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Barriers and enablers of local adaptive measures: a case study of Bengaluru's informal settlement dwellers

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ABSTRACT

Cities, with their increasing populations, are host to a range of issues including non-climatic factors due to the prevailing development paradigm, discriminatory urbanisation patterns, and weak governance structures. Climate change poses an additional challenge and exacerbates existing vulnerabilities affecting cities and its people, especially the urban poor. This paper highlights the barriers and enablers to climate change-related adaptation experienced in some of Bengaluru's informal settlements. The barriers described in the paper include economic, social, governance and information related issues that impede local actions and increase vulnerabilities. Enabling factors such as improving social and human capital, gaining formal recognition and most importantly support from agencies (e.g. local government, civil societies, and community leaders), help overcome some of the barriers or challenges. Hence, local level adaptation measures mainstreamed with local developmental agendas help address some of the structural causes of vulnerability. Contextual policies and interventions can facilitate successful local level adaptation measures.

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Cities; informal settlements; barriers; enablers; adaptation

Introduction

Cities across the world house more than half of the global population, three quarters of which live in low and middle-income nations (Revi et al. 2014). Furthermore, a majority of the population increase up to 2050 is expected to take place in developing countries, thereby propelling such cities to become power centres due to the concentration of resources and assets (ecological, physical, cultural, social, economic and political) (Krellenberg et al. 2017, Revi et al. 2014; Satterthwaite, McGranahan, and Tacoli 2010). However climatic hazards in a city often intersect with inherent vulnerabilities associated with development deficits, poor governance structures and discriminatory urbanisation patterns adversely affecting individuals, households and communities, especially the urban poor (Chu and Michael 2018, Field 2012, Michael and Vakulabharanam 2016; Michael, Deshpande, and Bhaskara 2018; Michael, Deshpande, and Ziervogel 2018). Notwithstanding that, in developing countries, climate change and urban adaptation have received little attention at the national level and local level (Revi et al. 2014), cities assume a central role in climate change adaptation (Krellenberg et al. 2017).

As in the case of most developing countries, pre-existing structural vulnerabilities have contributed more to the overall risk in Indian cities than a climatic hazard event per se (Michael, Deshpande, and Ziervogel 2018; Revi 2008; Revi et al. 2014). The current pattern of urbanisation in India has resulted in the transformation of cities into “hotspots” of vulnerability.¹ These vulnerabilities are

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also an outcome of the larger development process in the country that has made agrarian livelihoods untenable. Climatic changes like increased temperature, droughts or uneven precipitation patterns compound these risks forcing a large number of rural poor to migrate to the city (Krishna, Sriram, and Prakash 2014). India has the world's second largest urban population, a majority of which resides in informal squatter settlements around the city (Eisenack et al. 2014). In urban centres, there is a constant tension between fuelling economic growth and addressing the needs of the ill-served urban poor whose resilience to climatic impacts depends on access to infrastructure and services (Revi et al. 2014). Hence, there is a need to understand the root causes of vulnerability (Pelling, O'Brien, and Matyas 2015). Non-climatic factors catalysed by climate change² shape the distribution of risks, vulnerabilities and adaptive capacity of cities (Adger, Arnell, and Tompkins 2005; Georgi et al. 2012; Krellenberg et al. 2017; Pelling 2002; Schauser et al. 2010; Wilbanks et al. 2007).

