispose of your household waste?

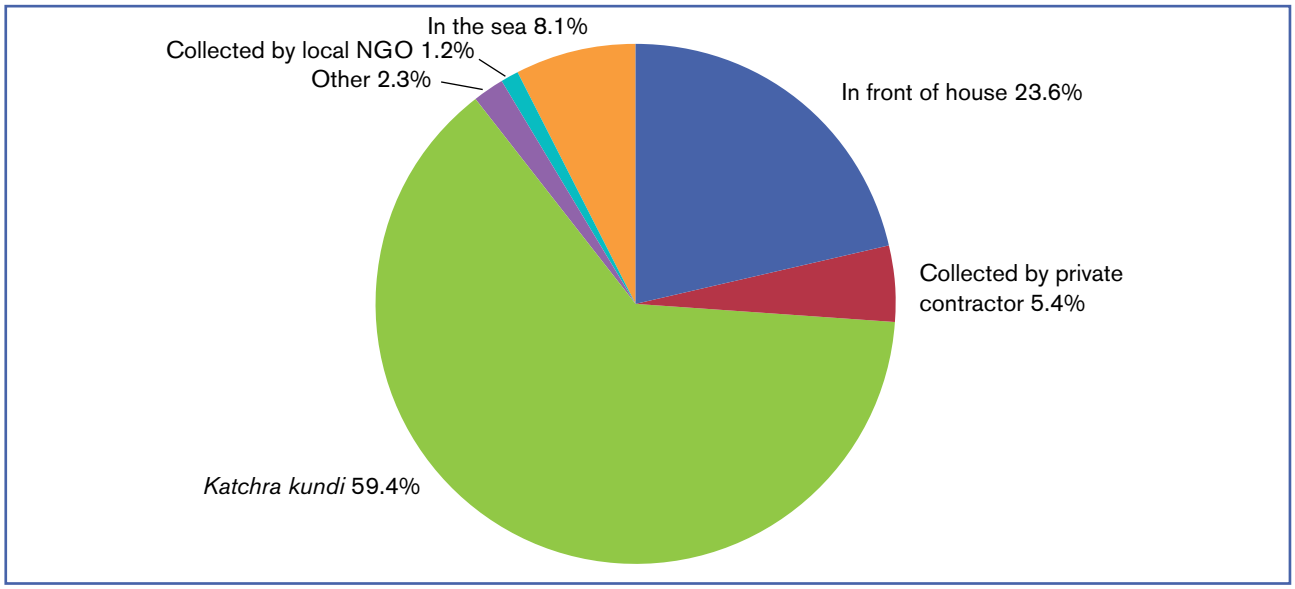


Table 10: Where do you dispose your household waste? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Katchra kundi (local informal dumping site)	72	38	62	63	60
In front of the house	0	62	27	10	24
Dispose of in the sea	0	0	0	27	8
Collected by private contractor	28	0	0	0	5
Other	0	0	7	0	2
Collected by local NGO	0	0	4	0	1

Around 86 per cent of respondents stated that household waste is not collected regularly from their area by concerned authorities. The situation seems to be worst in Labour Square, where there appears to be no municipal waste collection.

Almost 60 per cent of all respondents said they disposed of household waste at nearby garbage pick-up points (known locally as *katchra kundis*) and 23.6 per cent mentioned that they dump it outside their house.

Disposing of rubbish outside of homes is most prevalent in Labour Colony, which, again, reflects the residents' rural backgrounds (their unfamiliarity with solid waste disposal when living in close quarters with others) as well as their uncertain residential status in the eyes of the municipal authorities. The fact that nearly one-third of respondents in Pahar Gani rely on private contractors to collect their household waste is indicative of their comparatively higher-income group status. Twenty-seven per cent of respondents in Rehri Goth reported throwing waste into the sea, indicating a level of awareness regarding pollution, and/or could explain the practice of land reclamation in the settlement, which is situated by the sea.

More than four-fifths (85 per cent) of respondents said they were not satisfied with the sewage disposal system in their respective localities, stating that the existing sewers were narrow, poorly maintained, choked and the main cause of periodic flooding of the streets with

wastewater overflow. Respondents in Labour Square came out as being the worst served, whereas there was a comparatively lesser problem in Rehri Goth, as their wastewater drains directly into the sea (untreated).

Only 26 per cent of respondents overall got their potable water from a municipal pipeline. In Machar Colony and Labour Square, where tenure is insecure, none received piped water, while in the more established settlement of Rehri Goth, three-quarters of the respondents received piped water.

Of all those who received piped water (in Pahar Ganj and Rehri Goth), 75 per cent said they were not satisfied with the quality or quantity of drinking water; whereas none were satisfied in Pahar Ganj and 37 per cent were satisfied in Rehri Goth.

More than three-quarters of respondents overall in the four settlements were not satisfied with the three essential municipal services: solid waste collection, sewerage and water supply.

Table 11: Are you satisfied with the sewage system in your area? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Yes	14	0	16	32	16
No	86	100	84	68	85

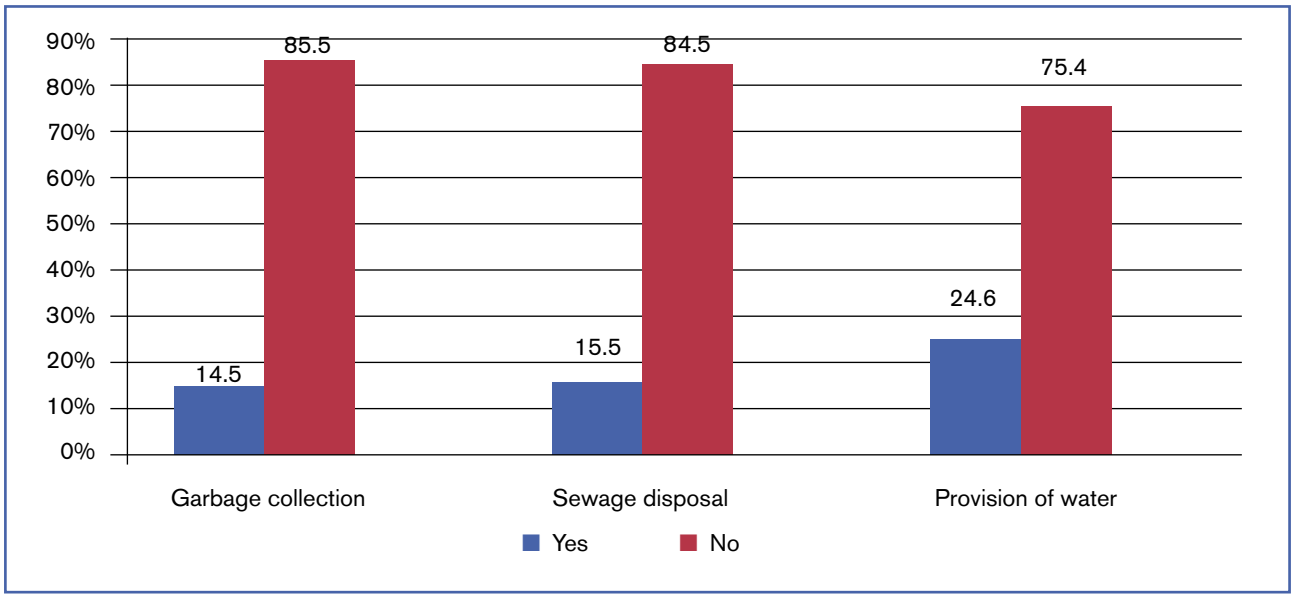
Table 12: Source of potable water (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Piped water	33	0	0	76	26
Water tankers	28	22	100	19	39
Water cans	38	78	0	6	35

Table 13: Are you satisfied with the quantity/quality of water you receive? (%)

	PAHAR GANJ	REHRI GOTH	OVERALL
Yes	0	37	25
No	100	63	75

Figure 6: Are you satisfied with the three essential municipal services? (%)



8.4 Health and education

8.4.1 Health

Malaria was cited as the most common health problem by 22.4 per cent of respondents. Gastrointestinal problems and high and low blood pressure were also cited as common health risks, and more than 11 per cent cited skin problems.

Cumulatively, 63 per cent of respondents cited unsafe drinking water and uncollected solid waste in the neighbourhood as likely sources of and/or contributors to the spread of diseases in the community.

When asked if there were any government-run clinics in the area, only 12 per cent of respondents in Rehri Goth said yes, while all other respondents in the four localities said no. Given that it was a factually verifiable question, it is possible that the 12 per cent of respondents in Rehri Goth mistook a private clinic for a government one. When asked what they thought might be the reason for there being no government clinic in their area, 49 per cent said they did not know, while 45 per cent blamed government apathy/failure. The highest percentages of respondents who blamed government apathy/failure were in Labour Square and Machar Colony.

Figure 7: Most common health problems?

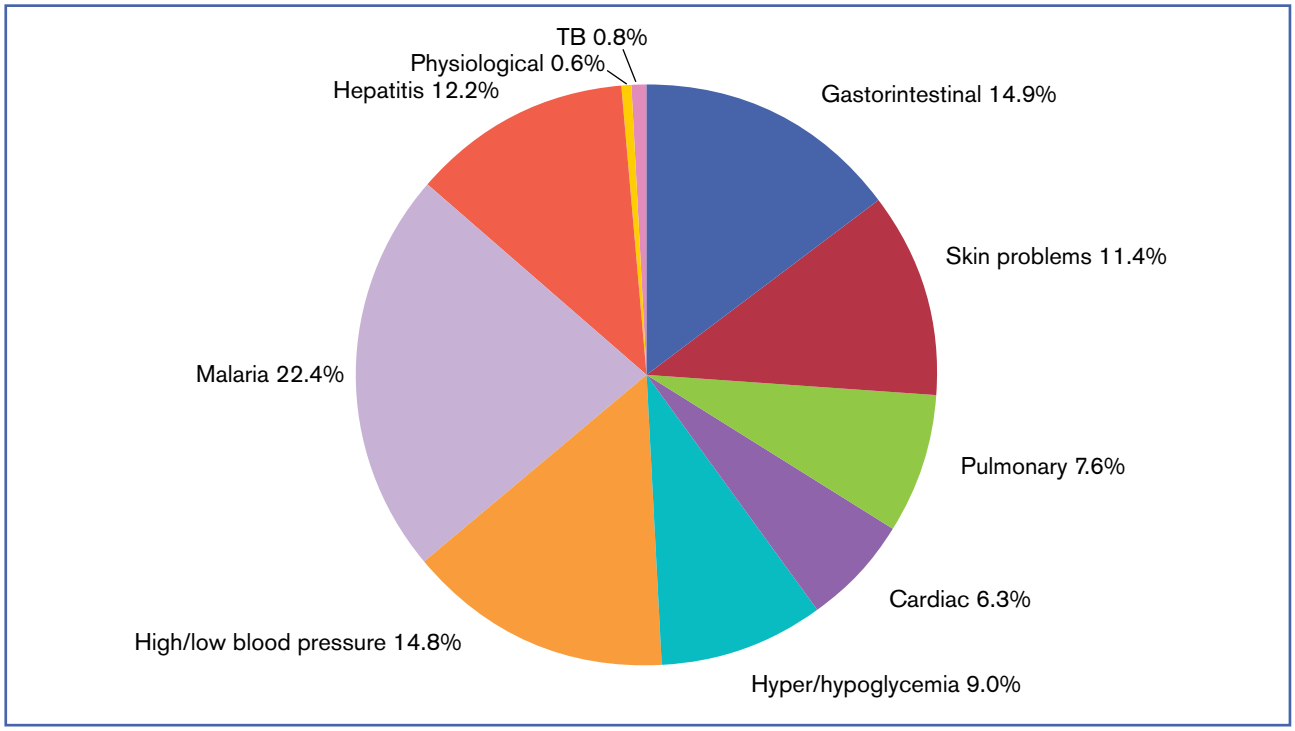


Table 14: Most likely source of ailments/diseases (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Pollution	17	4	12	21	13
Uncollected solid waste	31	42	27	33	33
Overflowing wastewater	12	19	10	1	11
Unsafe drinking water	23	32	34	32	30
Congested living	8	3	11	3	6
Adulterated food	4	0	4	5	3
Don't know	0	0	1	2	1

Table 15: Reason why there is no government clinic in the settlement? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Government not interested/not a government priority/failure of governance	26	62	52	17	45
Don't know	68	28	48	83	49
Building exists but no qualified staff	0	10	0	0	3
No space for building	6	0	0	0	2

Table 16: Reasons for selecting private health facilities? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Proximity to home	64	8	39	28	34
Private clinics are better	28	22	16	38	26
No government facilities nearby	0	20	41	14	19
Cheaper	4	2	4	18	7
Better facilities	0	14	0	0	4
Doctor not available in government hospitals	0	10	0	0	3
More effective treatment	0	12	0	0	3
No medicines in government hospitals	0	8	0	0	2
Government is 'bad'	0	4	0	2	2
On panel of insurance company	4	0	0	0	1

Table 17: Missed school days (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Last 10 days or less	44	25	42	36	36
Last 30 days	20	21	33	27	24
Last 3 months	36	50	25	36	39

Private clinics exist in all four settlements. The reasons why respondents and their households preferred private health care facilities (both clinics and hospitals) are diverse. Thirty-four per cent of all respondents said proximity to home, while 26 per cent mentioned that private establishments provided better health care compared to government-run facilities, and 19 per cent said there were no government facilities close by. Proximity was the single most common reason given by Pahar Ganj respondents, as for Machar Colony, while the perception that private clinics were better was the single most common reason given by Labour Square and Rehri Goth respondents.

When asked whether children at home had missed school in the last ten days or less, in the last 30 days and in the last three months, 36 per cent of households overall said children had missed school in the last ten days or less, 24 per cent said children had missed school in the last 30 days and 39 per cent said children had missed school in the last three months. Numbers were fairly similar for all four settlements. When asked the reason, 85 per cent cited fever/diarrhoea or other sickness.

Table 18: Reasons for missing school (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Fever	73	44	58	56	57
Diarrhoea	8	22	24	22	20
Other sickness	8	3	9	15	9
Weather/climate-related factors (eg, flooding, heat)	8	13	4	5	7
Other	4	0	2	0	1
To attend wedding in village	0	19	2	2	6

8.4.2 Education

When asked whether they preferred government or private schools, more than 90 per cent in Pahar Ganj and Machar Colony and 84 per cent in Rehri Goth said private schools. The exception was Labour Square, where 80 per cent of respondents preferred government schools. This might be due to the fact that when they previously lived in rural areas, private schools were less visible and accessible than government schools.

When asked the reasons for their preference, 25 per cent overall had no response, 37 per cent thought teaching was better in private schools/poor in government schools, 22 per cent said private schools were cheaper and 14 per cent cited proximity as a determining factor. Perhaps as an indication of their lack of exposure to the private school system, 68 per cent of respondents in Labour Square thought that private schools were cheaper – a curious claim given that government schools are tuition free. When asked why they thought the government had not provided adequate educational facilities, half or more said they did not know, while 61 per cent of respondents in Labour Square said it was a failure or negligence on the part of government.

Table 19: Which schools do you prefer? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Government	8	80	6	16	28
Private	92	20	94	84	73

Table 20: Reason why you prefer private schools? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Teachers are better in private schools	50	16	38	44	37
No response	18	12	34	38	25
Private schools are cheaper	2	68	4	16	22
Government schools are located far away	10	4	16	0	8
Proximity to home	18	0	4	2	6
Government school fees are high	2	0	4	0	2

8.5 Response to natural disasters

Forty-two per cent of respondents overall and/or their household members had experienced a weather-related disaster in the past ten years. All Labour Square inhabitants had been displaced because of the 2010 floods, whereas some respondents in the three other settlements reported being affected by localised urban flooding, caused in part by encroachment on drainage channels. All Labour Square respondents reported losses, while respondents in the remaining three settlements and 17 per cent of all respondents reported suffering economic losses due to flooding-related disasters, except in Rehri Goth, which was affected by a cyclone. An overwhelming 97 per cent of respondents who reported experiencing a natural disaster also reported loss of income, house damage and/or injury/death as a result of the event.

Of those who were affected by a natural disaster, only eight per cent of respondents from Labour Square reported being assisted by local government authorities. For the remaining, help came from local NGOs, neighbours and others. The majority of respondents from Pahar Ganj, Machar Colony and Rehri Goth reported receiving no information on safety measures to take during/after the disaster, whereas 70 per cent

Figure 8: Have you or anyone in your household been affected by a natural disaster in the past 10 years?

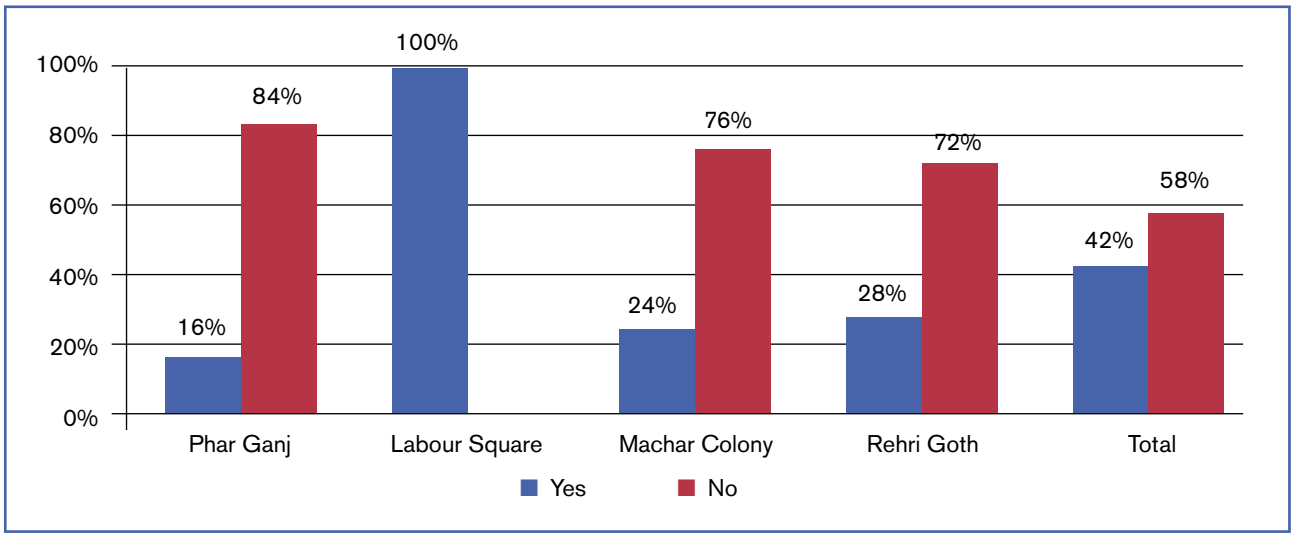


Table 21: Did you/your household suffer economic losses as a result? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Yes	8	100	34	8	38
No	92	0	66	92	63

Table 22: What kind of losses did you suffer? (%)

	PHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Lost income	25	2	0	14	6
Injury or death	13	0	0	7	2
Housing damage	13	20	58	50	30
Disrupted services (water, electricity)	0	0	0	7	1
Lost income and housing damage	25	72	42	21	55
Lost income, injury or death and housing damage	25	6	0	0	6

of respondents from Labour Square reported receiving such information. Around 70 per cent overall reported receiving the information from an electronic news media source and 18 per cent from NGOs. Respondents who reported getting the information from a government source were residents of Pahar Ganj and Rehri Goth.

In terms of who people trusted to provide them with relevant information during weather-related natural disasters, 62 per cent said electronic news media, with the highest percentage being respondents from Labour Square (all of whom are recent settlers from rural areas). Overall, only about 14 per cent trusted the government to provide such information; no one did in Pahar Ganj and only a small minority did in Labour Square. Similarly, only about 10 per cent overall, with the highest share of respondents from Machar Colony, reported trusting NGOs to provide such information.

When asked about concerns related to weather events, 67 per cent overall were extremely or very concerned and another 29 per cent were concerned or somewhat

Figure 9: Who assisted you with recovery from the disaster?

