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Editorial

It is well known that the environment in which people live significantly affects their health. Particularly in the case of low-income, urban resident groups, consideration of the housing-health nexus shows that health-related improvements require a cross-sectoral approach to housing conditions. The term "Environmental Health" refers to those aspects of human health, including well-being, that are determined by physical, social, and psychosocial factors in people's daily living environment – with health not just being the mere absence of disease or infirmity, according to the WHO's definition (WHO 1946).

The links between poor environmental health and other dimensions of poverty are complex, reinforcing each other in various ways (Sunikka-Blank et al., 2019). Poor people typically face greater exposure to environmental health risks because they live in "unhealthy" locations without basic services. They are more vulnerable because they are less able to adjust behaviour and moderate exposure. People's housing significantly impacts their livelihoods: location gravely influences which jobs are accessible and spaces at their disposal determine which businesses they can operate (Ellena et al, 2020). Some home-based economic activities can also represent health risks, such as smoke inhalation or exposure to harmful substances.

Housing, Health Nexus and livelihood aspects are intrinsically interlinked and complex. It has seldom been looked at in its entirety (Mukhija 2001). This TRIALOG issue strives to shed light on this nexus and explores ways in which poor urban residents (especially but not exclusively in India and Ethiopia) navigate constraints. Empirically rooted and informed by several disciplines, the cases presented here further our knowledge on this nexus.

O1 Mamta Patwardhan investigates the vulnerability of a community living in the informal settlement Adarsh Nagar, a neighbourhood in Deonar, Mumbai. While a dump yard serves as these residents' main source of livelihood in waste picking, it at the same time constitutes a considerable health risk. The study provide insight into the various risks during severe weather conditions and observes how extreme weather events produced near epidemic circumstances.

02 B.N. Eicker, J.R. Noennig, and **J.A. Schmidt** develop a Liveable Life Index that aims to support identifying and classifying relevant, locally rooted liveable life components. The index was empirically tested in Bhubaneswar, India and the context of slum upgrading areas. The study stresses the importance of contextualised indicators in supporting sustainable upgrading approaches.

03 António Manuel de Amurane, Dorival Victorino Fijamo, Cecília João Boaventura, and Jaibo Rassul Mucufo present the case study of Namutequeliua, an informal neighborhood in the Municipality of Nampula, Mozambique. Their findings verify the influence of low housing conditions and poor social relations on public health of the informal area's inhabitants, especially the children.

04 Abnet Gezahegn and **Peter Gotsch** focus on energy management in informal settlements in Addis Ababa, Ethiopia. They seek to understand the relationship between the energy management of households and the social, economic, and environmental characteristics of settlements. They show that access to the main grid, whether formal or informal, plays a significant role in ensuring tenure security of residents.

05 Also, in India, the paper of **Faiz A. Chundeli** and **Tania Berger** contributes to knowledge on relations between urban heat and the housinghealth nexus. Moreover, it tackles the question of how these affect the livelihoods of low-income residents in Vijayawada, India. The authors conclude that the quality of housing mediates the link between heat and health. Substandard building materials are likely to cause overheating, impacting the residents' livelihoods due to unhealthy living environments.

06 Sandeep B. Menon, Anirudh Somadas, Funda Atun and **Javier Martinez** investigate the "Nexus Between Human Well-Being of Peri-urban Communities and Ecosystem Services in Panju Island, Mumbai, India". The well-being of humans depends on the natural environment in multiple ways. The dependency ranges from food to enjoying a beautiful landscape as a cultural ecosystem service. However, the authors question whether everyone receives these benefits in the same way.

07 Sara Amare's paper on "Built Form and Energy Transition" presents the case of condominium housing in Mekelle, Ethiopia. In the context of a transition to cleaner energy, the authors found that residents of condominiums use predominantly electricity offered by a grid connection. However, the condominiums lack the space and facilities required to use other energy sources and limit the possibility of residents using a mix of energy sources.

08 Hone Mandefro and **Bekele Molla Ayele** examine whether neighbourhood design influences residents' social capital. The authors compare social capital across three different neighbourhood types in Gondar, Ethiopia. They find that the vertical nature of condominium houses and the divergent backgrounds of the neighbours contribute to the poorer social capital among the condominium residents.

09 Avni Rastogi's paper "Participatory Local Area Planning: The Case of Bombay Hotel, Ahmedabad" contributes to the question of What it means to "do" participatory planning in India. The author shows how participatory mapping and knowledge collected with the community are essential for key basic infrastructure such as solid waste, as it directly impacts residents' health and well-being.

10 Daniel Semunugus, Ephrem Nigusie and **Tania Berger** counter the narrative of an 'informal settlement free' city in Mekelle, Ethiopia, by looking at how urban housing demand induces changes of livelihood in peri-urban areas. This study, therefore, showcases the transition of periurban to urban land. During this process, land use changes to entertain non-agrarian livelihoods.