In Indian cities, configurations of climatic and non-climatic factors throw up significant adaptation challenges, which in adaptation literature, are widely perceived as barriers. The dominant imagery in India is a fetish for growth; urban adaptation is at best a tertiary concern. The few urban adaptation initiatives that exist in Indian cities are highly technical in nature (Hughes 2013). Adaptation actions should reduce people's exposure and vulnerability and improve adaptive capacity to extreme events (Field 2012). Climate adaptation is a cross-cutting challenge which requires multi-sector and multi-stakeholder participation and commitment (Shi et al. 2016). While this is indeed a critical aspect of urban adaptation, the huge majority of people such as migrants who move to the city depending on seasonal availability of work, residing in informal squatter settlements, are largely absent in this policy (Breman 1996). Since national surveys like the National Sample Survey are based on the fixity of residence, responses from groups such as these are not captured in the state's databases due to their temporary status (Breman 1996; Vakulabharanam and Motiram 2012). Furthermore, regardless of the official recognition status, a majority of the informal settlements are poorly connected to the governing bodies "that make the city a source of economic dynamism for other population groups" (Krishna, Sriram, and Prakash 2014). Additionally, there isn't enough focus on differentiated vulnerabilities and risks experienced by the urban poor and marginalised (Michael, Deshpande, and Ziervogel 2018). Adaptation debates in the Indian context have also failed to recognise vulnerable sectors and regions in different state action plans (Dubash and Khosla 2015). Moreover, not enough work has focused on understanding the context-specific determinants of vulnerability and adaptive capacity and in effectively using knowledge gained from available case studies to facilitate adaptation (Biesbroek et al. 2013; Hinkel 2011; Klein 2009; Preston, Yuen, and Westaway 2011; Smith et al. 2010; Tol and Yohe 2007). A nuanced understanding of risks and vulnerability distribution is critical to effectively address climate change (Bulkeley 2010; Romero-Lankao and Qin 2011) and increase urban resilience (Field et al. 2014). An effective urban adaptation strategy should identify the nature of existing barriers and enablers (highly contextual (Eisenack et al. 2014)) to adaptation in the city's informal settlements and use these understandings to build adaptive capacity.

Bengaluru has witnessed a proliferation of informal settlements as its growing economy is unable to absorb the influx of population. The poor who reside in Bengaluru's informal settlements are the worst affected; they are forced to live in precarious locations with no or poor access to basic services and infrastructure. They resort to work in the informal economy which has low entry barriers. Additionally, the urban poor have little support from the government or civil society, and have weak or no negotiating power (Krishna, Sriram, and Prakash 2014). The people living in informal settlements of Bengaluru are subject to a wide range of stressors (socio-economic, political and environmental) which further marginalises them. However, there are certain factors that help overcome barriers (Eisenack et al. 2014) and improve the adaptive capacity of individuals and communities. The enabling factors discussed in this paper include improved human capital (e.g. education, vocational training, awareness), and social capital (e.g. improved communication, social cohesion, self-help groups, social networks) all of which improves capabilities at the individual and community level. There are certain actors who play a crucial role in mobilising these changes

which include (a) NGOs and civil societies which act as intermediaries between communities and local governing bodies, (b) committed individual leaders or champions who often drive change and action (adaptation), and (c) dedicated local government authorities who provide basic services and some rights in exchange for votes. In this paper, we draw on a few case studies in Bengaluru's informal settlements that houses one of the most marginalised groups in the city and critically examine the nature of their existing challenges and interactions and identify local level adaptive measures.

2. Methodology

The case studies described in this paper are part of a broader research programme aimed at examining differential vulnerability and adaptive capacity in the informal settlements of Bengaluru. Initially four informal settlement clusters were identified within the city as research sites using the following criteria (a) located in low lying areas, and hence prone to flooding; (b) close to infrastructural corridors corresponding with rapid land use and land cover (lulc) changes in the past decades; and (c) demographic factors such as economic and social marginalisation, high population density among others. From these research clusters, 31 settlements were selected based on factors like age of the settlement, altitude, proximity to drains and access to services to get a representative sample (for more details see Michael, Deshpande, and Bhaskara 2018). The four settlements analysed in this paper met the above-mentioned criteria.

In this study, we primarily focus on four of the selected informal settlement clusters which provide an analytical template to understand barriers and enablers to effective adaptation in informal settlements. A mixed method approach (quantitative and qualitative research methods) was used to collect both primary (household and community level) and secondary data. An in-depth household level survey was conducted in 100 households across four settlements (Akiappa, Venkateshwara, Hebbal and Rachenahalli). Households were selected in the study sites using random sampling techniques using a right-hand rule where every n th house was surveyed across the settlement (n being 10% of the number of households). Data was collected for a range of variables such as housing, residential history, access to basic services, vector-borne diseases, expenditure, assets, social networks and support programmes, climate-related information and food insecurities. The qualitative tools used include transect walks within the settlements, semi-structured interviews with community members, key informant interviews with local government officials and civil society agencies associated with the settlements and focus group discussions with the community members. The qualitative research methods helped bring out nuances such as power and gender dynamics, and traditional or cultural norms that were not captured by the survey which helped understand the patterns and trends constructed from the quantitative data.