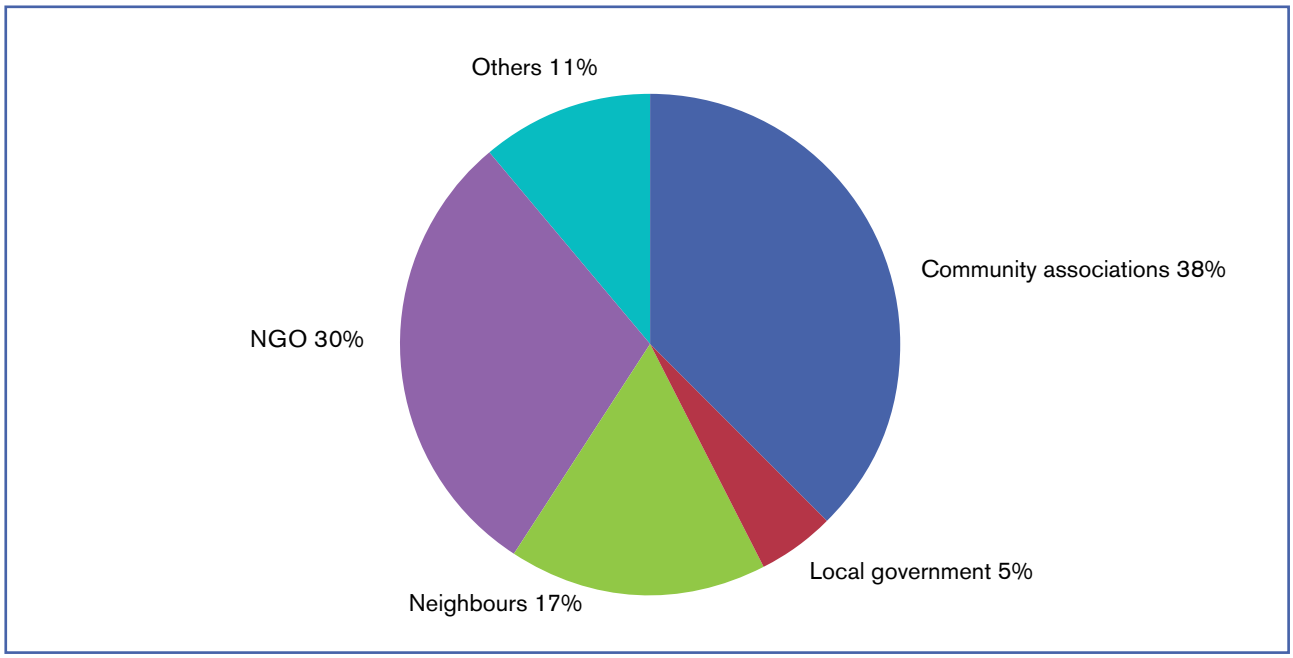


Table 23: Who assisted you with recovery from the disaster? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Community association	38	34	50	43	38
Local government	0	8	0	0	5
Neighbours	38	4	50	21	17
NGO	0	40	0	36	30
Other	25	14	0	0	11

Table 24: Did you receive any information about safety measures during/after a disaster? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Yes	16	70	28	32	37
No	84	30	72	68	64

Table 25: Who provided you with the information? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
News media	75	94	50	31	70
NGO	13	3	36	38	18
Government	13	0	0	31	8
Red Crescent	0	0	14	0	3
Not sure	0	3	0	0	1

Table 26: Who do you think is the most trusted source for information related to protection in times of weather-related natural disaster? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
News media	50	86	36	38	62
Government	0	9	21	25	14
Not sure	50	0	0	25	11
NGO	0	6	21	13	10
Insurance agent or company (presumably, employer)	0	0	21	0	4

concerned about extreme temperature events. This might be linked to the fairly recent heatwave event described in Box 1, which was widely and somewhat exaggeratedly reported on by the electronic media at the time.

The next biggest concern for all respondents was flash floods, with respondents in Pahar Ganj and Labour Square being particularly concerned – given their history with large-scale flooding. Higher-level concern about storm surge was reported by residents of Machar Colony and Rehri Goth, which are located close to the sea. Respondents most concerned about windstorms were those living in settlements with comparatively poor quality housing, namely Machar Colony and Rehri Goth.

Figure 10: Concerned about extreme temperatures?

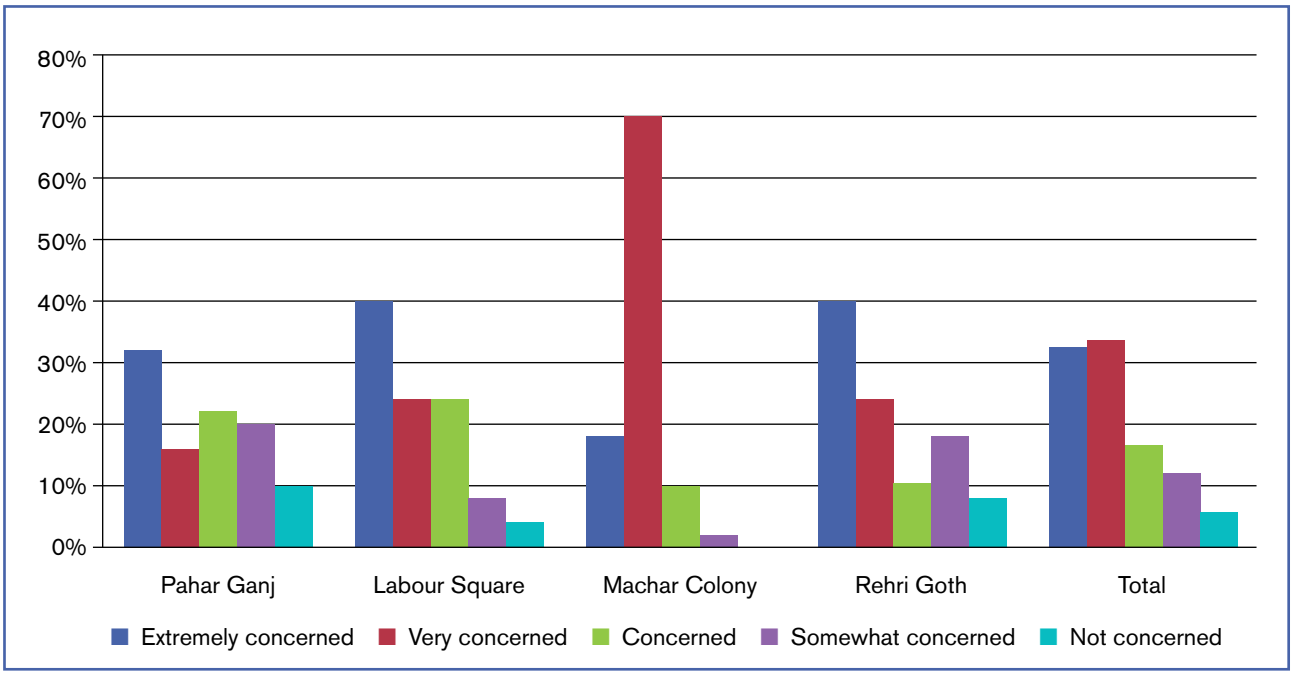


Figure 11: Concerned about flash floods?

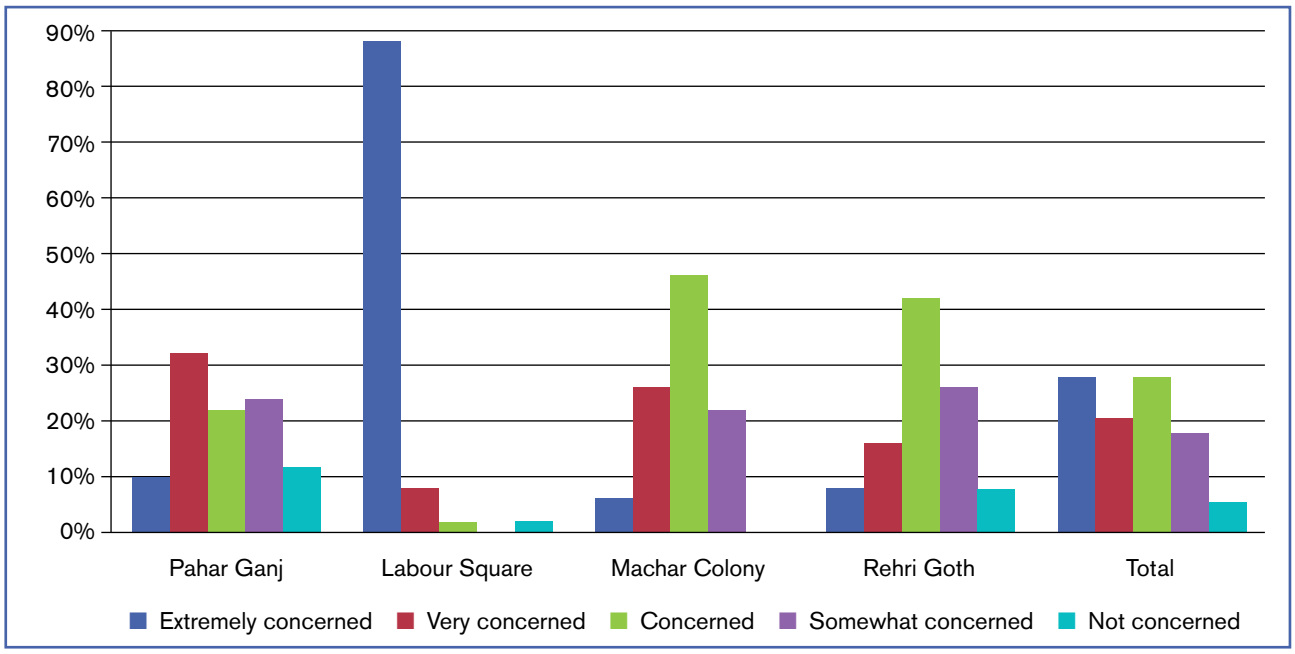


Figure 12: Concerned about storm surge?

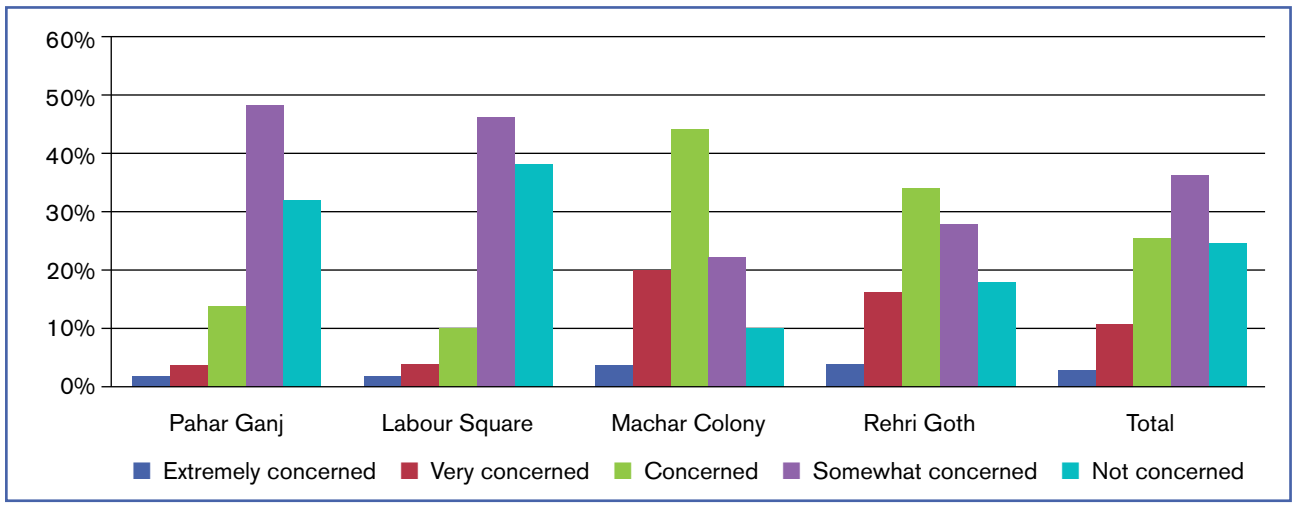
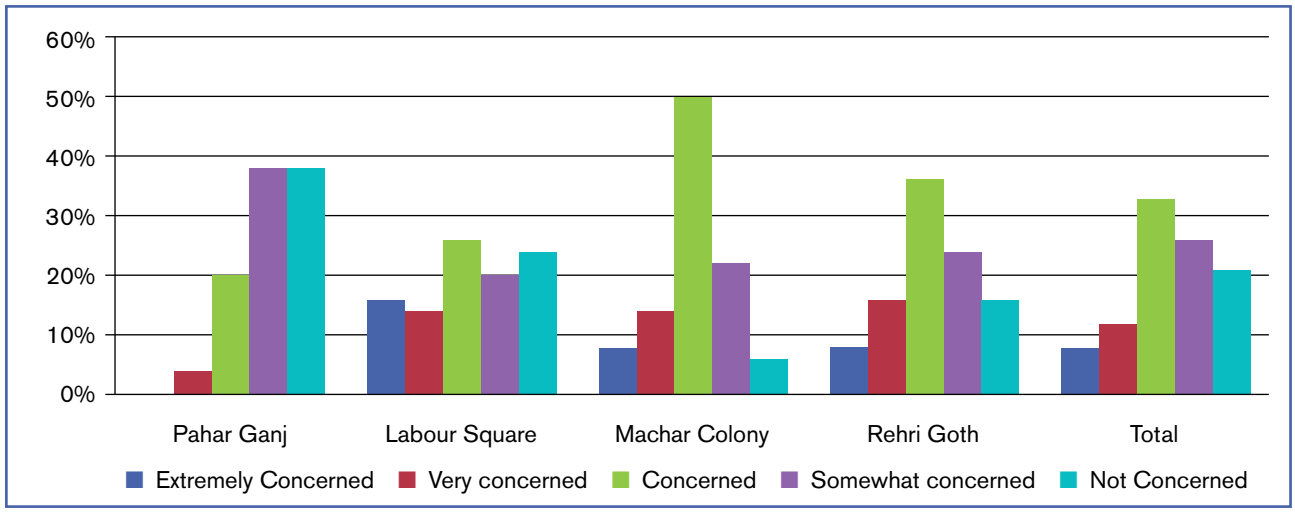


Figure 13: Concerned about windstorms?



8.6 Impressions on changing weather/climate and its impact

Eighty-eight per cent of respondents thought that Karachi was getting hotter. Sixty-eight per cent of respondents said hotter days had an adverse effect on health and 31 per cent said it caused a loss of income; 63 per cent reported taking no extra measures in response to hotter days, while 15 per cent reported increased fluid intake.

Ninety-five per cent of respondents reported that in last couple of years Karachi had experienced a decrease in rainfall and a shorter winter period, with a small percentage reporting a significant change in their lives as a result. Respondents' perceptions of the changing weather patterns are clear, with approximately 90 per cent reporting hotter summers, reduced rainfall and shorter winters.

Table 27: Are summers getting hotter? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Yes	96	68	92	94	88
No	4	32	8	6	13

Table 28: Does this affect you in any way? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Loss of income	32	39	21	33	31
Impact on health	65	61	79	67	68

Table 29: Do you/people in your household take any measures to protect yourself from the heat? (%)

	PAHAR GANJ	LABOUR SQUARE	MACHAR COLONY	REHRI GOTH	OVERALL
Nothing	60	76	61	57	63
Increase fluid intake	15	13	14	18	15
Stay in home/in the shade	12	7	5	1	6
Sit outdoors	9	0	6	3	5
Take shower	2	4	12	20	10
Cover head	2	0	2	1	1

8.7 Community-based/ voluntary organisations

Seventy-five per cent of respondents in three of the surveyed settlements mentioned that welfare and community-based organisations were active in their respective areas. No such organisations existed in the fourth settlement, Labour Square. Around 44 per cent of the organisations (in the three settlements) were general social welfare organisations, another 32 per cent focused on health issues and 25 per cent worked on education.

Sixty-one per cent of respondents from the three settlements where organisations were working mentioned that they did not benefit from social organisations working in their area. Sixty-five per cent said they could not rely on these organisations in difficult times, while 29.3 per cent did not know whether they could rely on them. Interestingly, while 68 per cent of respondents in Machar Colony said that they had benefited from voluntary organisations, none said that they could rely on them in difficult times (at a future date). Ninety-two per cent of respondents mentioned that their household members did not participate in voluntary organisations.

8.8 Key survey findings

Highlights outlining the main drivers of vulnerability in the four surveyed settlements are set out below:

- Basic survival needs (food, health expenditure and utilities) constitute the bulk of household expenditure and are also the main source of worry; this, combined with no reported instances of savings, implies that people live 'hand-to-mouth', leaving them with little or no financial resources to draw upon in times of need. High levels of health expenditure point to poor living conditions and/or inadequate nutrition, both of which contribute to household vulnerability.
- While tenure insecurity is low in Pahar Ganj and Rehri Goth – in the former on account of the population's upwardly mobile status and their political connections, and in the latter due to its long history, ethnic homogeneity and political connections – fear of eviction is (unsurprisingly) highest in Labour Square, where residents are essentially flood-affected squatters, and (to a lesser extent) in Machar Colony, due to the presence of recent migrants.

Table 30: Have you or your household benefited from voluntary organisations in any way?

	PAHAR GANJ	MACHAR COLONY	REHRI GOTH	OVERALL
Yes	16	68	32	39
No	84	32	68	61

Table 31: In times of difficulty, could you rely on voluntary organisations?

	PAHAR GANJ	MACHAR COLONY	REHRI GOTH	OVERALL
Yes	12	0	4	5
No	60	72	64	65
Don't know	28	28	32	29

- Provision of basic services such as adequate solid waste collection and easy availability of clean drinking water is inadequate in all four settlements, and an overwhelming majority expressed dissatisfaction with municipal performance in this regard. Poor quality water and improper disposal of solid waste along with poor wastewater disposal are seen not only as sources of disease – which people cited as a major source of expenditure and concern and also a leading cause of children missing school – but also as an indicator of how responsive concerned authorities are with regard to poor households' basic needs.
- More than two-thirds of respondents reported that at the time of a disaster, community/neighbours and, to a lesser extent, NGOs, provided assistance, with a very small number reporting receiving help from government sources. That so few mentioned any help from government is indicative of the weak relationship between the people and local government. Also, the fact that a majority reported proximity to family as a major factor when choosing their place of residence shows the extent to which households rely on extended family and community/clan to come to their aid in times of need. However, while households have some sense of security that family and neighbours would help in difficult times, there was little indication of (or enthusiasm for) community-level collaborative action, which can be a crucially important and timely source of support and rescue when disasters strike.
- Access to reliable and timely information is an important factor in dealing effectively with weather-related hazardous events, so it is an important component of resilience. Eighty-eight per cent of respondents overall expressed their low levels of trust in local government, citing the media and NGOs as the most reliable sources of information about weather-related hazardous events and how they might protect themselves in such situations. Although in many instances local governments do use various electronic media sources to convey information and safety messages, in our survey people seemed to be alluding to their trusting the media to report weather/hazardous events rather than to government information being conveyed by the media.
- Location, history and ethnic composition appear to be important determinants of the level of trust in the state. The residents of Rehri Goth, an old and established settlement, have a more positive view of government, which can partly be explained by the ethnic background they share with the rulers of Sindh province.
- Proximity to schools/clinics seems to be a stronger determinant of which service people will use rather than the perceived quality of the service on offer.
- People's greatest expense and concerns relate to food security and illness/disease.
- Flooding is a major concern for all communities.

9 Conclusions

Climate change will have profound impacts on urban infrastructure systems and services, the built environment and ecosystem services, and therefore on the urban population and the economy. The scale of these impacts will very likely exacerbate existing social and economic tensions and environmental drivers of risk, especially for marginalised and low-income groups who lack basic services.

Reducing basic service deficits and improving infrastructure systems (ie, water supply, sanitation, storm and wastewater drains, solid waste disposal, transport and telecommunications, health care, education and emergency response) can significantly reduce hazard exposure and vulnerability to climate change, especially for those who are most at risk and vulnerable.

The interconnected nature of current development imperatives, disaster risk reduction and climate adaptation can best be pursued under a comprehensive climate change adaptation strategy and action plan. An important part of such a plan will be improvements in the existing institutions of governance and the creation of strong horizontal linkages between them. As a first step, this will require a detailed multi-stakeholder vulnerability assessment of the city' institutions, systems and agents along with their links within and beyond the city. Thereafter, a programme that focuses on those groups and systems that are most at-risk due to anticipated climate change-related hazards will need to be developed.