3. Barriers to effective adaptation in informal settlements

In our research, economic, social, governance and information challenges either independently or collectively emerged as the dominant barriers to adaptation. Informal settlements primarily house the economically marginalised. About 27 percent of Bengaluru's population falls under the poverty line (Jana Sahayog 1998 in Madon and Sahay 2002) and constitute the urban poor who mainly inhabit informal settlements. Differences in class, caste, language and religion constitute social barriers, and the diversity in these makes it non-conducive for the various sub groups to communicate with one another and inhibits cohesion. Apart from other challenges that newer settlements which house first generations migrant face, language poses a major barrier for the interstate migrants as the dwellers do not know the local language *Kannada*, and find it challenging to communicate, live and work in the city. These communities have good horizontal associations³ because of their existence in a different socio-economic and linguistic space. However, establishing

vertical associations⁴ with the local state government becomes intractable without being able to communicate in Kannada.

Barriers for adaptation also emerge from poor governance which can be attributed to a multitude of reasons, the most common of which is government apathy and disregard which is an issue in some informal settlements (Keefer 2004). Urban governments control, regulate and restrict access and entitlement to livelihoods and assets⁵ (IFRC 2010; Islam et al. 2014) which negatively influence certain sections of society, specifically the urban poor. Local governments do not adequately address the needs of the growing urban population in terms of expanding or improving existing infrastructure and services (Revi et al. 2014). However, all problems cannot be associated with government apathy alone. The bureaucratic structures and division of power among various governing bodies disrupt ordered planning and reduces the accountability of each body (Singh et al. 2015). Further, lack of communication and coordination among the different bodies results in the ineffective implementation of solutions. The dilapidated state of informal settlements in Bengaluru is an example of the lack of coordination between relevant governing bodies such as the Karnataka state Slum Development Board and the Bangalore Development Authority. Another major challenge is the lack of understanding of urban multi-dimensional vulnerabilities and the impacts of climate change (IPCC 2014). The schemes, programmes and policies are not nuanced to address specific issues pertaining to each settlement. Based on variables such as the age of each settlement, its social diversity, resource availability, geographic location, etc., a nuanced plan is essential (Gogoi et al. 2014) for holistic development of each settlement. Jana Sahayog, an NGO working on improving awareness among informal dwellers, argues that the state government's development plan does not recognise the extent of informal settlement proliferation in the city and the various issues concerning these dwellers (Madon and Sahay 2002). It should also be noted that an efficient governance mechanism should also enable people to have agency, represent their interests and claim their rights.

Lack of nuanced holistic planning is not only due to government disregard but also due to the lack of information about informal settlements (Madon and Sahay 2002; Revi et al. 2014). Intricate profiles mapping the features and the specific needs of each informal settlement are non-existent, thereby crippling the ability of government planners to produce comprehensive plans (Dupont 2011). Furthermore, the absence of transparency and accountability of government projects gives room for misuse of funds and ineffective implementation. On the other hand, a majority of the settlement residents (notified or non-notified settlements) are poorly connected to the institutions which support economic dynamism for the rest of the city's population (Krishna, Sriram, and Prakash 2014). Additionally, inhabitants of settlements are unaware of the funds sanctioned by the government for a particular project and this promotes corruption and mismanagement (Shrivastava and Kothari 2012). The lack of information and communication among the people in an informal settlement are common issues (Krishna, Sriram, and Prakash 2014) that discourage cohesion. Aurebach (2016, 117–118) argues that informal settlement dwellers in India secure development through the following three processes: "1) the internal self-provision of development by residents themselves without the assistance of the state 2) group claim-making to get the attention of politicians and officials to improve the community 3) collective protests often involving public life disruption". The success of all the above-mentioned processes depends on the community spirit or cohesion without which these mechanisms fail to achieve the desired outcomes.

Generic assumptions regarding constraints cannot be applied when assessing vulnerability and adaptive capacity (Adger and Barnett 2009; Barnett and Campbell 2010, Mortreux and Barnett 2009). Hence, all the above-mentioned barriers are not prevalent across all settlements and thereby cannot be generalised as they manifest as combinations of varying proportions in different settlements. Furthermore, barriers are not static; they change over time. Additionally, some barriers have deep historical roots, and time plays an important factor in overcoming them (Eisenack et al. 2014). The following cases elucidate the interplay of barriers in a few of Bangalore's informal settlements.

3.1. Case study 1: Rachenahalli

This informal settlement which is 10 years old and houses 5000 people, sprouted to accommodate construction workers working on a commercial technology park. Distress migrants from different parts of Karnataka (Yadgiri, Gulbarga, Bijapur, Bellary, Raichur, Haveri and Koppala) rent houses in the settlement. They are mostly landless and have migrated for the sole purpose of earning money due to a decline in livelihood opportunities in their native villages. These migrants fit aptly into the category of labour described by Jan Breman as “footloose” or “nomadic” circulating between the village and the city (Breman 1996). Vakulabharanam and Motiram (2012) reiterate that these groups of workers are unable to find viable livelihood options in agriculture, and their temporary status prevents them from attaining a foothold in the city. They also argue that sometimes it is a “deliberate strategy of the employers to gain access to a voiceless and pliable labour force”. The construction workers in Rachenahalli face an extremely insecure livelihood because of the uncertainty in jobs created by the contractors. Hence when they do not have adequate livelihood opportunities in the city, they return to the villages and this circular process continues.

The Rachenahalli settlement is an undeclared settlement,⁶ and the residents are at the mercy of the landowner who, despite charging a high monthly rent of around INR 2000 for a house-like structure made of blue tarpaulin, fails to provide basic services. This settlement is characterised by poor housing conditions, limited water availability, no electricity, and no access to education. The people in this settlement lack cohesion because of the temporariness associated with their stay in the settlement. Most residents are uneducated and unaware of their rights as well as government policies and projects. Additionally, the heterogeneous nature of the settlement results in a lack of local groups and community leaders, which deters collective action and the establishment of communication channels with the local government. Consequently, there is no support from local authorities for the development of infrastructure and improvement of services.

3.2 Case study 2: Hebbal

This settlement comprises 400 households, and all its residents are from the state of West Bengal. It is less than 10 years old and is situated on unclaimed land located behind a residential complex alongside an open drain. This is an unrecognised settlement with extremely poor infrastructure and no access to basic services. It is characterised by untarred roads, poor housing conditions, unavailability of water and electricity, and no access to the⁷ Public Distribution System (PDS). The residents migrated due to a combination of push (non-climatic and climatic) and pull factors (better livelihood opportunities). These interstate migrants find it difficult to tap into decent and dignified livelihood opportunities in the city because language is a major barrier often causing them to feel a sense of alienation. Most often they are unable to communicate with potential employers, government agencies or civil society members.

A majority of them work as waste pickers in the city and reside amidst the garbage they collect.

Waste picking as a means of livelihood also poses severe health challenges and identity issues. Due to their lack of education and migrant status (interstate and language disconnect), they are unaware of the various rights and provisions provided to them by the government and often do not receive any benefits largely because their presence is unseen by any government actors. It must also be noted here that India has no significant policy to address the welfare needs of the interstate migrant worker category (Santha et al. 2017).

However, in this settlement, the sense of insecurity perceived by them in a so-called foreign⁸ land also leads to a sense of togetherness and community spirit among the dwellers which enables them to stay united during times of crisis.

4. Enablers to effective adaptation in informal settlements

Each of these settlements is exposed to certain issues (Auerbach 2016) and the socio-economic diversity within these settlements could be challenging for taking collective action against the problems

they experience. Notwithstanding this diversity, there are certain factors called enablers which help address and overcome locally experienced barriers. Some enabling factors identified in our study include (1) investment in improving human capital (e.g. providing education and vocational training and increasing awareness), (2) developing a strong social capital⁹ (e.g. improved intra-settlement communication and cohesion,¹⁰ strengthening existing or establishing new social networks such as self-help groups, youth clubs etc.), and (3) formal recognition of settlements (e.g. notification of settlements leading to improved access to services, information and channels). Improved human capital results in improved individual capabilities and awareness (Revi et al. 2014) about rights and opportunities, which in turn leads to a sense of empowerment at the individual and community level. Socio-economic barriers which deter intra-settlement cohesion can be overcome by improving the social consciousness through promoting education, encouraging communication (such as through promoting spaces for dialogue that neutralise power relations) and improving access to information and knowledge. In addition, the formation of official and non-official social networks across the settlement improves communication¹¹ among the dwellers as these provide a platform for the exchange of thoughts, ideas and grievances. Additionally, social cohesion requires dense cross-cutting networks among various groups in a settlement (Narayan 2002). If the solution of a predicament is beyond the capability of the community, communication among the dwellers helps in amplifying their voices by facilitating collective action. In some settlements, diversity of language poses communication barriers. However, this barrier is overcome as a settlement grows older¹² and more homogenous; typically, once the people learn to speak the local language, and also newer generations who are brought up and educated in the city, learn to speak the local language in addition to their native language. Intra-settlement cohesion can not only improve the horizontal dimension of social capital¹³ but also lays the foundation for vertical associations.