Various conclusions and specific recommendations are listed below:

- Karachi's coast is receiving ever-decreasing river flow and upwards of 450 million gallons of raw sewage a day. As population pressure and economic compulsions continue to make land for housing unaffordable, vulnerable people are being pushed into ecologically risky areas in search of land for homes. Impending climate change will likely have a huge impact on the coastal and fishing communities, so any climate adaptation strategy must begin by understanding and responding to the challenges these communities face.
- Given the reported levels of trust communities have in electronic media as a source of accurate information, it is important to work with the media to make them more conscious of, informed and responsible about environmental and weather-related hazards, so that their reporting and programming can better address people's concerns and ways to mitigate against these. However, the question remains as to who will do this and how?
- Government organisations that deal with disaster preparedness, relief and rehabilitation (ie, local government, revenue department, national and provincial disaster management agencies) should forge closer links with the media to raise awareness and get their public messages across. But first, these organisations must have the structure, capacity, capability and political support, all of which are missing.

- Migration will continue to increase due to changes in the rural economy, cropping patterns and increases in the rural population, and so anticipating the nature and scale of migration and dealing with migrants and their needs and impacts will have to become an essential part of urban planning in the city. So far, issues related to migration do not figure in Karachi's strategic development plan except as numbers. However, various academic studies are underway; how these can help politicians and planners take informed decisions needs to be understood and promoted.
- Current land use practices foretell of more serious ecological impacts in the city. Sensitive areas are being occupied (for example, drainage channels are being blocked by formal and informal developments), green cover is decreasing, open spaces are shrinking and, in areas such as Machar Colony and Rehri Goth, land is being reclaimed in potentially dangerous ways that will endanger those who build their homes on it. Karachi has no social housing, and government policy requires that even the poor access homes from the market, which does not cater to low-income groups who, in the absence of assets and formal sector jobs, also do not have access to credit from housing banks. The solution to this requires major political changes in the 'privatisation' ideology and involves bringing state land into the low-cost housing market.
- People appear to have a good understanding of the relationship between water quality, sewage disposal, sanitation and disease. This should be built upon through more targeted public service messaging and by incorporating hygiene promotion into the school curriculum. This can be achieved if it becomes part of a larger public health programme, where different institutions (public, private, academic) can coordinate their work.
- The process of (unplanned) densification will continue because there are no ideas or planning process in place that will be able to bridge the demand/supply gap in housing. However, it is possible to support this process through the provision of technical advice and guidance via state actors, NGOs and university departments. This needs strong horizontal linkages and the expansion of existing programmes that are already doing this. Who will be the best lead institution to promote this will have to be determined.
- To mitigate against the heat island effect, it will be essential to provide technical support and advice on ways to create/improve ventilation in existing and new homes in low-income areas. The Orangi Pilot Project–Research and Training Institute has been operating such a programme since 1987, and can form a model for other similar initiatives. Furthermore, awareness of and technical support for adopting simple principals of heat avoidance and traditional designs and materials should be supported through public–private partnerships. Initially, this will require promotion of the concept in both government and NGO institutions, and as the initiator of this programme, the OPP should take on that responsibility.
- Housing quality in all four settlements is poor and is unlikely to survive earthquakes, floods or other natural disasters. Housing is delivered through a well-established relationship between small contractors, materials suppliers and manufacturers, and households. This relationship needs to be strengthened through technical support and managerial guidance to all three players, and there are existing NGO programmes that do this, which need to be promoted and adopted by government agencies, NGOs and communities. The process through which this can be done needs to be discussed and debated between the actors in the land and housing drama in Karachi.
- As part of a resilience-building endeavour, it will be important to identify vulnerable groups, learn from them and also build their capacities, which in turn will require monitoring and training institutions in the public and private sectors to work together. This is necessary, but it is a tall order given the fact that 13 million people in Karachi live in informal settlements. Awareness raising can be done through the media and greater understanding can be promoted through the Allama Iqbal Open University, where a large number of students from low-income settlements are educated.
- The IEE/EIA procedure and process needs to be strengthened and made more robust given that it is largely seen as being rigged in favour of the project sponsor. There is therefore a need to build capacity of the EPA and also make operational environmental tribunals and magistrates. Moreover, the IEE/EIA requirements and process need to be updated to incorporate urban climate change issues. Informed

public participation in the EIA process has to be increased so that public concerns can be taken more seriously. Karachi NGOs working on environment-related issues must inform people regarding the EIA process and specific EIA project public hearings. People should also be encouraged to file petitions against insensitive projects that affect their lives with the environmental tribunals that are to be established. This will create the necessary case law that is desperately needed, so that courts can take appropriate action.

- Many of the issues highlighted in the report relate to governance systems. In Karachi, due to the prevailing adversarial relationship between the two main political entities, city-level institutions have been battered out of shape or destroyed. So new, responsive and representative institutions are needed, that can better plan, organise and deliver improved services (health, education, water, sanitation) that meet the minimum requirements of the city's residents – especially the poor and marginalised. Residents are not hopeful, as they distrust the state and consider it corrupt.
- There is a need to establish horizontal linkages between various organisations of the state, academic institutions and NGOs dealing with urban environmental issues as well as climate-related (hazardous) events. This in itself will go a long way towards improving environment-related issues that impact on climate change and disaster management. Academic institutions are perhaps the best place to initiate the creation of such linkages.
- The issues mentioned in this report, as well as some of the solutions highlighted, are well understood by state agents and interest groups; but what is required to operationalise any kind of response to identified challenges involves the coming together of various stakeholders in an institutional arrangement that does not as yet exist. Given the focus of the state and its agents and the corresponding resources available for 'non-security-related' issues, the likelihood of the suggestions mentioned above being considered seriously is extremely low. However, it is felt by the authors of this report that with combined pressure from civil society, Chambers of Commerce and industry, academia, trade unions, and shopkeepers and market operators associations, the two major political parties can be brought closer together to overcome the governance-related crisis of Karachi.

Annex 1: Key climate change terms used in the IPCC report

Climate change: Climate change refers to a change in the state of the climate that can be identified (for example, by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: "*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods*." The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes.

Hazard: The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources. In this report, the term *hazard* usually refers to climate-related physical events or trends or their physical impacts.

Exposure: The presence of people, livelihoods, species or ecosystems, environmental functions, services and resources, infrastructure, or economic, social or cultural assets in places and settings that could be adversely affected.

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Impacts: Primarily refers to the effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services and infrastructure due to the interaction of climate changes or hazardous climate events occurring within a specific time period, and the vulnerability of an exposed society or system. Impacts are also referred to as *consequences* and *outcomes*. The impacts of climate change on geophysical systems, including floods, droughts and sea level rise, are a sub-set of impacts called physical impacts.

Risk: The potential for consequences where something of value is at stake and where the outcome is uncertain, recognising the diversity of values. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. Risk results from the interaction of vulnerability, exposure and hazard. In this report, the term *risk* is used primarily to refer to the risks of climate change impacts.

Adaptation: The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

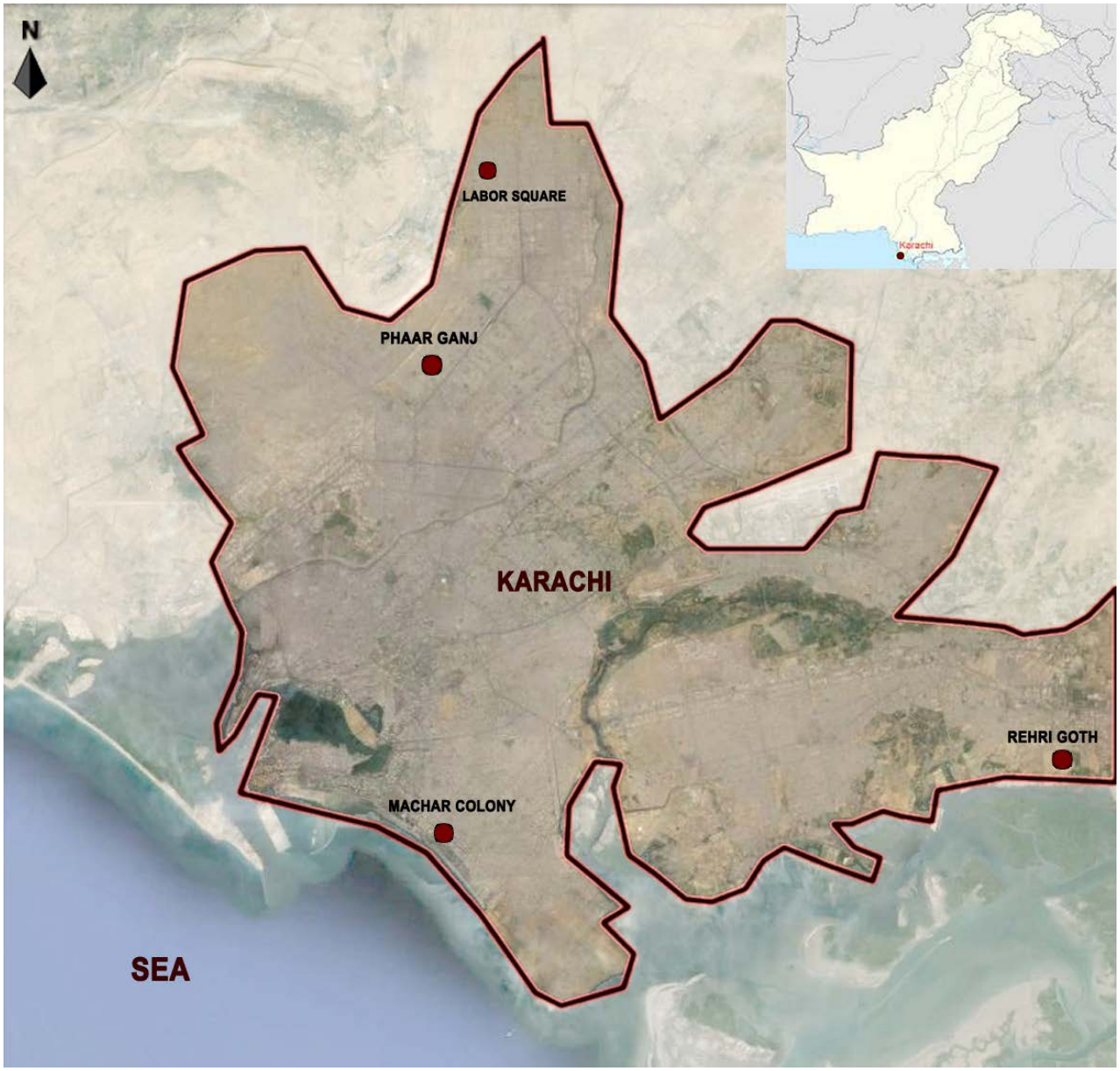
Transformation: A change in the fundamental attributes of natural and human systems. Within this summary, transformation could reflect strengthened, altered or aligned paradigms, goals or values towards promoting adaptation for sustainable development, including poverty reduction.

Resilience: The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.

Source: IPCC, 2014.

Annex 2: Profiles of selected settlements and maps

Figure 1: Location of the four selected settlements



1 Machar Colony, Kemari Town, District South, Karachi - profile

(The profile is synthesised from various interviews conducted of residents and service providers of Machar Colony from March 02, 2016 to March 18, 2016. Wherever deemed necessary media articles are also cited.)

The land belongs to Karachi Port Trust (KPT). In the mid 1960s some 10 to 12 families of Pashtun ethnicity came from Swat to make the land their home. They were port labourers. Bengalis came here later, from 1970. Later Swatis, Mianwalis, Punjabis and Sindhis also came here. People preferred this area because it is close to the port and initially there was no cost for the land, and even later on the cost of the land was and still is extremely cheap here compared to the rest of Karachi. In earlier times (1960-85), when the land (which used to be marshes and water) was more easily available, the migrant himself marked the land, put a wooden fence around it and then reclaimed it by putting debris on it.[19] Influentials of the area in collusion with Docks' police and KPT, grab and sell the land to incoming migrants.[20] (Who gives the permission could not be determined).

Nowadays, it is simple. One can put a boundary wall of sheets or wires in marshes and then start reclaiming the land by throwing debris on it. An area of marshes covering some 200 square yards costs Rs. 300,000. A dumper of waste costs Rs. 4,000 and a 240 square yards plot takes 10 to 12 dumpers. Now it is ready for construction. Besides cash, a friendly *thallewalla* (owner of a construction component manufactured yard) can provide bricks on credit, and one (now owner of the piece of land) would be needing a mason who by default would act as an architect as well: guiding all along the construction of the house. Meanwhile, one needs to apply for a Karachi Electric Company (KE) meter as it take 15 days to 2 months to get the meter installed. The bribe rates for that could vary from Rs. 500 to Rs. 5,000. Potable water will be available through small or big tankers and for other utilities one has to have a boring in the house. The boring goes 35 to 40 feet below the ground and costs Rs. 12,000 to Rs. 14,000. A 3000 gallon tanker costs Rs. 2,000 and is usually shared by 3 to 4 households and lasts for 20 days. Lastly, comes the provision of gas and once one has an electric supply from KE, on the basis of it, it is easier to get the gas connection. Two years back it cost Rs. 5,000 with a 40 square feet pipe to get the gas connection. Now it is Rs. 18,000. Sui Southern Gas Company (SSGC) touts roam the streets and one just has to ask them and rest will be taken care of by them. Since Karachi Operation (an operation launched by para-military forces against lawlessness in the city) reclamation has become more difficult.[21] Machar Colony provides cheap labour, cheaper land, stolen electricity and stolen water and that makes it attractive for everybody: the migrants and the would-be employees.[22]

On the reclaimed and grabbed land, the sale and purchase of houses continues, except that most of the dealings are bilateral and the involvement of a middle man or real estate agent is minimal. A stamp paper, father's NIC, neighbour's NIC and KE meter number is required for sale or purchase of land. Earlier there was less sale and purchase of land and more land grabbing. Now since almost all the land is grabbed (except the area towards mangrove bushes) more sale and purchase business is prevalent.[23] *(Interviewees do not talk openly about the involvement of KPT police personnel and 'influential' but whispers were made about the involvement of the three 'stakeholders').*

Some 50 to 60 *thallewallas* are operative in Machar Colony, mostly Pashtuns. Besides cash on credit, *thallewallas* provide blocks on credit as well. Those who take blocks on credit, return the money on a monthly basis. Average time for repayment of credit is 4 months. Almost all agreements are verbal and a register is maintained by the lender. On average 700 blocks are required to make one room. Those who have more money at their disposal prefer to use 4 inch block, otherwise 3.5 inch block are popular. 4 inch blocks are used more in pillars. Bengalis prefer 3.5 inch blocks to 4 inch blocks. The cost of one block is Rs. 16. One cement bag of Rs. 500 with 3 donkey carts of gravel (Rs. 150 per cart) can make 110 to 130 blocks. Now people are making more and more *pucca* (permanent) RCC roof tops houses. Earlier the houses were made of mud, bamboos and plastic sheets. Most of the workers manually mix cement and it takes a lot of time. With a motor operated mixing machine daily production of blocks can be enhanced and daily sales, therefore, will also increase. The finished blocks are transported on donkey carts to the customers' house, a time consuming process. If a Suzuki pick up is available with those *thallewallas* they can transport more blocks in less time.[24]

Different figures are cited for the population of Machar Colony and vary from 700,000 to 1.2 million. Those who live in Machar Colony include Bengalis, Burmese, Punjabis, Katchis, Balochs and Pashtuns.

[19] Interview with Shams-ur-Rehman, an old resident of Machar Colony March 09, 2016
[20] Interview with Mr. Parvez, a male NGO worker, March 15, 2016
[21] Interview with Shams-ur-Rehman, an old resident of Machar Colony March 09, 2016
[22] Interview with Mr. Parvez, a male NGO worker, March 15, 2016
[23] Interview with Shams-ur-Rehman, an old resident of Machar Colony March 09, 2016
[24] Interview with Nazir and Kahsta Gul, thalla operators, March 04, 2016

> "Dubbed Machar Colony by Karachiites, Muhammadi Colony is the epitome of a crowded, desperate and haphazard community. It's suggested that as many as 700,000 people live here. If that's true, then on a patch of land about 4.5 square kilometres, the settlement has a population density that not only is more than 75 times higher than that of Karachi as a whole, but also rivals some infamous slums of Mumbai."[25]

Though not neatly segregated some correlations between ethnicity and professions, as summarized in the table below, can be established:

S. NO.	*QAUM*	OCCUPATION/ PROFESSION
1	Mianwali	Roaming vendors of fish and shrimps
2	Bengalis	Fish and shrimp cleaning, workers at fisheries and businessmen (fishing related)
3	Pashtuns	Thallewallas and businessmen (fishing related)
4	Punjabis	Transporters and labourers
5	Sindhis	Transporters and Clearing & Forwarding agents for fish related work
6	Katchis	Construction workers, masons, labourers and shuttering experts
7	Burmese	Fish and shrimp cleaning and workers at fisheries
8	Baloch	Sailors, mostly
9	Afghanis	Transporters, dumper drivers and debris providers

Most of them are making money through shrimp and fish cleaning and packing. Manufacturing and/or provision of ice slabs and net making are associated businesses. This is dominated by Bengalis and Burmese. To handle the low incomes in off seasons (when fishing is banned) some households have opened up small grocery shops in their homes. There are a lot of *chai khanas* (tea shops) in the vicinity as well and most of those are run by Pashtuns.[26]

The sinking of settlements is also an issue. As mentioned before, Machar Colony is on reclaimed land from mangrove marshes and the sea itself. Though people spend quite an amount on reclaiming land by purchasing and dumping debris and waste on their plot, they start building before the filling is consolidated. As a result, the house begins to sink. The windows of houses often sink down to the level of the lane. Every new house construction is one level up compared to his/her neighbour's house and as a result, in the monsoons, the old house gets flooded.[27]

For Pashtuns and other "bonafide" citizens of Pakistan, lack of provision of civic amenities is the biggest problem, the main concern of the Bengali community is different. The most important issue for them is how to obtain CNICs (Computerized National Identity Cards). Despite living here ages they are regarded as Bengali (citizens of former East Pakistan and current Bangladesh) by the state institutions, and so the Bengali population is suffering from a serious identity crisis of alienation, both political and social.[28]

This absence of a CNIC has a domino effect. For instance police personnel can pick up any Bengali or Burmese boy from anywhere, which they do on a regular basis and later release them by accepting any amount from Rs. 5,000 to Rs. 10,000, and even above Rs. 10,000. The community lives in perpetual fear.[29] The government of Pakistan has declared general amnesty for Bengalis who migrated to Pakistan before 1974, and they were granted permission to seek citizenship through proof of residence in the country. Those immigrants who entered the country after 1974 until June 2000 are not entitled to citizenship, but they can seek rough registration and permission to work. According to the rules of National Alien Registration Authority (NARA), all those immigrants who entered the country after July 10, 2000, have no right to work or do business and are, in fact, supposed to be deported.[30]

The majority of girls in the area are deprived of educational opportunities for two reasons: lack of CNICs (without which registration at a school is difficult) and because they don't see any future opportunities after getting educated. This is in spite of the fact that in Pakistan girls' education is on the rise, not because the state is realising its role, but because of sporadically mushroomed private schools in low income areas. They are the ones who are catering to the rising demand.[31]

Provision of potable water is a serious issue. People here have to purchase potable water but it is not fit for drinking purposes. Second main issue is the availability of electricity as load shedding is common.