Actors such as civil societies, local governing agencies and community leaders/champions, play a vital role in facilitating the above mentioned enabling factors. For instance, local municipal authorities (MLAs) in exchange for votes help overcome development deficiencies (Auerbach 2016) and also notify the non-notified settlements with improved access to basic services and rights. Local governing bodies play a crucial role in terms of assessing risks and vulnerabilities and implementing policies and interventions that reduce risks and vulnerabilities (Bulkeley 2010; Bulkeley and Betsill 2005; Burch 2010a, 2010b; IPCC 2014; Measham et al. 2011; Ziervogel and Parnell 2012). Hence, urban governments can understand the local context, generate awareness, address citizens' and civil society needs, foster an inclusive policy space (Brunner 1996; Brunner et al. 2005; Cash and Moser 2000; Grindle and Thomas 1991; Healey 2006) and promote understanding and action against climatic risk (Corfee-Morlot et al. 2011; Moser 2006; Moser and Dilling 2007; Ostrom 2009).

Improving the asset base of low-income households helps increase their resilience to climatic risks (Moser and Satterthwaite 2010). Recognition of the settlements by the government¹⁴ is one of the primary steps to enabling facilitative beneficial action by the local government authorities. Providing basic services and building resilient infrastructure systems (e.g. water supply, sanitation, storm and waste water drains, electricity, transport and telecommunications, healthcare, and education) can significantly reduce hazard exposure and vulnerability to climate change, especially for those who are most at risk or vulnerable (Revi et al. 2014). Furthermore, whether the decision is taken by the community or household or NGO, it is governed by the action taken by local governments (ibid). Hence, urban governments are very important for the interface between climate change and development (Bulkeley 2010; Revi et al. 2014).

Apart from local governments, other actors such as NGOs (that do not operate within the bureaucratic state apparatus) are also capable of delivering local adaptation (Gogoi et al. 2014) as they are well placed to address local conditions and some of the structural causes of vulnerability (Revi et al. 2014). NGOs facilitate interventions that improve literacy rates, enable access to information (e.g. beneficial government schemes and programmes) and communication, and build public opinion. NGOs and civil societies not only enable improving human and social capital through certain interventions but also often act as intermediaries between informal settlements and local governing

agencies. Furthermore, these organisations help translate scientific or expert information for local communities (Moser 2006; Moser and Dilling 2007; Moser and Luers 2008) and encourage locally adaptive participatory approaches (Madon and Sahay 2002).

Often, committed individuals who facilitate meetings to discuss certain issues in a settlement and who then reach out to either NGOs or local MLAs for help, emerge as community leaders/champions in a few settlements. Leadership is crucial for generating awareness and momentum for some sort of institutional change (Anguelovski and Carmin 2011; Carmin, Nadkarni, and Rhie 2012) for local leaders can drive the first steps for collective action by creating necessary action space for other actors (Eisenack et al. 2014). Additionally, in some cases, representatives from the settlements along with NGOs are included in the planning and designing process of certain settlement-specific interventions by the local MLAs. Hence, a sustained representation at the local municipal body and constant compelling can help establish vertical associations with the governing bodies. Participation is a powerful approach that serves to advance the communitarian agenda (Khosla 2014 cited Oakley and Marsden 1984). Although, local leaders help in forming vertical associations, organised collective action can also establish vertical associations.¹⁵

Participation is the affirmative action required for sustainable change (Khosla 2014). With the onset of participation, settlements witness some development. Coordinated effort and support from all actors (e.g. governments, the private sector, and civil society) and horizontal learning through networks of cities and practitioners, benefits local level adaptive interventions (IPCC 2014). Hence, urban adaptation depends on locally rooted, iterative learning processes about risks and opportunities, and making collaborative decisions involving all the relevant actors (Revi et al. 2014). Participatory processes enabled by the flow of information builds the community's capability to represent their views, negotiate their entitlements and influence policy. They also create vertical associations between settlements and local governing bodies. These vertical associations enable two-way communication channels which allow a two-way flow of information between the community and the government. The government bodies directly receive critical information about the condition and requirements in communities and more importantly, the people of the community are given direct information about the policies, schemes and projects undertaken by the government. This flow of information encourages and promotes participation.

4.1. Case study 3: Venkateshwara

The Venkateshwara settlement is located adjacent to the river Vrishabhavathi at a junction of a transport and industrial corridor. The 60-year-old settlement houses older migrants from all the south Indian states including Andhra Pradesh, Tamil Nadu and Kerala as well as parts of north Karnataka. Most of them are second or third generation migrants, and hence can be termed as natives to Bengaluru city. They have either undergone formal education in the city or have been living in the city long enough to learn the local language. The community is at an advantage because they speak the language which helps build cohesion since the dwellers constantly communicate with each other about their grievances. There are around 200 households in the settlement with good access to water and electricity. The houses here have been constructed with government support, roads are cemented, and the river banks have been reinforced to prevent flooding. Most of the people have ration cards, and all the children of the settlement attend school.

The residents of Venkateshwara settlement have been significantly successfully in claiming their development rights from the state partly because of the language connect and improved cohesion and communication among the members of the settlement that has developed over time. For example, the women of the settlement established a self-help group and successfully bargained for piped water supply. However, the major transformation occurred in the settlement only when they were able to develop significant ties with the elected representative of their constituency. The local politician provided them with access to basic services and infrastructure in exchange for votes. The key element of transformation was the political patronage they enjoyed. Auerbach

(2016) argues that since the city governance officials often deal with a large number of claims by citizens, political support plays a key role in providing a significant bargaining power to these claims. It has to be noted that even though the settlement has existed for 60 years, they were able to avail these benefits only 15 years ago – 45 years after it was established – with political support. As Auerbach (2016) reiterates, “access to goods and services in informal settlements is mediated, conditional on political support, and brokered through complex, vertical networks of intermediaries” (12).

4.2. Case study 4: Akiappa Garden

Akiappa Garden is located behind one of Bengaluru’s railway stations. This settlement first came up more than 40 years ago and currently houses 3500 people. They belong to diverse linguistic backgrounds, yet most of the dwellers speak Kannada. In addition, they are conversant in other languages such as Tamil, Telugu, Hindi, Marathi and Punjabi. The settlement has good access to basic services and infrastructure with people living in permanent houses and having access to piped water and electricity. Most of the dwellers even have ration cards. There are five government creches (Balwadis) in the settlement and all children below the age of 16 attend school.

The settlement witnessed a major transformation 20 years ago, which occurred as a result of an intervention by the NGO Paraspara Trust.¹⁶ In 1996, Paraspara Trust began its operations in the settlement with the primary goal of ensuring that all the children living there attended school. To enable this, they worked towards understanding the problem from all perspectives so that they could address the various forward and backward linkages that prevented this from happening. They began educating and empowering the populace by forming self-help groups and discussion groups. These groups not only improved the communities’ financial security but also formed communication networks which improved community cohesion. The trust also educated them about the various rights individuals are entitled to and encouraged them to pursue collective action. This encouraged the rise of local leaders who would take charge in reaching out and constantly compelling the local governing bodies to take action. These actions paved way for the local government to recognise the settlement, which led to development. The role of Paraspara Trust as an agent of significant change in Akiappa Garden is instrumental as it leads to significant development of human and social capital of the community members and also developed a critical awareness about their rights. This case highlights the role external agencies can play in bringing about development in a true sense by encouraging participation.

5. Discussion and conclusion

Post the announcement of the New Urban Agenda in October 2016, there is an increased appetite for dovetailing actions to address the Sustainable Development Goals (SDGs) with the process of urban development itself (Michael, Deshpande, and Ziervogel 2018). A few crucial aspects of this agenda aim to “provide basic services for all citizens”, “ensure that all citizens have access to equal opportunities and face no discrimination” and “fully respect the rights of refugees, migrants and internally displaced persons regardless of their migration status” (UN-HABITAT 2016). These agendas are thus implicitly focused on uplifting the economically and socially marginalised in urban spaces. Development can produce adaptation co-benefits in urban areas and reduce vulnerability for low-income groups (Anguelovski and Carmin 2011; Burch 2010b; Clapp et al. 2010; Dodman, Bicknell, and Satterthwaite 2012; Hallegatte, Henriot, and Corfee-Morlot 2011; Kousky and Schneider 2003; Roberts 2010).