[25] http://www.newslinemagazine.com/2009/05/choked/
[26] Interview with Shams-ur-Rehman, an old resident of Machar Colony March 09, 2016
[27] Interview with Nasira Saroon, a female Bengali resident, March 04, 2016
[28] Interview with Nasira Saroon, a female Bengali resident, March 04, 2016
[29] Interview with Nasira Saroon, a female Bengali resident, March 04, 2016
[30] https://tahaz.wordpress.com/2010/06/02/in-search-of-an-identity/
[31] Interview with Nasira Saroon, a female Bengali resident, March 04, 2016

Lack of education can also be observed in boys as well, because of the seasonal nature of livelihoods. From April till August, there is less seafood related business. So the community thinks that they should earn more in peak seasons to save for the fishing ban period, and hence want more work force to be deployed. It is important to mention that mostly people are paid on a piece basis by the contractor.[32]

As they have no proper sewers (no primary and no secondary) the pit latrine system is prevalent in the area. When the sea levels are high, sewerage washes away with the tides. Almost every house has a 'boring', but the sub soil water is brackish. So people use brackish water for cleaning and washing while they have to purchase potable water. The private contractors provide this to them through tankers on trucks and on donkey carts.[33]

The most prevalent health issue is Hepatitis C. Further to that are dermal infections, diarrhoea, eye infections, cataract in elderly and diabetes. Birth attendants exist but are not properly trained and they either learn by trial or error or claim to be hereditary midwives. Since the roads are not paved, dust and accompanying allergies are common. Solid waste is not disposed of properly as there is no government agency or private contractor operative here. In monsoons, the spread of solid waste in the lanes, and the mud due to accumulated rain water (the rain water usually remains there for two to three months) get together to form a stinking sludge that creates problems for pedestrians.[34]

The interviews revealed that the sea breeze is a relief against rising temperatures. Plantation cannot be achieved because reclaimed land is fallow.[35]

Religious festivals and family ceremonies provide occasional opportunities for women to exchange views. However their work places (*Jheenga Bara* or shrimp cleaning workshops - these are women-only places) are also spots of socialisation to discuss day to day issues. For men, *masjid* (mosques) serve the same purpose. They also socialise at *chai khanas*, and they also have a fishermen committee.

Women's movement is usually hampered by stray youth. Sitting at the corners of the streets or at *chai khanas*, they regularly pass comments on young girls.

In Siraji's tenure (name of a don, whose apparatus became dysfunctional after the Karachi Operation in 2013) women were abused both physically and sexually. Despite all odds those women who manage to move out of the house and gain employment in fisheries are more prosperous compared to others. Fisheries are a great blessing for both men and women, as they provide job opportunities close to homes. Because of this proximity women have no hesitation in accepting jobs for night shifts as well. More women are employed compared to earlier years.[36]

Probably because of this cross gender interaction has increased, resulting in more love marriages. Simultaneously more marriages are ending in divorce as compared to "before". I also observed more inter-communal marriages between Bengalis and Pashtuns.[37]

The main issue for men is unemployment and secondly, harassment by the police.

Almost every home has a TV and a cable connection; "earlier" it was not the case. The number of thallas (brick making facilities) has increased and more schools are operating. Popular newspapers are Ummat, Awam and Express. A considerable number of homes offer beauty services for women but on a small scale, perhaps because of lack of training or equipment. Most would-be-brides prefer to go to Khadda or Agra Taj[38] (some distance from Machar Colony and better-off).

Because of increasing loss of open spaces, children have less opportunity for outdoor sports. Also, because of dumpers and trucks, they are discouraged to play in lanes and streets. The number of motorbikes has also increased tremendously.[39]

There is no government dispensary in the area, no bank, no graveyard, no police station and no playgrounds. Besides private schools, there is one government school in the area.

It is feared that, in the years to come, the population living in Machar Colony will be removed forcefully. Keeping in view the exponential rise of land prices in the City, KPT certainly wish to make the most of it by removing the inhabitants and selling the land to the commercial sector or by developing it themselves.[40]

[32] Interview with Nasira Saroon, a female Bengali resident, March 04, 2016
[33] Interview with Nasira Saroon, a female Bengali resident, March 04, 2016
[34] Interview with NasiraSaroon, a female Bengali resident, March 04, 2016
[35] Interview with Mr. Parvez, a male NGO worker, March 15, 2016
[36] Interview with NasiraSaroon, a female Bengali resident, March 04, 2016
[37] Interview with NasiraSaroon, a female Bengali resident, March 04, 2016
[38] Interview with NasiraSaroon, a female Bengali resident, March 04, 2016
[39] Interview with NasiraSaroon, a female Bengali resident, March 04, 2016
[40] Interview with Mr. Parvez, a male NGO worker, March 15, 2016

Issues to pursue:

1. Given the low quality of building components, design advice and technical supervision of homes and community buildings, how will climate change affect the living conditions within the home? How can future housing quality be better and how can new housing be improved?
2. Given the fact that the area has been reclaimed and is in the process of sinking, what effect will sea-rise have on the settlement and what mitigation measures can be taken?
3. The absence of a sewage, water and waste collection system has a negative impact on the social and physical environment and has serious health implications.
4. In the absence of a proper education system and curriculum, how can future generations deal with issues related to the environment, disasters and climate change?
5. This is a community which does not enjoy political patronage as it is not considered to be Pakistani. Also, the land on which they are sitting is an important location and has a high economic value. Given these two factors, how do the residents see their future and that of their settlement?

Maps – Machar Colony

Figure 2: Map Machar Colony Figure 3: Survey Area Map

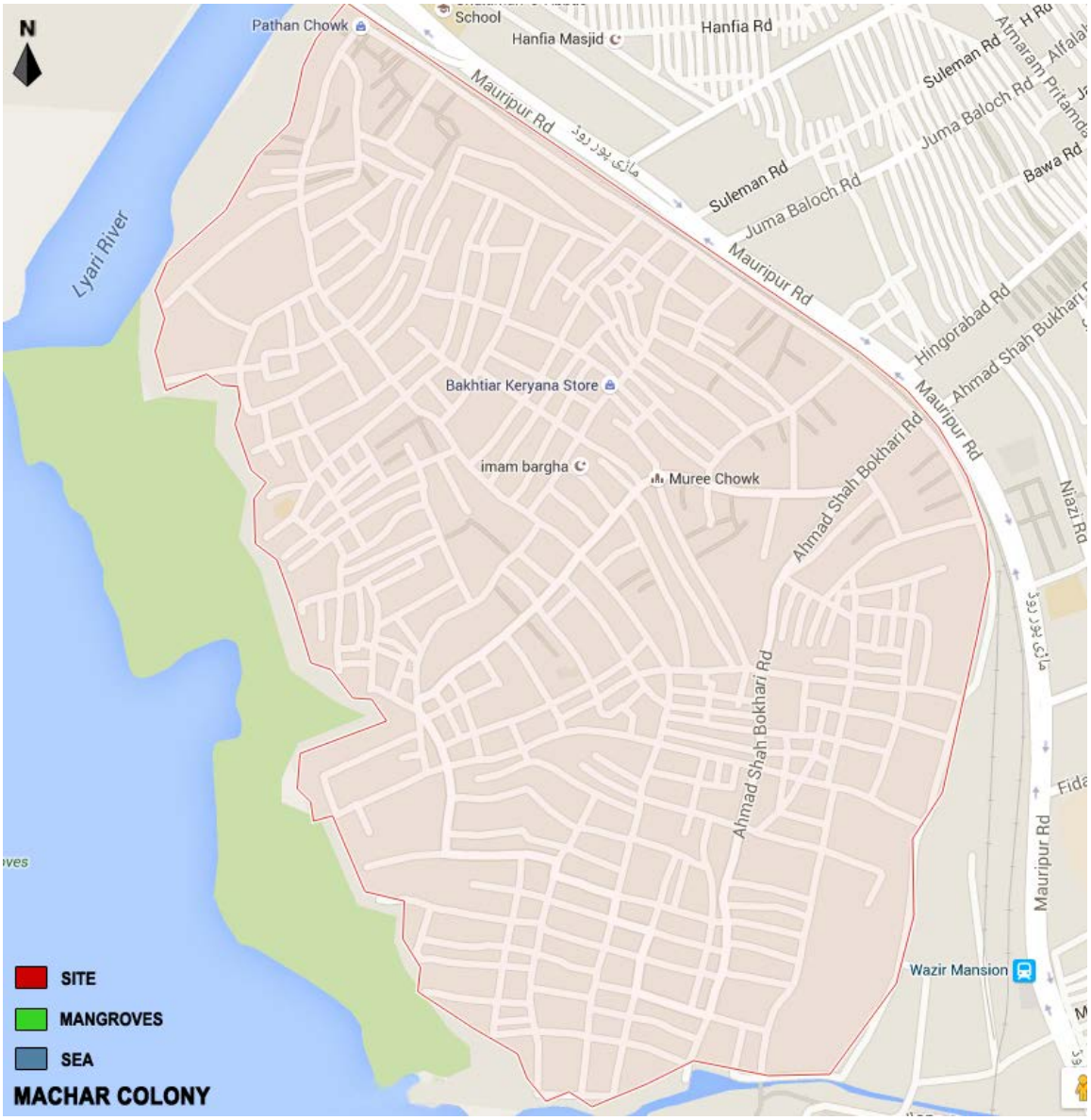


Figure 3: Survey area map

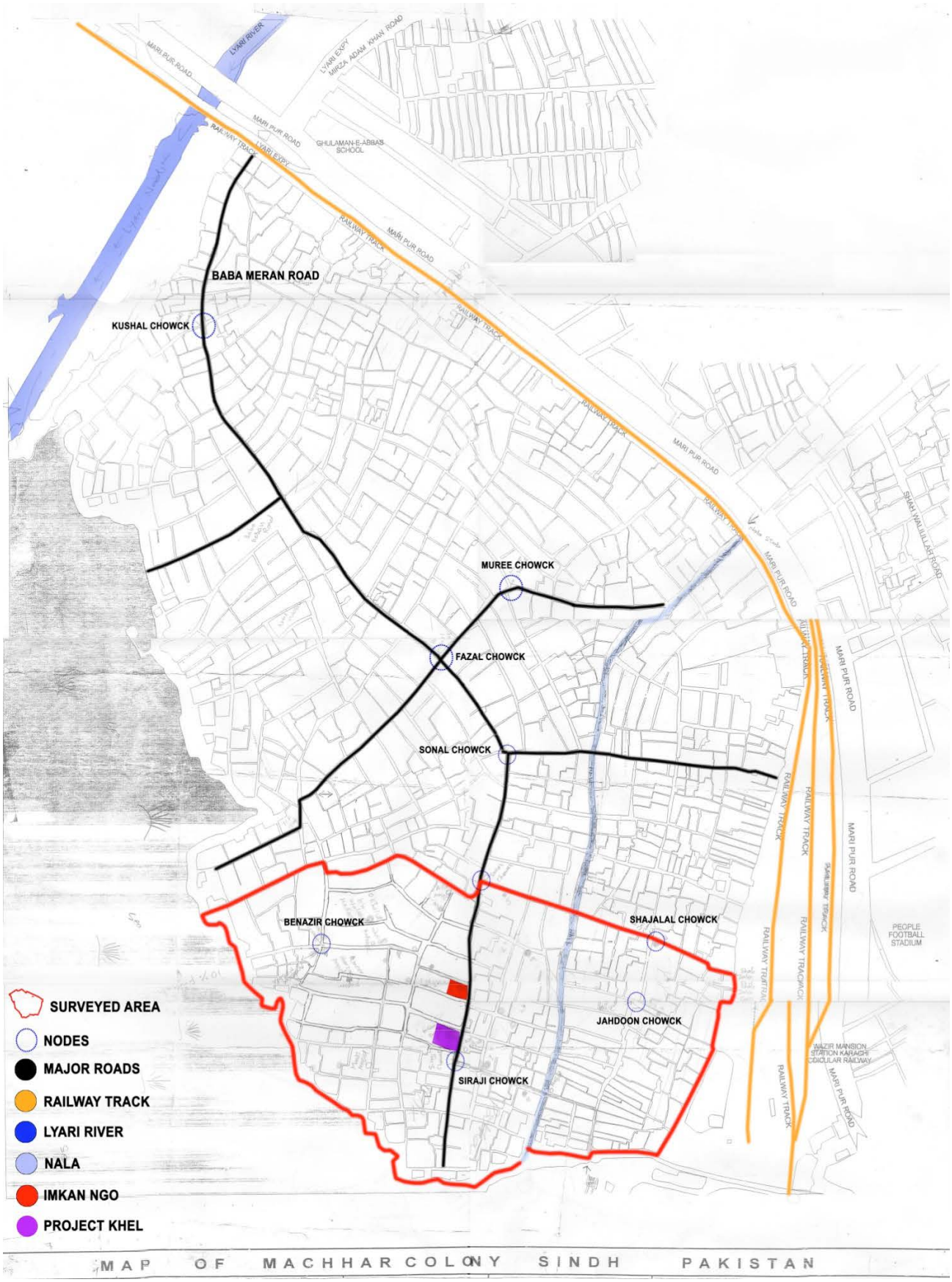


Figure 4: Amenities

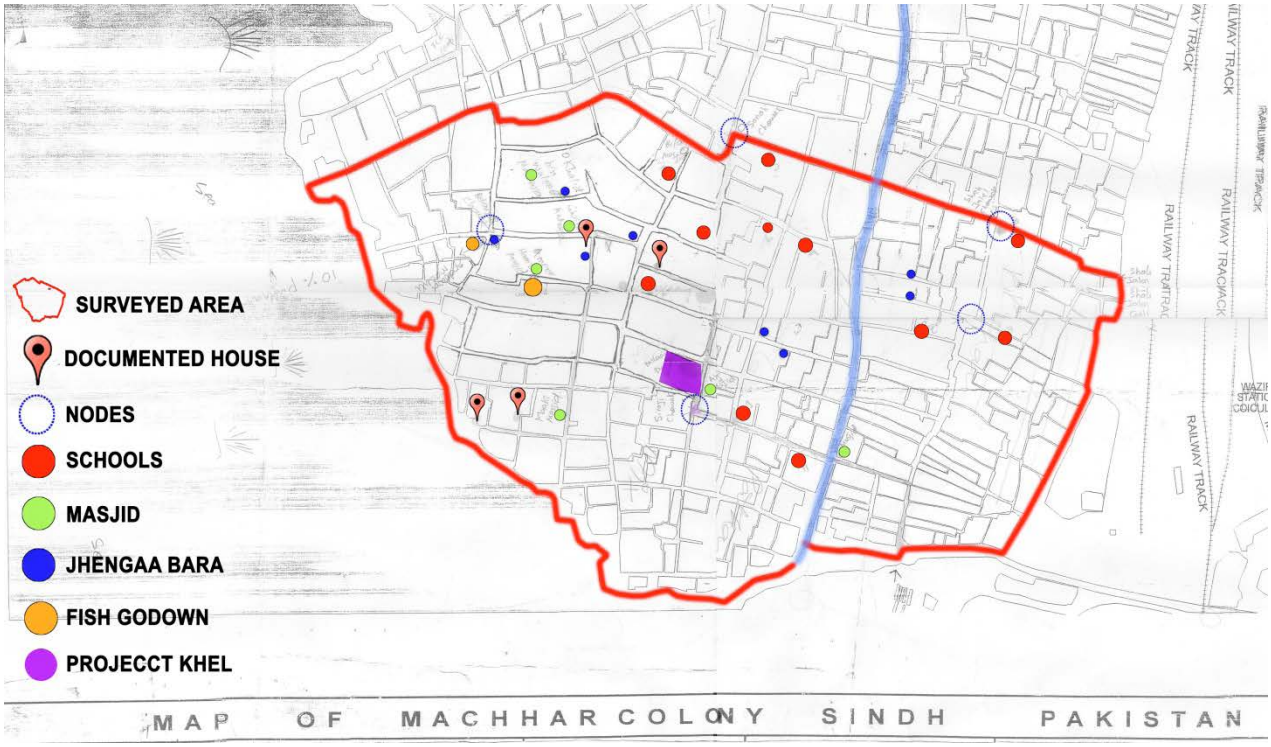


Figure 5: Ethnicity Map

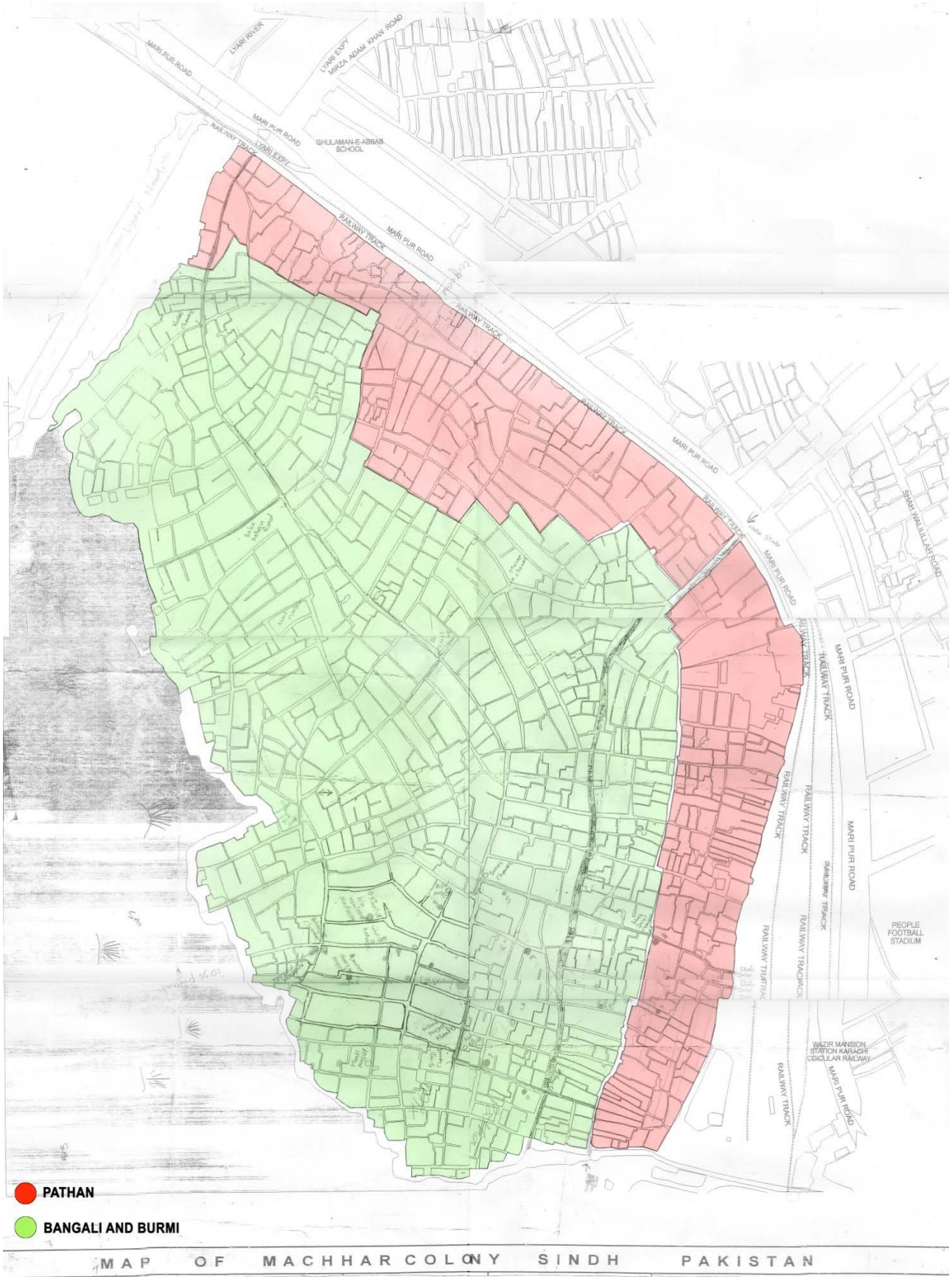


Figure 6: Growth Pattern

2. Pahar Ganj, North Nazimabad, District Central, Karachi - profile

(The profile is an extract of the interview of Mr. Zahid Farooq a social activist of the area, on January 19, 2016 and a case study as complied by Urban Resource Centre. The profile also draws upon conversations with other activists and thallewallas conducted earlier.)

In the early 1960s, around 15 to 20 displaced families of Miran Shah Bridge (Shershah) came to Pahar Ganj. Meanwhile, the labourers working in North Nazimabad (a newly planned settlement) also made Pahar Ganj their home. In the land department records the entire land of Pahar Ganj is marked as ST-3 and was allotted to the Social Welfare Department for the construction of a public hospital.

After the construction Abbasi Shaheed Hospital in Nazimabad (around 5 kilometres south of Pahr Ganj) in 1975, the plans were amended and quite a large number of families moved in, as they saw it as a place for permanent dwelling. According to a ruling by the Supreme Court of Pakistan, nobody can change the status of an amenity plot, which is the case with the land of Pahar Ganj. But the previous local government headed by ex-Nazim (Mayor) Mustafa Kamal, moved a resolution in provincial assembly (Sindh) and granted it the status of a residential area. 20 per cent of the land is allocated for a grid station and the remaining 75 per cent is now for residence. Some families here claim that they have documents of ownership of the plots on which they live. At present there are 1,000 houses with 3,000 households in the area and the population is almost 28,000. In 1975 there were only 300 houses in the area with 400 families.

The population comprises of 69/70 per cent Christian and 30/31 per cent Muslim. Only 1 per cent's mother tongue is Urdu (the national language), the rest speak Punjabi with an exception of 5 per cent Pashto speaking population. Some Bengalis also live in Pahar Ganj but they speak Urdu in public interactions.

Initially people made their houses by borrowing brick and gravel from *thallewala* on credit. The massive wave of construction came after 1974/75 when people started sending remittances from the Gulf. When Zulifaqar Ali Bhutto opened the doors, a lot of low skilled workers went to Gulf regions and it changed the landscape of the area. On the basis of Ration Cards, community living in the settlement applied for National Identity Cards (NIC) and once the NICs were issues they got passports to travel to the Gulf, mostly to Kuwait, Bahrain, Dubai and Saudi Arabia. Since the first generation of the population was by and large illiterate they used to pay the postman of the area money to fill out their forms for the NIC. The situation has changed in the second and third generations as there are government employees, qualified dentists, one government officer and government school teachers now in the locality. The remittances were spent on education of siblings. There are also women beauticians in the locality that provides service to the inmates of the locality and to adjourning areas as well. The second and third generations have developed links with the corporate sector and in the mornings a lot of them can be seen going to corporate offices.

The source of water for the area is Hub Dam in Balochistan and since it depends on rain water to recharge, when it does not rain the area suffers from a serious shortage of water. In such times the community resorts to nearby affluent neighbourhoods who allow them to fill cans of water free of cost. Also it purchases water from water tanker operators. There is a nearby pumping station of KWSB and some of the community members get their cans filled from there. Some houses in Pahar Ganj have underground water tanks and in water shortage days, sell water to the community at Rs. 15/20 per can (a can has the capacity of 25 litres). Since the locality is terraced those houses that are situated at higher levels get piped water with difficulty. Moreover, due to encroachment onto the streets by house owners, it is difficult for browsers to reach the higher levels of the settlements.

The other problem of the locality is management and disposal of solid waste. Some 15 years back, sweepers, as deputed by the then Karachi Municipal Cooperation (KMC), used to come twice a week. Now, for unknown reasons, they come only once a week. However, the religious festivals of Easter and Christmas are an exception when they make sure the cleanliness of the area is maintained. The nearest roundabout, at Muhammad Ali Shah Stadium has the status of a Garbage Transfer Station (GTS) and all the solid waste from the nearby residential areas and blocks of North Nazimabad Town is dumped here for further transfer to the landfill site, which most of the time does not happen. It is a source of foul smell, breeding ground for vectors and a nuisance to the people living in Pahar Ganj. To handle the issue, the KMC staffers often put the heap on fire and as a result the temperature of the area rises and the emitting smoke causes choking and suffocation.

The encircling storm water drain of Pahar Ganj has been encroached by houses and shops. Some house-owners have extended their houses on the *nala* (storm drain) while others have made shops on it making it difficult to get it cleaned on a regular basis. On normal days it is a source of foul smell and in the monsoons it overflows and brings out all the filth on to the streets. Sewage also enters the low lying areas and houses, and when rains are exceptionally heavy a few houses are washed away. The *nala* is cleaned by the contractors and financed by

the community. In heavy monsoons the accumulated water is often drained back into the *nala* buckets by the community households.

The number of trees has reduced over the years. Until mid-1980s there were lots of trees along the roadside, in the area itself and on vacant plots. Now there are only couple of them left. The biggest advantage of those trees was that they provided a shelter in summers, and were a place of socialisation for women and elderly, and a place for conflict resolution.

In the last heatwave four people of the locality died, in all probability due to sunstroke. Due to the high density of the area, houses are short of space and most of the time many household members spend their time on streets which are becoming suffocating as a result of densification. This is because the second generation of migrants do not leave their parents house but increase the density of the house by constructing first and second floors onto the ground floor of the same plot. To cope with the problems of increasing temperature and the associated power shortages people have changed their work habits to start early in the morning and return late from the office when it is cooler.

There are lot of health issues in the area. Pulmonary, dermal diseases and diabetes are prevalent. There is no government or clinic in the area. The nearest government run facility is Abbasi Shaheed Hospital 5 km away. Private clinics are operating but only for those who can afford their fee.

Almost every household has a motorcycle. There are 100 rickshaws, 15 to 20 taxis and 20 cars in the locality, mostly bought with remittance money. This is in sharp contrast to 1975 when there was only one rickshaw in the locality. During monsoons the number of transport vehicles on the road gets reduced which is an inconvenience to the commuters of the locality. Also, since the locality borders onto *Katti Phari* (supposed to be a dangerous area), the para-transporters are either unwilling to go to the area after dusk or charge exorbitantly high fares. People pool either in the form of shared fares for para transport or in the case of motorcycles pay for the petrol.

Issues to pursue:

1. Heavy rains flood the *nala* that goes through Pahar Ganj and the upper levels of the *nala* are being encroached upon. If rainfall increases then a very large number of homes will not only be flooded, but will also be washed away.
2. In the previous heatwave, a number of people died. Pahar Ganj is densifying since many households are building upwards and the streets are narrow. Construction is of unplastered and unpainted concrete block which absorbs and lets off heat. All indications are that the “heat island” affect will increase.
3. Land values are increasing in Pahar Ganj and there is pressure on the inhabitants to sell and move out. How will the community be able to withstand this?
4. This is an upwardly mobile community. What is it that makes it so and what is its socio-economic future? What effect will this have on the physical development of Pahar Ganj?