Using the case of Bengaluru’s informal settlements, it has emerged that building individual and community adaptive capacity and agency helps address multiple climatic and non-climatic stressors. This draws on Sen’s capability approach, at an individual and a community level, which fosters effective adaptation against external constraints (Lehtonen 2004). The capability of the informal dwellers can be improved and achieved by both reducing vulnerabilities and improving the adaptive

capacity and agency. By providing basic services (e.g. water, electricity and sanitation), creating economic opportunities, ensuring environmental sustainability and promoting equity, existing vulnerabilities can be reduced and well-being can be improved (Roberts 2016). Infrastructure provision like permanent housing also reduces vulnerability as it provides a cleaner environment for day to day activities. Adaptive capacity is improved by services such as healthcare and education wherein the ability to cope better with various climatic and non-climatic stressors is improved. Affordable healthcare helps the dwellers recover faster from ailments, whereas education improves their access to information especially with regard to existing government schemes, empowers them to claim their rights, feel like citizens in their full rights, and also entitles them to access better job opportunities. Well governed cities with universal provision of services and infrastructure are crucial for building resilient cities in the face of changing climate (IPCC 2014).

The scale of informality in urban India is growing exponentially due to the migration of the marginalised from rural areas. Each new informal settlement springs up wherever temporary niches (Krishna, Sriram, and Prakash 2014) and livelihood opportunities are available. This leads to specific complexities originating in every settlement. The blanket policies and schemes provided by the government does not cater to the nuances in specific settlements. Grassroots agencies such as civil societies and NGO's which work closely on the ground tend to have a more nuanced understanding of the situation in a settlement, and consequently are often effective in addressing such issues. These local level agencies also play a crucial role in bridging the communication gap between the informal dwellers and the local municipal body. Decisions taken by urban governments control the contribution of households, community and civil society-driven action to effective adaptation. Furthermore, they play an important role in providing required infrastructure and services (Revi et al. 2014). The actor-centered framework and method is ideal for understanding barriers and informing efforts to overcome them. Many barriers can be overcome by actors and actions (Eisenack et al. 2014). Therefore, to move closer to achieving the New Urban Agenda, there is a need for policy that will encourage and incentivise the inclusion of grassroots level actors and organisations. Our research has shown that it is imperative to understand the underlying causes of vulnerability, the contextual nature of these issues and inclusive and participatory governance structures.

Notes

1. Interactions between urbanisation and climate change reduce the adaptive capacity of the urban population especially in low-income countries (IPCC, 2014).
2. Erratic and intense rainfall patterns lead to flooding in some areas and also result in water scarcity issues. Whereas increasing temperatures lead to urban heat island effect. These affect the livelihoods and living conditions of the urban poor.
3. Horizontal associations are networks of communication among individuals from similar social hierarchy like family and neighbours living in the same or similar informal settlements.
4. Vertical associations are networks of communication between the people across social structures like communication between informal settlement dwellers with the local governments, corporate actors, judiciary system etc.
5. Access to assets determines the vulnerability and ability to cope with and adapt to stress (Islam et al. 2014).
6. Not recognised by the government
7. PDS is an Indian food security system that distributes subsidised food and non-food items to the poor.
8. Foreign land or "*videsh*" is the term used by the respondents to describe their perceptions about the city.
9. Information sharing, coordination of activities and collective decision making are few of the beneficial functions of social capital (Lehtonen 2004).
10. Cohesion between different groups residing in one settlement.
11. Communication is essential in streamlining the various challenges a community faces and allows exploration of avenues to find localised solutions to some of the challenges faced by them.
12. Older settlements have seen multiple generations of people living there and trace their association with Bengaluru (Krishna, Sriram, and Prakash 2014).
13. Lehtonen provides many definitions of social capital. The narrowest definition views social capital as a set of horizontal associations that has an effect on the productivity of the community (Putnam, 1993 in Lehtonen 2004). Broader definitions also included associations with institutions like governments, political regimes, the rule of

law and the court system. Though there are varied definitions of social capital, Woolcock (2001) defines social capital as the “norms and networks that facilitate collective action” as a resultant of a consensus among scholars.

14. Formal records of the settlement.
15. A group of people from a community collectively approaching the government and compelling them for certain actions or benefits also helps in establishing a vertical channel between the community and the local governing body.
16. A NGO working with informal settlements of Bengaluru with an aim to improve literacy rates, empower women and eradicate child labour.

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