Maps – Pahar Ganj

Figure 7: Map Pahar Ganj

Figure 8: Amenities

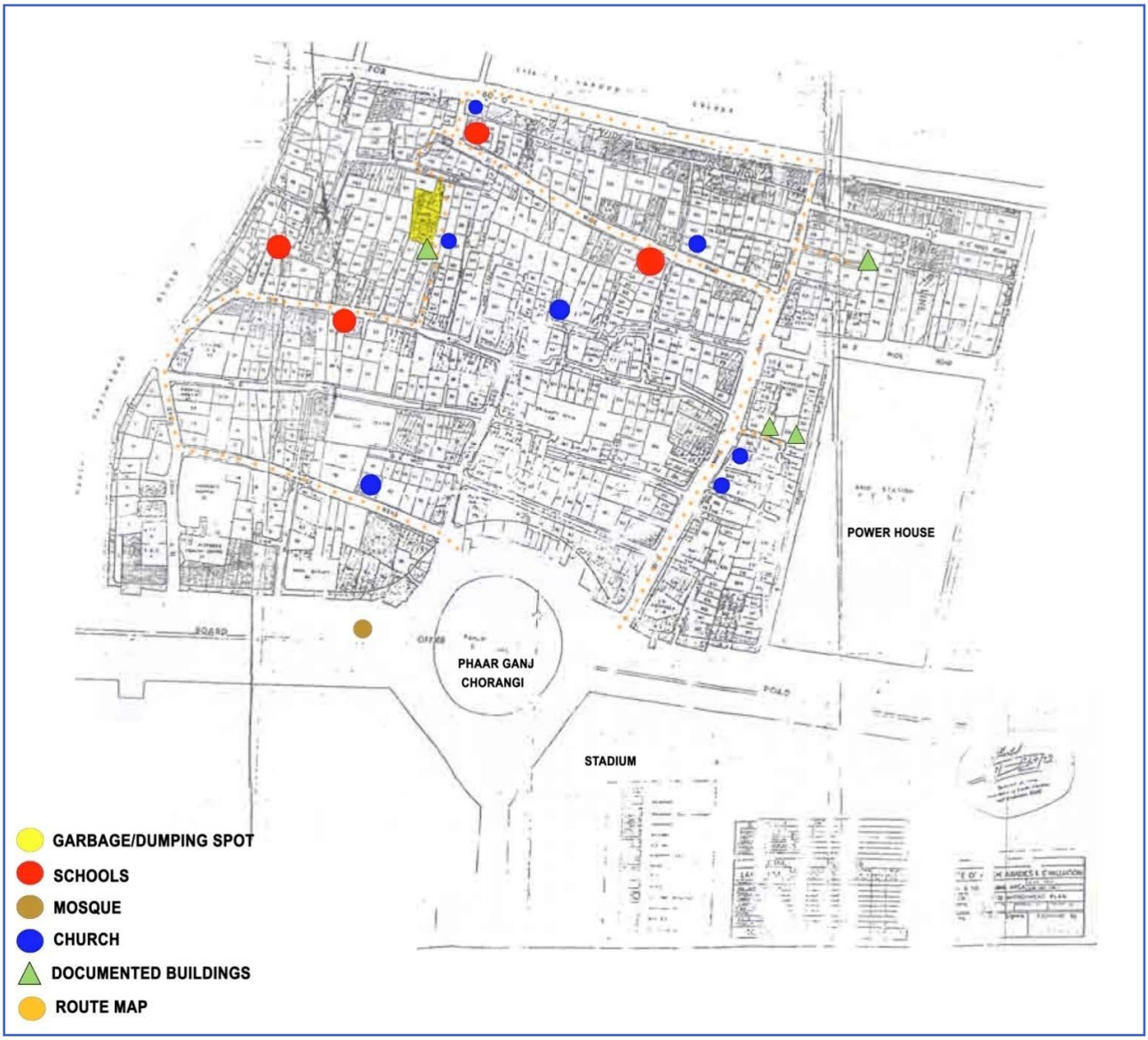


Figure 9: Economic Activities

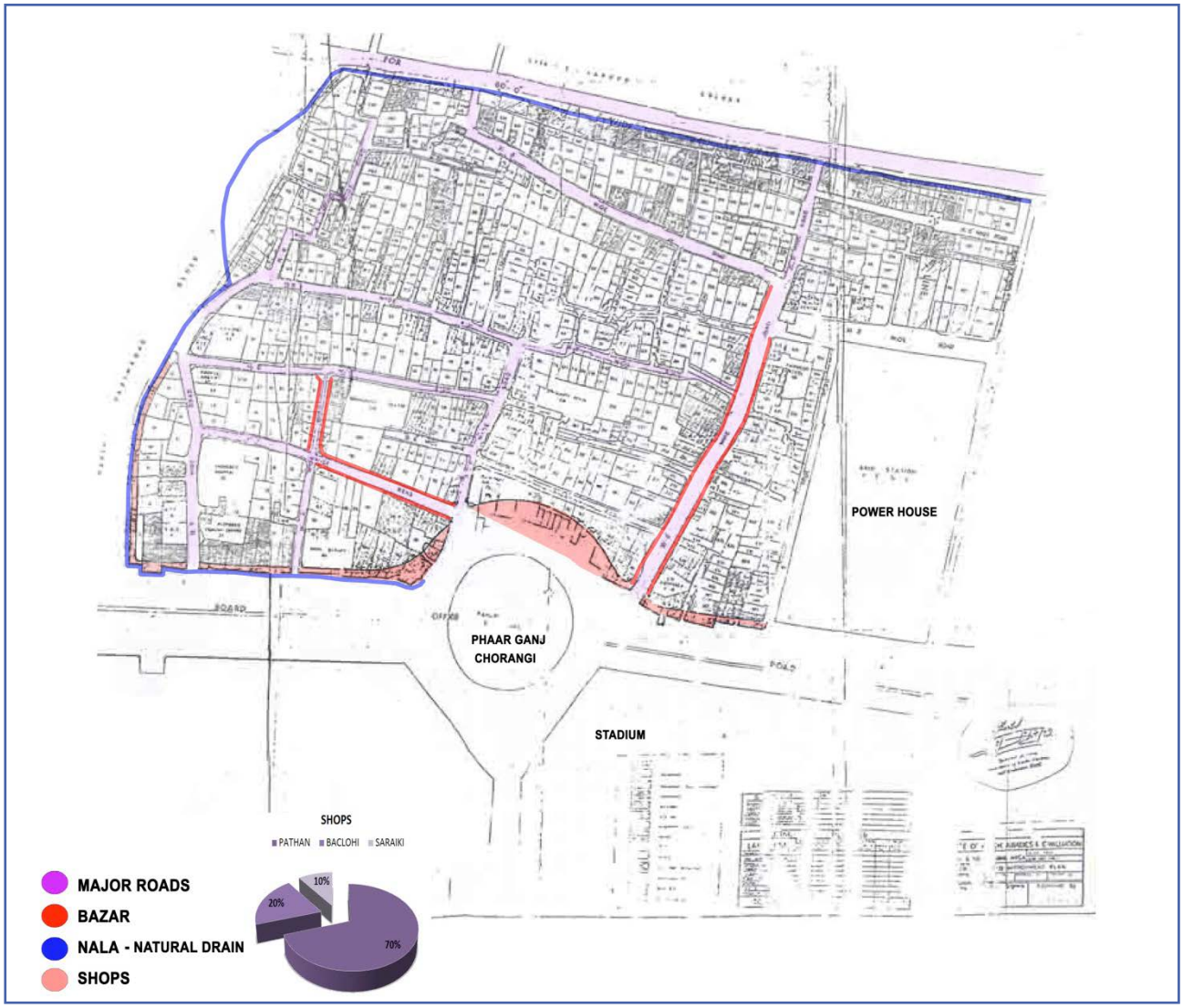


Figure 10: Ethnicity Map

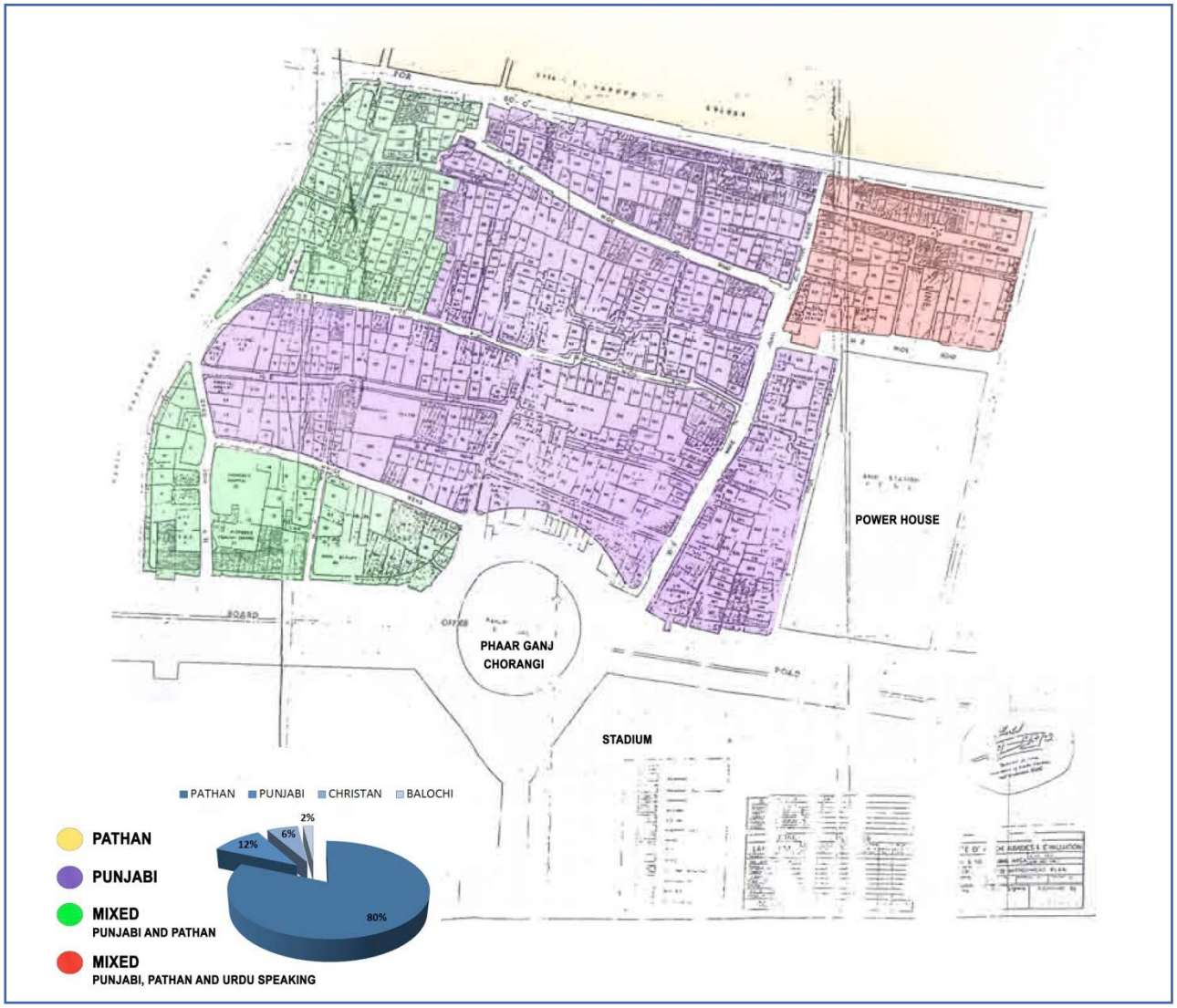


Figure 11: Religious Map

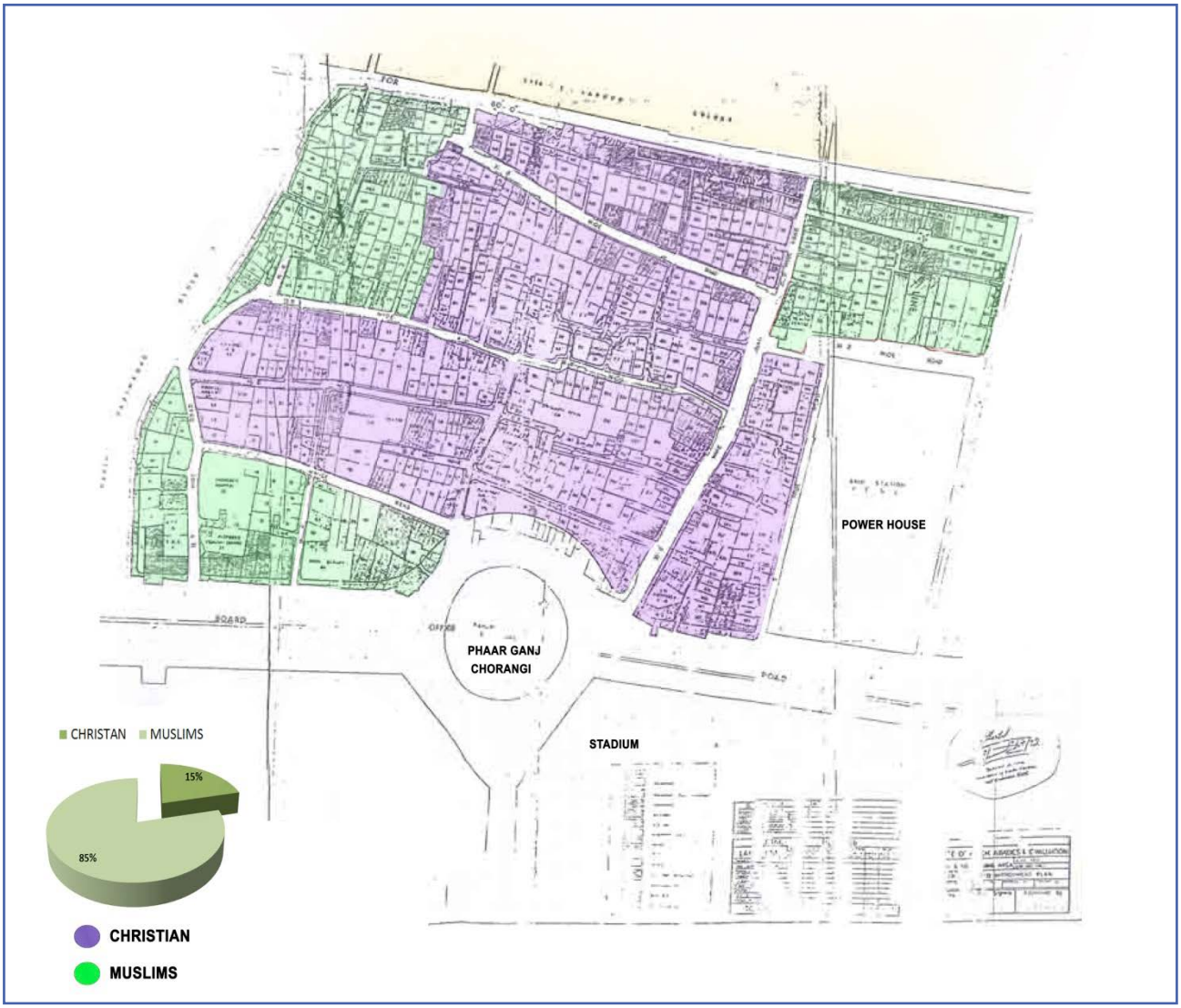
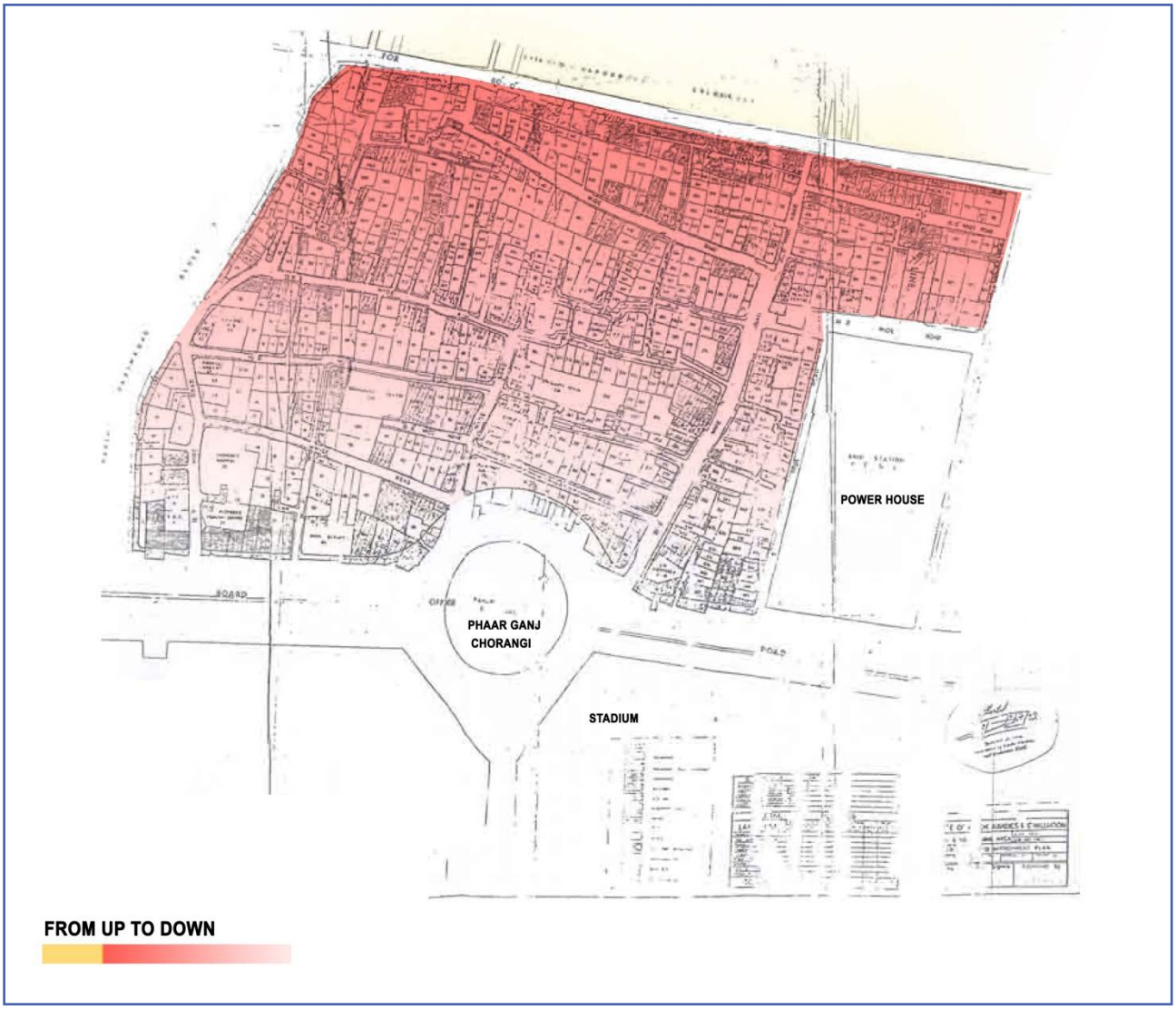


Figure 12: Growth Pattern



3. Rehri Goth, Bin Qasim Town, Malir District Karachi - profile

(The profile is an extract of the interviews of Mr. Saleh Muhammad Jutt, Mr. Nawaz Dabla both local activists and Mr. Ibbo Waddo Dabla a local artist and a veteran fisherman of Rehri Goth, on Thursday March 24, 2016 and Tuesday March 29, 2016 respectively.)

Some 400 hundred years ago, six brothers Mosani, Variani, Qasmani, Ismailyani, Sayarani and Panjwani migrated from Soniami to Rehri Goth. The reason for migration was a feud among the clan members. They settled in Rehri Goth and continued with their ancestral occupation of fishing.[41]

Later, some 200 years back Sheikhs (a merchant community) from the interior of Sindh, came here. From coastal areas and islands of Thatta Khaskhelis came around the middle of nineteenth century. Jutts from Ketti Bunder migrated in the 1960s and 1970s. Dablas and Balochs came around the same time. These later migrants were forced to migrate from the Indus Delta due to sea intrusion which left them with no drinking water. Before migration, these tribes had relationships with the communities living in Rehri Goth. The fishermen from Rehri Goth used to visit the coastal islands of *Thatta*, providing the communities there with dried fish and in exchange used to get wheat, butter, milk and ghee.[42]

After the construction of Kotri Barrage and with the passage of time, the sweet water at the tail end of river Indus reduced, thus causing sea intrusion and the swallowing up of agricultural lands of Thatta. The Jutts and other castes, because of their pre-existing business relationship with the Rehri Goth communities decided to migrate to Rehri Goth.[43]

Initially there was no formula for the distribution of land to migrants and the demarcation was done by Jamots (the decision makers) of the area through their *'wazirs'* (representatives). However, with the passage of time, the settlement of Rehri Goth was consolidated on a clan basis and in local language these clan neighbourhoods are called *'Paras'*. Officially Karachi Port Trust owns the land of Rehri Goth.[44]

The migrant communities to Rehri Goth, by and large were agricultural communities without skills, boats and nets for fishing. They were employed by Khaskhelis (or boat hands), as *'Khalasis'* who at that time were among the dominant fishing communities. The migrants also got employment in the industrial area of nearby Korangi. Later they developed the skills of fishing and purchased their own boats and the necessary paraphernalia for that.[45]

Road and electricity was provided to the area by the Zulfiqar Ali Bhutto government (in early and mid-1970s) and telephone lines and gas for cooking were provided by Benazir Bhutto in her first tenure (1989). Before that Ayub Khan (during the 1960s) introduced a bus route (16-A) for commuting to the city centre. The bus route was very long and usually carried the passengers early in the morning to the city by coming to the area just before dusk.[46]

Initially the source of potable water was a five foot deep well in the house. Rainwater was also harvested and for livestock there were community water spots. With the passage of time the well turned brackish. Now due to local government investment, every home has piped water and the supply is regular.[47] However, the residents of Dabla Para, mentioned that though they have infrastructure of piped water, they do not get water from the system. They usually rely on push carts and water tankers for the supply of potable water.[48]

Garbage collection is a major problem of the area as the waste collection system is highly ineffective. The waste collection trolley, operated by city administration comes only once a week or sometimes after a fortnight. The same holds true for Dabla Para, where frequency of garbage collection by government agencies is even less. However, the garbage is also used for land reclamation from the sea by the communities.[49]

Rehri Goth Union Council (UC), the lowest rung of local government, has a population of approximately 45,000. The adjourning Chashma Goth UC has a population of 25,000 and Juma Goth has an additional population of 25,000 persons. The approximately 100,000 population throws raw sewage in the sea on a daily basis. That has affected the fish catch and a lot of species have migrated to the deep sea. Dabla Para (the caste derived its name from the ancient and historic port of Debal) has a population of 25,000 persons and their sewage goes into the open sea.[50]

[41] Interview with Mr. Saleh Muhammad and Mr. Nawaz Dablo, March 24 and March 19, 2016 respectively
[42] Interview with Mr. Saleh Muhammad, social activist, March 24, 2016
[43] Interview with Mr. Saleh Muhammad and Mr. Nawaz Dablo, March 24 and March 19, 2016 respectively
[44] Interview with Mr. Nawaz Dabla, social activist, March 29, 2016.
[45] Interview with Mr. Saleh Muhammad, social activist, March 24, 2016
[46] Interview with Mr. Saleh Muhammad, social activist, March 24, 2016
[47] Interview with Mr. Saleh Muhammad, social activist, March 24, 2016
[48] Interview with Mr. Nawaz Dabla, social activist, March 29, 2016.
[49] Interview with Mr. Saleh Muhammad and Mr. Nawaz Dabla, March 24 and March 29, 2016 respectively.
[50] Interview with Mr. Nawaz Dabla, social activist, March 29, 2016.

There are four government primary schools in the area, six lower secondary schools and six private schools. There is one government operated Rural Health Centre, one rural dispensary one 40 bed hospital. The private health services include one diagnostic centre by Aga Khan University Hospital and one Mgharai Clinic. Due to transport issues, the carrying of pregnant women to hospital in the final moments is a problem and the cause of many neo-natal deaths.[51]

Some houses in Jutt Para are now below the road level and in the monsoons get flooded. The houses of Malkai, Jutts, Moosani and Dabla Para come underwater in monsoon rain.[52]

15 to 20 persons from the area died in last year's heatwave. Some of the dead were already suffering from diseases, some were old and some were physically weak. The majority of the dead were women and children.

Motorbikes, Datsun pickups and rickshaws are the modes of transport for the area commuters. There is no minibus and no public bus available to them.

Indus Resource Centre (IRC) works on primary education and operates a school in Rehri Goth. Health and Nutrition Development Society (HANDS) works on basic health. Pakistan Fisher Fork (PFF) deals with the wide ranging issues of fishing communities. Caritas, a social welfare NGO also has an office in the village.

Because of youth, *charas* (cannabis), heroin, capsule, alcohol (imported and *katchi* both) are common. One of the factors of unemployment is that less fish are available in the catchment area of Rehri Goth now compared to "before". The causes attributed to lower fish catch are increased sea water pollution and less rains in Karachi. Earlier, the fishing business was a family enterprise whereas now it's on a more commercial basis. Deep sea trawlers have destroyed subsistence fishing.

Over the years the fishing business has changed a lot. As the boats were motorised wooden oars were no longer used. Sail boats, after mechanisation, have also become redundant. Initially, Italian motors of 6 hp were installed and now motors up to 16 hp from China, are in use. When fishing was commercialised, it attracted a lot of non-Sindhi speaking migrants to the area. The indigenous population was relatively caring towards the marine environment as their social and cultural life has evolved around the sea itself. The sustainability of marine life was in their interest. The incoming migrants were interested only in economic gains and hence their fishing activities were not eco-friendly. They introduced small drag nets (which destroy fish life), disregard the set timings for fishing and overlook the trade-off between profit and sustainability.[53]

The price of fish varies according to the quantities of fish caught. The greater the supply, the lower the prices. If the boat and the fishing net is on credit, the investors share in the fish catch will be 50 per cent. Agencies are also responsible for creating problems for fishermen, asking for various documents that results in loss of time for the fishermen. Ever increasing marine pollution is also creating problems for the fishing community. Since there is no clear demarcation of oceanic boundaries between India and Pakistan, a lot of boats get drifted by the wind into Indian waters and are captured by the Indian Navy. This has changed the lives of many families as a number of fishermen have spent many years in Indian prisons. Marine life and fish catch have suffered due to cow dung from the cattle colony thrown directly into the sea by the operators of the nearby cattle farm which has 400 buffalos, and from the effluent from the factories of the nearby Korangi Industrial Estate making its way to the sea.[54]

The resulting pollution resulted in decreased boat life as well. Earlier a boat made of Burmese teak had a life of 50 years. Due to marine pollution and almost non-availability of sweet water from Indus, the acidic levels of estuaries and the coastal waters has increased resulting in increased wear and tear of the boats. It is also important to mention that due to raw wood price increases, boat manufacturers have resorted to inferior quality of wood for boat making. The two factors have increased expenses in maintaining boats.[55]

More and more women are getting educated and work away from the settlement. Earlier they were not consulted in the making of the house and did not have any say in community decision making. Decisions were made by grey haired male members in the 'elders' council'. Now they are more empowered at household level because of their contribution to household finances as the nearby Korangi Industrial Area provided job opportunities. More inter-communal marriages and more marriages of liking are happening in the area which was not possible some 30 years back. Educated women are more conscious about cleanliness of the house, hygiene habits of children and strive more for the education of siblings. However, the community elders are worried about the increase in divorce rates and attribute it to the increased participation of women in public spheres.[56]

[51] Interview with Mr. Saleh Muhammad, social activist, March 24, 2016
[52] Interview with Mr. Saleh Muhammad, social activist, March 24, 2016
[53] Interview with Mr. Mr. Ibbo Dabla, an artist and a veteran fisherman, March 29, 2016
[54] Interview with Mr. Saleh Muhammad, social activist, March 24, 2016
[55] Interview with Mr. Nawaz and Mr. Ibbo Dabla, March 29, 2016
[56] Interview with Mr. Nawaz Dabla, March 29, 2016

There is a transition in women's occupations where in the past, when fishing used to be a family business, nets were made of cotton and by the women of the household. In the 1980s the silk net and afterwards the nylon net started replacing the cotton fishing net. Both were imported from Japan, China and Thailand. As a result women searched for alternatives to supplement incomes.[57]

Hepatitis C, malaria, scabies, tuberculosis, typhoid and chicken pox are the prevalent diseases and illnesses of the area.

Earlier there were a limited number of radios in the area and now every home has a TV and a cable connection.

Plantation in the area has reduced to a considerable extent. Mangrove forests have suffered a lot as mangrove wood is used for making matchsticks, as fuel for boilers in nearby industries, as crates for packing and for furniture.

Issues to pursue:

1. Connection with the city is difficult because of the absence of public transport. This has economic repercussions.
2. There are serious clan related land ownership and control issues between the new migrants and the original inhabitants.
3. Marine pollution (sewage, industrial affluent, cattle farm dung) affects livelihoods, depletes fish life and causes health problems.
4. There is constant land reclamation from the sea for building new homes.
5. Mangrove forests are disappearing since mangrove timber is used for matchstick making, packaging, fuel for industrial boilers, furniture and also for house construction.
6. Girls are being educated but boys are not since they go for long deep sea fishing trips. This is creating social problems, including increased divorce.
7. Women are earning more working in the industrial area then men who work as boat hands on fishing trips.
8. What can the community, NGOs and government agencies collectively do to tackle some of the problems mentioned above?

Maps – Rehri Goth

Figure 13: Map Rehri Goth

[57] Interview with Mr. Nawaz and Mr. Ibbo Dabla, March 29, 2016

Figure 14: Map with Settlement

Figure 15: Amenities

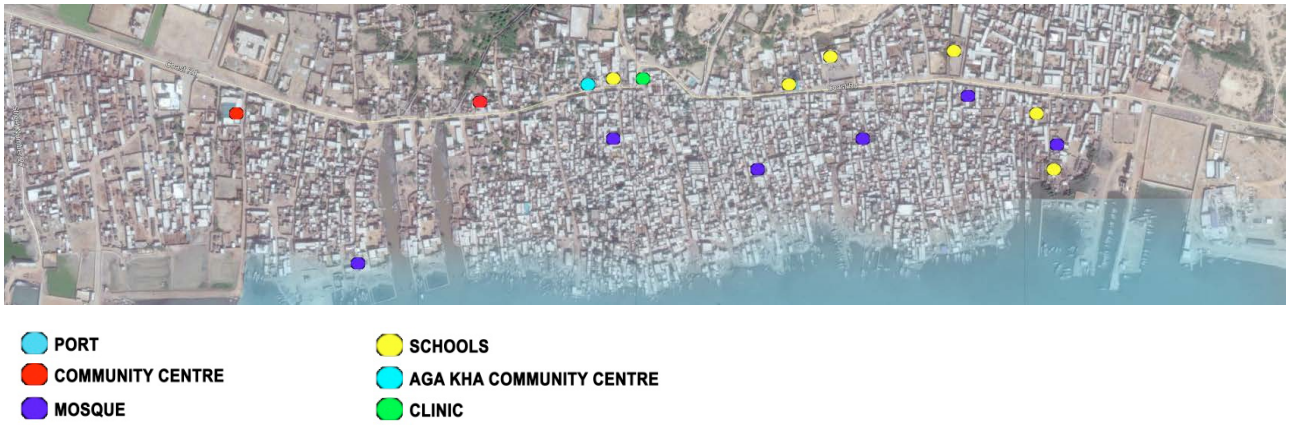
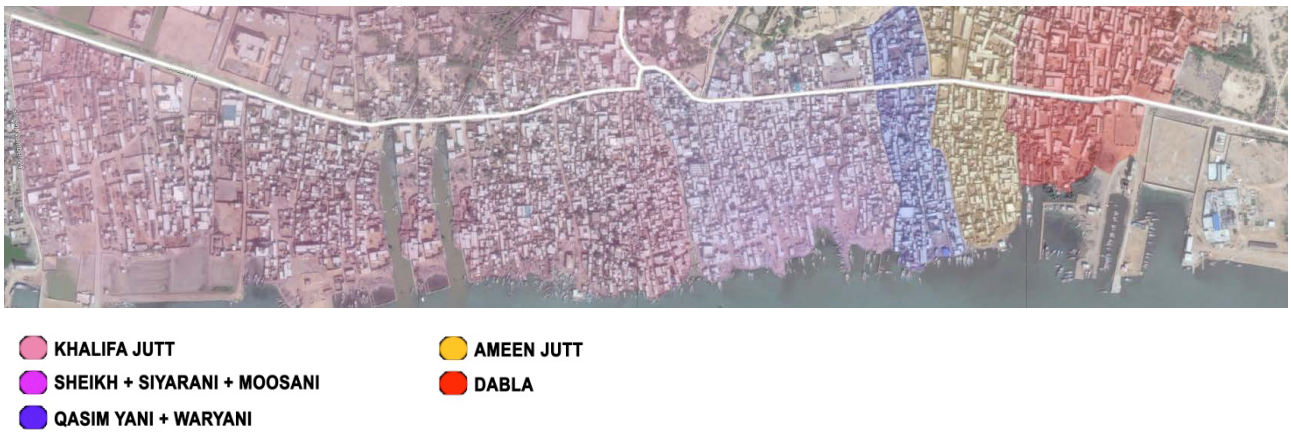


Figure 16: Growth pattern

Figure 17: Map of cast and clan



4. Labour Square, Gadap Town, Malir District, Karachi - profile

(The profile is an extract of the interview of Mr. Sultan Meher - President, Labour Square Selab Mutassareen Welfare Association - on Thursday March 17, 2016 at Labour Square and information available from the Pakistan Institute of Labour Education and Research.)

In 2010, the displaced persons of Floods 2010 from the interior of Sindh Province were asked, through newspaper advertisement by the Sindh government, to seek shelter in the reinforced cement concrete (RCC) constructed but vacant flats of Labour Square (a Sindh government housing scheme for the working class).

The Labour Department started its construction in 2004/2005 and planned to give the flats to working class households for Rs. 180,000 to Rs. 200,000 in advance and the rest by payment of monthly instalments of Rs. 1,500 to Rs. 2,000. There are 1,000 flats housed in 32 blocks of three and four floors with underground water storage tanks in-between two blocks. The construction of the flats was completed by the middle of 2008. The situation got out of hand when under the patronage of major political parties the flats were occupied by activists of party loyalists and a turf war ensued. The unresolved conflict between the activists ended through a joint action of law enforcing agencies and the occupants were removed. The entire compound was handed over to a contractor for renovation, with the gates closed and two to three persons deputed as full time guards. This continued until the third quarter of 2010 when finally the displaced of Floods 2010 were asked to move in, for a limited period of time, as it was envisaged by the Government of Sindh that they would, sooner or later, go back to their native areas.

But, even after six years, they do not want to go back and the reasons are simple to understand. Before the Floods 2010, they were farm labourers in their respective areas. Over the years they accumulated huge amounts as debts by borrowing from their landlords for various kinds of emergencies, defaults and for festivities. After working at least ten hours a day they were paid bare minimum wages which were just enough for them to survive. The flood waters destroyed their place of labour and homes and they came to Karachi and made makeshift shelters along the Super Highway. Some took refuge with their relatives only to move out later. It is important to mention here migrants are from nearly all areas of Sindh as some are from Shikarpur, Jacobabad (upper Sindh), some are from Ghotki (middle) and some are from Badin (lower Sindh). In some places (Badin), their migration was facilitated by Dr. Zulfiqar Mirza, the then interior Minister of Sindh Province under the government of Pakistan People's Party (PPP). Initially life was tough for them, but two almost simultaneous events made things better when they were approached by NGOs who helped them and the government of Sindh advertised the provision of accommodation in the flats of Labour Square. For six to nine months, NGOs provided them with rations (food packages), a school and a health clinic, continuing until funds dried up. Meanwhile, the search for livelihoods led them to Karachi's biggest fruit and vegetable supply market (*sabzimandi*) and other places for unskilled work. With that came economic independence and unimaginable relative prosperity as they did not have to pay debts and could save money. The second equally important factor is of acquired dignity. In the city, unlike in rural places, they are paid market rates for their services and interactions with employers are only money related, whereas in rural areas they lived in constant fear of being evicted, living on somebody's land and often faced humiliation from the landlord. The taste of newly acquired economic independence and the search for respect are the two reasons for their decision to remain in Karachi.

But the fear of displacement from Labour Square is a cause of anxiety. When in 2012, the pressure by Labour department was mounted to get the Labour Square flats vacated, the inhabitants formed an Association and filed a law suit against the Labour Department but the final court ruling was against the migrants. They also continuously lobby with PPP legislators and the relevant government officials but so far no decision has been taken in their favour.

Since their dwelling in Labour Square Flats is not appreciated by any of the departments of Government of Sindh, civic agencies are reluctant to provide them with the basic facilities. Karachi Electric has a Pole Mounted Transformer (PMT) for the Square, but it does not send bills to the inhabitants and often threatens to remove the PMT. Voltage in the flats is quite low and the compound suffers from longer hours of load shedding compared to other adjourning areas. In summers the only source of relief in the absence of electricity is the after dusk south-western winds from Arabian Sea. Eight people from the compound lost their lives in last year's heatwave.

Since solid waste is not collected by the waste management authorities on a daily basis (only once in six months) and the sewerage is overflowing, the locality is a home to vectors and water borne diseases. Hepatitis, typhoid, pulmonary diseases, malaria, diarrhoea and dermal infections are the common complaints. Because of stagnant sewerage foul smells fill the air between the blocks and inside the flats.

Water is purchased from water tanker operators. A tanker of 3,000 gallons costs the residents Rs. 2,800 and is shared by 28 to 30 flats. The browser downloads the water in the underground water tank between the two blocks. From there it is pumped through an electric motor and a plastic hosepipe to the flats. Each flat pays Rs. 100 per day for pumping the water for 6 to 10 minutes. One member of the community monitors pumping for just distribution.

Summers are more difficult as there are no trees in the vicinity. In summer, there are longer hours of load-shedding by the authorities and the ice-slab suppliers are not able to provide intact blocks of ice (often placed in rooms to create a cooler environment) to the customers. In winter the fumes and the particulate matter emitted by the nearby automobile oil cleaning factory stays in the area longer (in the absence of the strong summer monsoon winds) causing suffocation and choking.

Route A-25 minibus and the QINGQIs are the prevalent mode of conveyance. On average a single commuter spends Rs. 100 on fares to go to work and back home. Some residents own motorcycles and other have QINGQIs but nobody owns a car in the area.

Since the locality is abode to a limited number of people, housed in a compound, inhabited by one ethnic group (major clans include Buraors, Chandios, Abros, Bugti and Bhutto – Baloch Sindhis) and materially not so attractive, it is relatively safe from both official and market extortion. However, it was raided by the law enforcers once and they took away the weapons which the displaced persons had brought with them in 2010. The majority of residents belong to Shia school of thought.

Issues to pursue:

1. This is the first time that flood affected households have migrated to Karachi although there have been serious floods before. What is the reason for this? Is it simply because the floods were more severe than ever before or are there other reasons for it?
2. What will residents do if they are removed?
3. What are the options for continuing to live in Labour Square?
4. What are the changes in the rural environment (physical, social, economic) that the residents have seen over the years?
5. Where do issues related to health and education figure in their priorities?

Maps – Labor Square

Figure 18: Map Labor Square

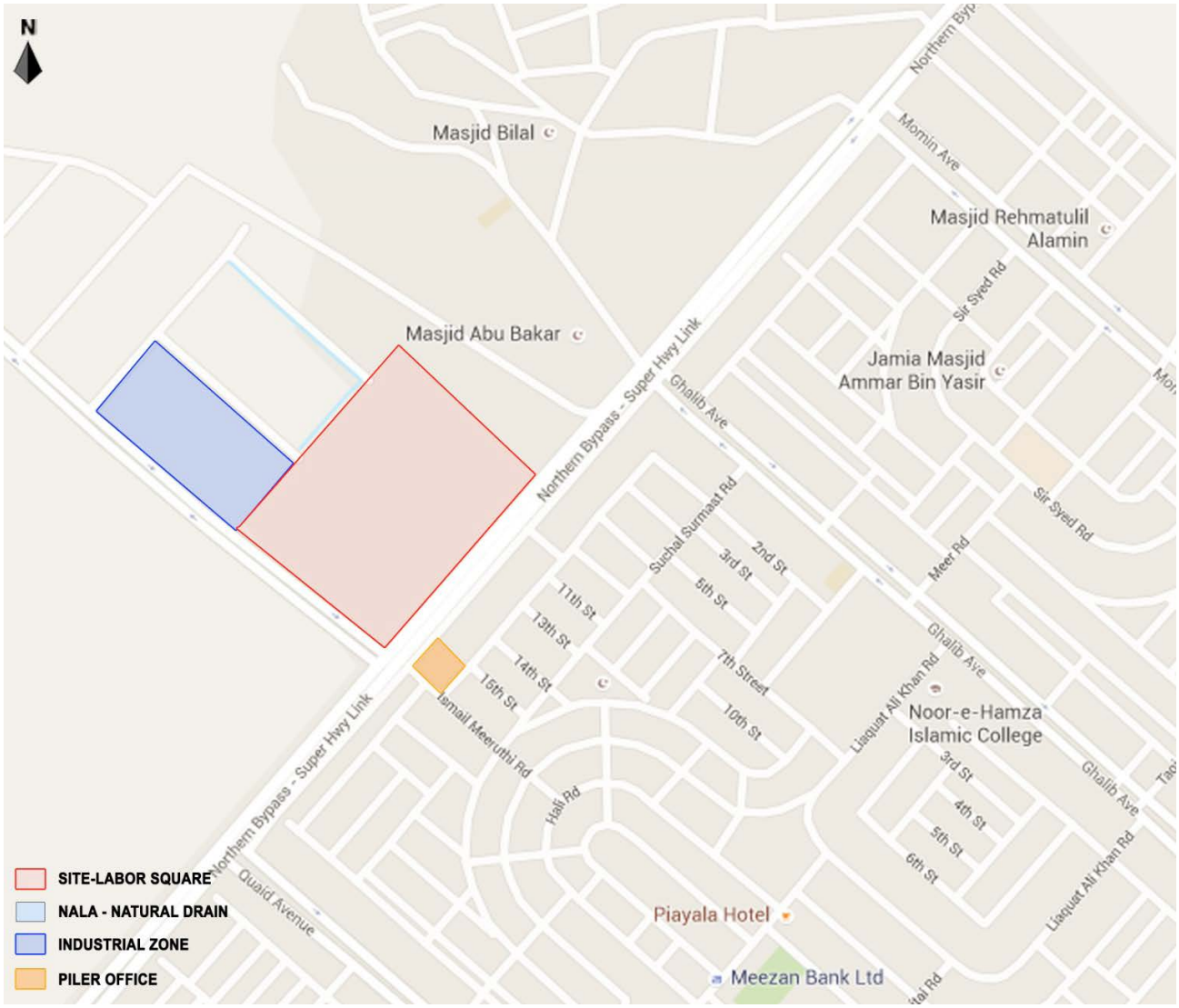


Figure 19: Amenities

Figure 20: Economic Growth

Figure 21: Division

Annex 3: Interview with key informants

1. Interview with Masood Alam

Senior Director, Municipal Services, Karachi Metropolitan Corporation

Tuesday July 19, 2016

- It was the Sindh Local Government Act in 2013 that made the functions of KDA and KMC separate and different than in 2001.
- Karachi Metropolitan Corporation (KMC) is responsible for overseeing the following:
  - 40 major corridors of the City
  - 2 landfill sites
  - 14 major hospitals
  - Land Department (KMC land only)
  - Katchi Abadi Department (for the regularisation of Katchi Abadis)
  - Orangi Town Directorate
  - 2 slaughter houses
  - CNG buses component
  - Major parks (as Hill Park, Safari Park and Karachi Zoo)
- As of May 2016, Karachi Development Authority (KDA) has been revived so KMC is in transition. All resources will be reshuffled, redistributed and the KMC will be moved to its building near City Courts. From 2001 to 2016, that building was under the use of City Councillors. A Transition Committee has been set up to work on the details of transition and transfer of human and financial resources. The separation means the revival of old institutions under National Reconstruction Bureau and 28th Amendment.
- Secretary Local government, who reports to Minster Local Government, is the controlling authority.
- Just to give you an idea about the resources, KDA has 4400 employees and has a budget of Rs. 1 billion per annum to run the organisation.
- Karachi is run through three major systems: Police, Commissionerate and local government systems. It has 6 administrators of 6 districts and 1 mayor. It has 6 deputy commissioners and 1 commissioner. It has 6 land owning agencies... so if you count, Karachi in fact has 36 'daddies', who are managing Karachi, but with little or no horizontal linkages between them. Just to give you an example, the corridor from Karachi Airport to Mövenpick Hotel is 12 kilometres long and is managed by 5 different agencies. KMC is responsible for only a 5 kilometre long patch. And the irony of the matter is that though KMC is perceived to be managing the entire corridor, the revenue generated (from that corridor) goes to those 5 agencies. Every department works in isolation. For instance Sindh Building Control Authority (SBCA) does not ask the Fire Brigade how a fire accident will be dealt in the wake of mushrooming high rises. They just announce the buildings. The Master Plan is with SBCA, though it was with KMC till 2010.
- Overlapping and coordination between various agencies is a serious problem. If I try to, let's say, collect solid waste from an area which is not under KMC's jurisdiction, I will be held accountable by the auditors. So sometimes it happens that though we realise the need for taking action and providing relief to people, we are shackled by our defined geo-boundaries.
- Solid waste management in Karachi is a serious issue as, if not managed properly, it can lock your sewers, takes toll on individual's health, creates pollution and would block the storm water drains. We spend Rs. 2 billion per annum on solid waste collection and if my mathematics is correct it translated to Paisa 10/ person/day to manage solid waste. This is in contrast to Lahore where a private company gets USD 50 per day and earns USD 300,000 per month. Sindh Solid Waste Management Authority was created in 2013 and collection of solid waste is now a provincial subject. However, it is believed that local government is a third tier of governance and it's the only institutional connector with a common man on the street. In my view the role of provincial government is to provide vision (in contrast with day to day

management) and the role of Federal Government is to maintain a vigil and to act as a watchdog.

- The biggest hurdle in the effective functioning of KMC is the lack of funds. KMC needs Rs. 960 million every month, just to pay salaries to its staff. Out of those 960 million, 500 million is provided by the Federal Government and we have to arrange the rest, Rs. 460 million in a month. It often happens that at the end of month we are left with a meagre amount of Rs. 10,000 in KMC's bank account. We haven't paid KMC contractors since 2009 and the institution is in debt of Rs. 3 to 4 billion.
- Uncontrolled growth of Katchi Abadies is also a major issue. Every new settlement, both formal and informal needs water, electricity, sewers and clearing of solid waste. It's simple mathematics that out of every 10 Pakistanis, one lives in Karachi and if you assume that an average household in Pakistan comprises of 10 people (it's a bit exaggerated) then every household in Pakistan contributes to the population of Karachi.
- Transport is another serious issue. All planning depends on measurement and since we have no census we cannot plan (even for transport system).
- This City is unmanageable and rest assured it cannot be managed if the current state of affairs prevails. We need competent people to manage it.
- From the army of staff in KMC, if I need 10 dedicated persons to run the City, I cannot do that. That's the situation here.

2. Interview with Roland Desouza

Partner and Principal Electrical Consultant of Fahim, Nanji & DeSouza (FND)

Tuesday July 19, 2016

- Perspective of not only Karachi but the entire world is like that of Titanic: the lower deck will sink first, so is happening with Karachi.
- Decisions in Karachi are made as various interest groups and mafia exploit the non-governance of Karachi.
- Reasonable use of land for the exploding population of Karachi, needs extra ordinary measures. The percentage of population living in Katcahi Abadis in Karachi is 60 per cent, where as in Lahore only 10 per cent of the population lives in the same. In Lahore people come from its surroundings (by-and-large of the same culture) so they integrate in the city better. The case of Karachi is different as people from all parts of Pakistan come to Karachi: Karachi is a bigger magnet than Lahore.
- Karachi is unique because of its moderate weather and its philanthropy. You can see "dastarkhans" everywhere. A poor man wants food, so it's available through those "dastarkhans". He needs a place to wash and bath and that can be achieved in mosques. Also, worldwide, people moves to coastal areas for livelihoods and Karachi is no exception to that.
- Absence of governance is obvious in Karachi. PPP treats Karachi as its fiefdom and therefore the last 7/8 years were not good for Karachi. They have shifted subjects of local government to provincial setups. Solid waste and building control functions have been shifted and water is in the process of being transferred.
- The impact of the phenomenon is obvious. Nobody collects garbage from the city streets, transport system is not adequate and there is no ownership of the city.
- Land use should be planned. Unplanned densification of the city suffocates the existing land use planning. In the past city plans were based on some mathematics and the densification tinkers with those calculations.
- DHA is a plot-planner and not the master planner. Creek vista land was allocated for graveyard but allotted to some businessman. Roads, amenities, parks, play grounds all are planned before a housing scheme is launched but nowadays this is not the case. MA Jinnah road in good old days was 100 feet wide, Nursery 240 feet, North Nazimabad 320 feet and DHA is a mere 100 feet. Service sector/support staff for DHA residents comes from Azam Busti and Mahmoodabad as DHA did not plan for their accommodation.
- Incremental form of housing is the key to the success of informal sector in providing houses to the low income groups of Karachi. In contrast government schemes are not tuned to the needs of the people.
- Earlier KDA used to do the planning of the city. It got bankrupt in the 1980s. Nowadays private developers are involved in developing small projects here and there and the planning process becomes atomized instead of holistic. No institution is there to make a complete picture of the city.
- Karachi's land is under serious pressure as per square yard rates are exorbitantly high. The impact is that you find every single piece of land encroached: right from nullahs to railway tracks.

3. Interview with Professor Noman Ahmed

Chairman, Department of Architecture and Planning, NED University of Engineering and Technology, Karachi

Thursday, July 21, 2016

- Building Controlling authority, earlier, used to regulate community development and self-built environment. Now it is used by different political regimes to extend their agendas.
- The law under which it operates was enacted in 1989 and was called Sindh Building Control Ordinance.
- Later they (the political actors) realised that Karachi Building Control Authority (KBCA) has great commercial clout, so they converted KBCA to Sindh Building Control Authority (SBCA).
- Though they did it, but it was not a well thought out move, as they didn't take into account the existing capacities of other parts of Sindh, where they had opened offices. As a result the estate agents and those who were doing the photocopies of maps became the inspectors. Nevertheless, because of the enhanced control over construction activities, they were able to increase the revenues.
- Though, Musharaf's devolution plan resulted in increased control over civic institutions, however, Karachi Water and Sewerage Board (KWSB) and KBCA maintained a considerable level of autonomy.
- Through KBCA, the City government maintained a considerable control over the city.
- Under Pakistan people Party (PPP) tenure, Master Plan Department was handed over to KBCA and by virtue of that handover KBCA got the power to adjust the land use plan of the city. Earlier Karachi Development Authority (KDA) used to design and plan the city and then hand it over to Karachi Municipal Corporation (KMC) for management.
- The handover of the planning function to KBCA proved to be a disaster but KBCA is eager to retain control over it.
- There is no central authority in the city to look after its functions and hence KMC is not able to perform. Moreover, its financial health is not good. The only effort of KMC management is to keep staff off the streets and pay them salary regularly.
- The provincial government is trying to consolidate its control over the city. A recent example is the formulation of Sindh Waste Management Board and of provincial minister holding broom and showcasing a token sweeping of streets. Nonetheless provincial government lacks the capacity to deal with the technical issues of the city.
- This city needs 12/13 Garbage Transfer Station (GTS). Defacto GTSs are operating in the city but not the properly notified ones.
- All (the above-mentioned) moves by the provincial government shows that there is a tussle going on between local government and city government.
- I think that provincial government also thinks that they will be discredited if they empower local government.
- As far as KWSB is concerned, I remember that World Bank (WB) recommended that from conduit to household tap there should be one controlling authority.
- Until 1996, the mayor of KMC used to be the Managing Director (MD) of KWSB. Post 1996, minister of the local government is supposed to be the MD. Mayor's role became nominal.
- On behalf of Katchi Abadis KMC used to provide a lump sum amount to KWSB, a sort of grant.
- The architects of Devolution (2001) proposed that KWSB should be under local government (under nazim). That was effectively opposed on the argument that water supply and other serviced are integrated and cannot be administered separately. The row was resolved by agreeing that a group of officers would manage and will keep the Water Board Act intact. But by then, due to inadequate recovery system, the financial position of KWSB was in doldrums.
- KWSB has two types of consumers: bulk and retail and the former are a problem as they are the biggest defaulters of KWSB. Defence Housing Authority (DHA), Karachi Port Trust (KPT) and Pakistan Railways (PR) are the few of many defaulters. Even then, the policy direction of KWSB is to increase bulk-consumers' clientele.
- The bulk consumer punctures the line, siphon off the water and defaults. Most of the industries in Sindh Industrial Trade Estate (SITE) and Korangi do the same.
- Developers (organised and non-organised) are apparently approved and legal, but not part of any master plan assert their clout on water distribution system. Vis-a-vis housing schemes, there is a difference between what is legal and what is planned. Karachi Electric (KE) is an exception to that as it is a private enterprise and is interested in mere money making.
- A housing scheme should not be functional before getting No Objection Certificate (NOC) from the relevant utility provider agencies. But this does not happen here and as a result a lot of new apartments and housing schemes do not have gas and water for its residents.

- Not only distribution but to develop new sources of water sources is also the mandate of KWSB. Just to let you know that KWSB has authority over sub soil water sources as well. And water improvement projects are also the responsibility of KWSB.
- The distribution infrastructure of KWSB has lived its life and is in shambles. It requires major revamp.
- K4 was planned earlier and on the basis of now redundant population figures. Moreover, how K4' s water would be distributed through existing dilapidated water distribution infrastructure.
- Water issue is closely related to irregular development of the city, lack of census and unabated population growth of the city.
- The planned areas of Karachi (example N. Nabad) are in the process of densification and seven member household on the same size of plot is replaced by 28 member ground plus three building. How the existing infrastructure will cater the enhanced requirements of the dwellers? So what to talk of ill planned areas and Katchi Abadis. The emergency imperative is deployed to provide water to Katchi Abadis.
- Sindh Mass Transit Authority (SMTA) functions are not clear. There is no declared plan that how different lines (green, orange, blue...) of mass transit will communicate and coordinate with each other. It is also not very clear that how the ticketing system will operate and whether the ticket of one line will be accepted by other lines. It's also vague that how the interchange will take place and how the exiting transport system will feed into those lines.
- Karachi's state of affairs could only be handled through a negotiated political settlement between provincial and local governments. The present premise is that if Karachi's 'security situation could be improved Karachi will be thrive. Security issue is only an outcome or manifestation of deeper social and economical problems. Those need to be handled. By the way I do not see those negotiations happening in foreseeable future.
- Sindh Province has a budget of 1 trillion and there is no public oversight of its expenditure. It's also unfortunate that the credibility of the service providing institutions is not established by the merit of the service delivery.
- Vis-a-vis provision of services there are three types of Katachi Abadis: 25 to 30 per cent are the regularised and the mainstream ones. Next 25 to 30 per cent are those that are not notified and they are in limbo. KMC is responsible for provision of services and pays to relevant agencies on behalf of the residents of those Katchi Abadis. The remaining 40 per cent are neither regularised not notified and they do not come under the ambit of any service provider. They sustain on their own and grab services from here and there.

4. Interview with Mohsin Raza

Trade unionist, Karachi Water and Sewerage Board

Thursday, July 21, 2016

- There is a huge difference between demand and supply of water in Karachi City. Neither can we estimate the demand accurately as there is no census after 1998. Whatever plans government makes are based on the census of 1998 in which Karachi population was shown as 9.8 million and we don't have house counts as well.
- We bring water from two sources. Indus is 200 km away and requires three-stage pumping. The other is hub river dam and is heavily dependent on rains. Karachi didn't see good rains after 2011, so the water levels in the dam have already gone down to dangerously low levels. As a result, parts of District Central and of District West do not get enough water. It happened in 1999 as well. At that time we introduced "Pani tank" and used to supply water through those "Pani tanks".
- For the water supply to the City we are dependent on Karachi Electric (KE). We have 25 huge motors and if we have one hour of load shedding by KE, it results in shortage of 25 million gallons of water for the City.
- Though the Katchi abadis are mushrooming but the concept of stand post (community tap) has gone.
- The impact of shortage is that people purchase water at expensive rates. On the other hand there are people who are aggressive users of water and pay minimal amount of their excessive usage: the privileged segments and the elite.
- For a total population of let's say 20 million, the availability of water is 650 million gallons per day (MGD), whereas the demand for Karachi is 1100 MGD (as per World Bank standards).
- The water infrastructure is outdated and needs a complete revamp. For instance the water line from Gharo was laid in 1943.
- A household of seven to eight members, living on a plot size of 120 sq yards consumes 2333 gallons in a month from a pipe line of half inch and pay Rs. 166 and that includes sewerage charges as well.
- We have 6,000 to 6,500 bulk consumers as well. The total per month income of KWSB is around Rs 620 million and expenses are around Rs. 42 million per month. The difference is spent on maintenance.

- Water Board was established in 1996 and the development of new schemes was the responsibility of government of Sindh. KWSB is a defaulter of World Bank (WB) and Asian Development Bank (ADB). Japan Internal Cooperation Agency (JICA) did a detailed study on the water distribution mechanism of Karachi.
- Karachi's bulk water users include Cantonment Boards and Union Councils and they are part of the problem as they do not pay their bills. The mineral water companies purchase water from KWSB at the rate of Rs 222 per 4500 litres (which means 5 paisa per litre and sale at Rs. 50 to 60 per litre).
- The print media do not publish such reports because bottled water companies provide them with lucrative advertisements.
- Water Board has been taken over by political parties and interest groups. The water distribution mechanism (of schedule of opening and closing of water valves in a certain locality) is handled by powerful groups.
- The devolution played havoc with Water Board. Earlier the entire city was dealt by handful of Executive Engineers (XEN). After devolution 18 towns of Karachi needed 18 XENs and KWSB remained short of those. Available XENs were re-designated as superintendent engineers but they came under the pressure of the political parties governing that particular town. By the way a Bachelors of Engineering (BE) cannot write a report satisfactorily, so how can he describe the problems to his supervisors?
- Mustafa Kamal claimed that in his tenure Rs. 30 billion was invested in Karachi. As far as water utility is concerned the question remains unanswered that where did that amount go?
- KWSB is not free from corruption and actually it's rampant. The common terminology that is used for bribe is "*file ko load kar do*", which means to top up the actual costs of purchases for maintenance.
- The big valves of KWSB are not maintained. Their seats are either destroyed deliberately or fell prey to corrosion, so water regulation as per schedule cannot be accomplished.
- Once quite propagated metering system couldn't function because it was not in the interest of political groups neither KWSB.
- In 1996, the WB study concluded that 35 per cent of the total supplied water is lost because of leakage or siphoned off. I am sure that this has been increased over the period of twenty years.
- KWSB approved hydrants are only 22 in the City with a supply of 25 MGD per day and making 25000 trips per day (by the way they are responsible for the traffic accidents as well). The rest are all illegal and mostly running with the connivance of KWSB staff. Though Supreme Court decreed that Station House Officer (SHO) of the area will be held responsible but who cares. You can imagine the dependence of general populace on tankers by simply observing the fact that in Urban Resource Centre (URC) forums people don't ask questions to the Managing Director (MD) Water Board and instead ask phone number from the representatives of water tankers associations...!!!
- Water is supplied to Orangi Town after 7 days and to Pahar Ganj after 22 days so you can imagine the situation.

K 4 will not have much impact as there is a disconnect between increased water supply and the existing infrastructure of Water Board. The structure is so dilapidated that it cannot take extra pressure of water. The lines will burst as they have lived their lives.

- In 1996 Justice Wajih uddin through court order asked the S3 (sewerage treatment), but it started now with an investment of Rs. 26 billion. Please remember that a project cannot be run without maintenance and there is so much hanky-panky in maintenance expenditures.
- Reverse Osmosis (RO) plants are not economical. They require high maintenance. They were installed in Lyari and Kemari Towns and provide 1 MGD at a cost of Rs. 5 billion...!!!

Annex 4: Survey questionnaires

1. First set - environmental baseline survey (EBS) – four settlements

Objective of the survey

The objective of the EBS is to:

1. To ascertain the environmental status of the settlements at the time of EBS – 2016,
    a. Across various environment related socio-economic and governance parameters – preferably over time.
    b. In terms of coverage of various civic amenities and development schemes, and
    c. Understand the communities' perspectives about the prevalent environmental issues in their respective areas.
2. To compile data in such a way as to identify the response, of the respective community members, to the manifestations of the earlier identified environment and weather related notions and changes.
3. To serve as a benchmark against which a comparative before and after scenario of the probable changes could be constructed at the end of three years.

Contents of the survey

Baseline of the settlement will involve systematic collection, compiling, cleaning, analysis and summarising on, interalia, the following areas:

a. Basic information/history about the settlement
b. Housing
c. Economic status of the settlement
d. Educational Dynamics
e. Physical Infrastructure
f. Environmental Issues
g. History of Hazards (floods, landslide, water shortage/pollution, fires, heatwaves)

The survey

Surveyor: _____

Dated: _____

Form No.: _____

Basic info (based on observations, to be filled-in by the surveyors)

1. Settlements :
   1. Machar Colony _____ 2. Pahar Gunj _____
   3 Labour Square _____ 4. Rahri Goath _____
2. Locality / Area Name: _____
3. Locality / Area Coordinates: _____
4. Locality established in (year): _____
5. Population (M/F): Male: _____ Female: _____
6. Ethnic Composition: _____
7. Religious Affiliations: _____
8. Prevalent languages: _____
9. Literacy levels: _____
10. Size of the Plot/dwellings in square yards: (range) _____
11. Lane/street widths: _____
12. Encroachment in the streets:
    1. Yes _____ 2. No _____
13. Availability of functional foot paths for pedestrians:
    1. Yes _____ 2. No _____
14. About plantation/green cover in the area:
    1. Yes _____ 2. No _____
15. About the availability of parks in the area:
    1. Yes _____ 2. No _____
16. Sight of women and children using public spaces (footpaths, streets etc): _____
17. If yes to point number 15, for what purposes: _____

(The sections below onwards is for individual respondents)

History

18. Living in Karachi since: _____
19. Living in this area since: _____
20. Living in this house since: _____
21. Previous place of residence if from outside Karachi (Village/City/District/Province):
    Village/City: _____ District: _____ Province: _____
22. If you/your family has moved to Karachi in the last 5-6 years, where from?
    (i) Rural Sindh ____ (ii) South Punjab ____ (iii) KPK ____ (iv) FATA ____
    (v) Northern Areas ____ (vi) Moved more than 6 years ago __ (vii) Other: _____

23. Your main reason for moving to Karachi?
    (i) Lack of sufficient on-farm employment in previous place of residence?
    (ii) Lack of sufficient off-farm employment in previous place of residence?
    (iii) Other reasons
    (iv) Economic loss due to Natural disaster? 1. Yes _____ 2. No _____
    If yes, 1. Flood _____ 2. Drought _____ 3. Other _____
24. Do you feel economically safer/more secure in Karachi compared to your previous place of residence?
    1. Yes _____ 2. No _____
25. Why? _____

Environment and natural hazards related

1. Do you think summer days/months are getting hotter in Karachi?
   1. Yes _____ 2. No _____
2. If "yes" how? (examples needed from the respondents)

   _____

   _____
3. How does this change affect you and your household?
   1. Loss of income _____
   2. Impact on health _____
   3. Other _____
4. What do you do in intense heat? (measures taken)

   _____
5. Do you think that there are lesser rains in Karachi?
   1. Yes _____ 2. No _____
6. If "yes" how? (examples needed from the respondents)

   _____
7. Have these changes made any difference in your life?

   _____
8. Do you think that there are short winters in Karachi?
   1. Yes _____ 2. No _____
9. If "yes" how? (examples needed from the respondents)

   _____
10. How this change does affect you?
11. Have these changes made any difference in your life?

    _____

Further observations by the surveyors:

1. _____
2. _____
3. _____

Natural hazards information

1. In the past ten years, have you or someone in your household experienced a natural disaster such as an earthquake, severe windstorm, flood, or other type of natural disaster?

   [ ] Yes

   [ ] No (If NO, skip to Question 2)

   a. If YES, which of the hazards below have you or someone in your household experienced and when? (Please check all that apply.)

✓	HAZARD	YEAR(S)	✓	HAZARD	YEAR(S)
	Drought			Storm surge	
	Dust storm			Household fire	
	Earthquake			Wind storm	
	Flash flood			Winter storm	
	Landslide/debris flow			Nullah overflow	
	Extreme temperature			Other _____	

2. How concerned are you personally about the following hazards?
(Circle the corresponding number for each hazard.)

HAZARD	EXTREMELY CONCERNED	VERY CONCERNED	CONCERNED	SOMEWHAT CONCERNED	NOT CONCERNED
Drought					
Duststorm					
Earthquake					
Flashflood					
Landslide/debris flow					
Extreme temperature					
Stormsurge					
Household fire					
Windstorm					
Nullah overflow					
Other _____					

3. What is the frequency of the hazards that you have experienced?
(For example, 2 times per month over the last 10 years)

NATURAL DISASTER	MONTHLY	YEARLY
Drought		
Duststorm		
Earthquake		
Flashflood		
Landslide/debris flow		
Extreme temperature		
Stormsurge		
Household fire		
Windstorm		
Nullah overflow		
Other _____		

3a. Was the cause

1. Natural _____
2. Manmade _____

4. What was the impact of the disasters on you or your family?

[ ] Lost income

[ ] Injury or death

[ ] Housing damage

[ ] Disrupted services (water, electricity)

4a. What was the cost of damage: Rs. _____

5. Following a disaster, who assisted you in recovering? (For example, community association, local government, neighbours, or nongovernmental organisation.)

1. community association,
2. local government,
3. neighbours,
4. nongovernmental organisation
5. Other _____

6. Have you ever received information (training or information raising) about how to make your family and home safer from natural disasters?

   [ ] Yes

   [ ] No (If NO, skip to Question 7)

   a. If YES, how recently?

      [ ] Within the last 6 months

      [ ] Between 6 and 12 months

      [ ] Between 1 and 2 years

      [ ] Between 2 and 5 years

      [ ] 5 years or more

   b. From whom did you **last** receive information about how to make your family and home safer from natural disasters? **(Please check only one.)**

      [ ] News media

      [ ] Government agency

      [ ] Insurance agent or company

      [ ] Utility company

      [ ] Red Crescent

      [ ] Other nonprofit organisation

      [ ] Not sure

      [ ] Other (specify)_____

7. Whom would you most trust to provide you with information about how to make your family and home safer from natural disasters? **(Please check all that apply.)**

   [ ] News media

   [ ] Government agency

   [ ] Insurance agent or company

   [ ] Utility company

   [ ] Red Crescent

   [ ] Other nonprofit organisation

   [ ] Not sure

   [ ] Other (specify) _____

8. Have you made any kind of change in your home/life to prevent disaster?

   _____

Other comments:

Work and commutation

26. Occupation / profession of head of household: _____

27. Any other working members in the house and their nature of work:

    1. Yes _____ 2. No _____

27a. If yes Their nature of work: _____

28. How far the place of your work in Km: _____

29. How do you commute to your place of work?

    1. Bike 2. Car 3. Bus/Van

    4. Rickshaw/Chingchi 5. any other

30. How much money do you spend for commuting to job and back home daily: Rs _____

31. How much time **(in minutes)** does it take to in commute (to the work place): _____

Present condition of house

32. Present condition of house:

    i. No. of Floors: _____ ii. No. of rooms: _____

33. Type of construction:

    i. Load bearing: _ Mansoor _____ ii. R.C.C. frame: _____

    iii. Girder slab: _____ iv. R.C.C. roof: _____

    v. G.I sheet/asbestos: _____

34. Location/orientation of plot in street:

    i. Corner: _____ ii. Centre: _____

    iii. West open: _____ iv. Road facing/proximity: _____

35. Is the house in wind direction? _____ (**Repeat**) _____

36. Number of airy rooms ? _____

37. Is kitchen airy:

    (i) Yes (ii) No

Reasons for chooseing the area

38. Reasons for selecting this area for residence:

    (i) Affordability:

    (ii) Close to:

    a. Relations/friends/Community b. Security:

    c. Work place: d. Shopping Centre

    e. Transport f. Religious facility

    (iii) Others:

Health facilities

39. Which diseases are prevalent in the area?

    (i) Gastrointestinal (ii) Dermal (iii) Pulmonary

    (iv) Cardiac (v) Hyper/hypo glycemia (vi) High/low Blood pressure

    (vii) Malaria (viii) Others: _____

40. What are the reasons for those:

i. Pollution: _____

ii. Garbage: _____

iii. Overflowing sewers: _____

iv. Unsafe drinking water: _____

v. Congested living: _____

vi. Crime/Safety concerns: _____

vii. Others: _____

41. Are there any operational govt. clinics in the area?

(i) Yes: _____ (ii) No: _____

42. If "No" then why: _____

43. If yes what is the fee structure?

(i) Rs. _____ (ii) Don't Know: _____

44. Are there any private clinics in the area?

(i) Yes: _____ (ii) No: _____

45. If "No" then why: _____

46. If yes what is the fee structure?

(i) Rs. _____ (ii) Don't Know: _____

47. Which one you prefer

12. Government _____ 13. Private _____

47a Why? _____

Educational facilities

14. Are there any operational govt. schools in the area?

i. Yes _____ ii. No _____ iii. Don't Know _____

15. If "No" then why: _____

16. If yes what is the fee structure?

1. Rs: _____ 2. Don't know _____

17. Are there any private schools in the area?

i. Yes _____ ii. No _____ iii. Don't Know _____

18. If "No" then why not? _____

19. If yes what is the fee structure?

1. Rs: _____ 2. Don't know _____

20. Which one you prefer for your children/sibling

1. Government _____ 2. Private _____

9a. Why? _____

21. Have any of the children in your home missed school in the:

1. Last 10 days or less _____ 2. Last 30 days _____

3. Last 3 months _____ 4. Last 6 months _____

22. How many days of school did she/he/they miss in the last year?

    1. 1–5 days _____ 2. 6–10 days _____

    3. More than 10 days _____

23. What was the main cause for the child(ren) missing school?

    1. Diarrhoea 2. Fever

    3. Other sickness 4. Weather/Climate related factors (e.g., flooding, heat)

    5. Other _____

Garbage disposal

24. Where do you throw your HH waste?

    i. In front of the house: _____

    ii. Contractor Collects: _____

    iii. Katchra Kundi: _____

    iv. Other: _____

25. Is garbage picked up daily by CDGK (about the waste collection service)?

    1. Yes _____ 2. No _____

26. If not, why not? _____

Sewerage

27. Are you satisfied with the sewerage disposal system?

    1. Yes _____ 2. No _____

28. If not, why not? _____

Water facilities

29. What is the source(s) of drinking water for the HH?

    1. Piped water 2. Water tankers

    3. Boring 4. Any other

30. Are you satisfied with the water supply system?

    1. Yes _____ 2. No _____

31. If not, why not? _____

2. Additional Questionnaire for households in the four localities

A. Local Organisations

1. Are there local NGOs, CBOs or *Falahi Tanzeems* working in your area?

   1. Yes _____ 2. No _____

2. If yes, what kind of work do these organisations do?

   (List areas of work, e.g.1. health, 2. education, 3. water and sanitation, 4. security, 5. advocacy, 6. social welfare, etc.)

   (i) _____

   (ii) _____

   (iii) _____

   (iv) _____

   (v) _____

3. Have you or your household benefitted in any way from the work of these organisations?

   1. Yes _____ 2. No _____

4. In times of need or difficulty, could you rely on one or more of these organisations to help you out?

   1. Yes _____ 2. No _____

   3. Don't Know _____

5. Have you or anyone from your household voluntarily participated in a community or social activity designed to help others (during the last 5 years)?

   1. Yes _____ 2. No _____

B. Livelihood(s):

6. What is the occupation of the Head of Household?

   _____

7. How many **other** people work in your home? (Circle number)

   0 1 2 3 4 5

8. What kind of work do they do? (List ***occupations***/work)

   (i)_____ Family Member

   (ii) _____ Family Member

   (iii)_____ Family Member

   (iv)_____ Family Member

   (v) _____ Family Member

9. Does anyone in your family do 'home-based work'?

   1. Yes _____ 2. No _____

10. If yes, please list the **kind** of work they do

    (i) _____

    (ii) _____

    (iii) _____

11. What are your family's three (03) largest monthly expenditures?

(i) _____

(ii) _____

(iii) _____

C. Savings and Loans

12. Are you part of a ***Bisi*** (savings) committee or group?

1. Yes _____ 2. No _____

13. If Yes, how much is your monthly installment/contribution?

Rs. _____

14. What is the **total** value of the committee?

Rs. _____

15. What do you / your household use the money for? (List expenditure items in order of priority)

(i) Marriage (ii) Household expenditure

(iii) Health (iv) Education

(v) Repayment of loan (vi) Religious rituals

(vii) Others _____

16. Are you in debt?

1. Yes _____ 2. No _____

17. If yes, to whom?

1. Money lender	
2. Family member	
3. Friend	
4. Group	
5. Other(s)	

19. How much money do you owe?

Rs. _____

D. Security

20. Are you scared of being evicted from your home?

1. Yes _____ 2. No _____

21. What are the three main issues that concern/bother you?

(e.g. 1. **Health** status of family, 2. children's **education**, 3. how to meet **household expenditures,** 4. **job security**, 5. **marriage expenditures** of children, 6. personal security, 7. **eviction** from home, 8. **loan repayment**, etc.?

(i) _____

(ii) _____

(iii) _____

(iv) _____

3. Questionnaire on Electricity

1. Do you have an electricity connection?

   [ ] Yes [ ] No

2. If yes, do you have a meter or is it a *Kunda* connection?

   Note: Ask to see if respondents say Meter

3. If it is a *Kunda* system, how much do you pay a month for it?

   _____

4. If it is metered, how much is your monthly bill?

   _____

5. How many hours a day do you have electricity?

   _____

6. Are you able to pay your bill fully and on time?

   [ ] Yes [ ] No

7. If No, why not?

   _____

8. How does load-shedding affect your household?

   a) It impacts household earning/livelihood

   Explain:_____

   b) Contributes to illness or poor health of household members

   Explain: _____

   c) Impacts children's education

   Explain:_____

   d) Contributes to arguments and fights within the household and/or with neighbours

   Explain: _____

   e) Any Other

   Explain: _____

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Karachi, a city of around 20 million people, is facing a crisis of governance that is reflected in the poor state of service delivery, and unplanned and unsustainable urbanisation. The city's development shortcomings, and attendant social, economic and environmental challenges, have created vulnerabilities at different scales that are likely to exacerbate the impacts of climate change-related weather events taking place within the city and elsewhere in the country. This report is a step towards identifying and highlighting some of these vulnerabilities (and linkages), in the hope of initiating a discussion and prompting action on climate change adaptation measures.

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