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The Housing-Health-Nexus and its linkages with aspects of livelihood

Volume editors: Tania Berger, Javier Martinez, and Peter Gotsch

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Health and Climate Risks in Informal Settlements in Mumbai A Case in Deonar

Mamta Patwardhan

In addition to the rapid pace of urbanisation and demographic growth, climate-change effects negatively affect the vulnerability and health of residents. While presenting livelihood opportunities, informal settlements are often in particularly risky and environmentally sensitive locations. In this context, we aim to establish an interlink between climate change and health, and examine how harsh conditions are exacerbated by environmental events like flooding, waterlogging, and urban heat island effects. Our case study examines the communities living in the informal settlement Adarsh Nagar, a neighbourhood in Deonar, Mumbai. The informal settlement is located on low-lying land adjacent to a dump yard. Our data collection comprised a mix of 72 structured interviews and various observations. We found that heavy rainfall results in waterlogging and flooding, resulting in people getting infected with waterborne or vector-borne diseases. Moreover, entire communities are affected by chronic respiratory ailments owing to the proximity to the dump yard. The female population faces higher rates of vulnerability, with inadequate water and sanitation being a primary cause of health issues, which are aggravated during extreme climate events. As the residents grapple with risk reduction or adaptive strategies, one follow-up question is how planners can help address informal conditions and build resilient communities.

Gesundheits- und Klimarisiken in informellen Siedlungen in Mumbai: Ein Fall in Deonar

Neben rascher Urbanisierung und demografischem Wachstum wirken sich auch die Folgen des Klimawandels negativ auf die Verwundbarkeit und Gesundheit von StadtbewohnerInnen aus. Obwohl informelle Siedlungen vielfach räumliche Nähe zu Jobs bieten, befinden sie sich auch oft an besonders riskanten und umweltsensiblen Standorten. In diesem Zusammenhang zielt der vorliegende Beitrag darauf ab, eine Verbindung zwischen Klimawandel und Gesundheit herzustellen und zu untersuchen, wie extreme Bedingungen durch Umweltereignisse wie Überflutungen und städtische Hitze verschärft werden. Die Fallstudie untersucht die informelle Siedlung Adarsh Nagar im Stadtviertel Deonar in Mumbai, Indien. Diese Siedlung befindet sich auf tiefliegendem Gelände neben einer Mülldeponie. Unsere Datenerhebung umfasste eine Mischung aus 72 strukturierten Interviews und Beobachtungen. Wir stellten fest, dass starke Regenfälle zu Überschwemmungen in Adarsh Nagar führen, wodurch die BewohnerInnen an durch Wasser oder Vektoren übertragenen Krankheiten leiden. Darüber hinaus sind ganze Gemeinschaften aufgrund der Nähe zur Mülldeponie von chronischen Atemwegserkrankungen betroffen. Die weibliche Bevölkerung ist einem erhöhten Risiko ausgesetzt, da unzureichende Wasserversorgung und sanitäre Einrichtungen eine Hauptursache für Gesundheitsprobleme darstellen, die sich während extremen Klimaereignissen verstärken. Während die BewohnerInnen um Risikominderungs- oder Anpassungsstrategien ringen, stellt sich die Frage, wie PlanerInnen dazu beitragen können, informelle Bedingungen anzugehen und Resilienz zu stärken

Introduction. Urban climate hazards in the context of Mumbai, India

The Mumbai urban agglomeration, one of the largest metropolitan areas in the world, has seen an extreme increase in its population (currently 22 million) over the past few years (World Population Review 2018). As per the 2011 census, 62% of Mumbai's population lives in slums with limited access to civic amenities, including access to potable water and sanitation services (Mehta 1992).

These already marginalised communities are subject to risks arising from artificial and natural hazards. We know that climate-related hazards (e.g., rising sea levels and storm surges, extreme precipitation, inland and coastal flooding, and heat stress) are likely to worsen, causing widespread disastrous impacts on people and their health, life, livelihood, and assets. Children, women, and the elderly are the most vulnerable to the effects of climate change (NAPCC 2008, Rana 2014).

An example of climate change-related hazards is the increasingly heavy seasonal flooding.¹ Generally, Mumbai is susceptible to flooding owing to its geography, both natural as well as artificial (Duryog Nivaran 2005). The city is exposed to heavy rainfall during the monsoon, and experiences almost 50% of its rainfall during July and August, which are said to be the rainiest months (Jenamani 2006).² The city's current drainage systems are inadequate to cope with heavy rainfall, and are impeded by urban encroachment and channel blockages. Surface water is quickly contaminated during heavy rainfall events.

Northwest India has observed statistically significant annual mean surface air temperatures warming over the past century (IPCC 2007). This has multiple hazardous effects on the population. An increase in temperatures also increases the particulate matter in the environment. Air pollution generated locally is usually swept away by wind blowing in from the sea. Mumbai, however, is surrounded by hilly terrains and mountain ranges, which lock air within the area. Also, the extreme humidity tends to hold on to particulate matter longer.

The impacts of flood events (and of heat waves) on health are manifold (Kovats et al. 2008). Urban poor populations often experience increased rates of infectious disease after flood events. For example, increases in cholera,

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For example, in July 2005, Mumbai experienced the worst flooding in its history, resulting in around USD 1.7 billion in damages and around 500 fatalities (GoM 2005). The city received 944 millimetres of rainfall in 24 hours, compared to an average of 217 millimetres of rainfall per year. The consequent flooding affected many households, including those in the more-affluent parts of the city. In addition. blocked canals and drains exacerbated the flooding in Mumbai. Around 20% of the area was affected, with floodwaters to a depth of 0.5 to 1.5 m in low-lying areas (Ranger et al. 2010).

cryptosporidiosis, and typhoid fever have been reported in low- and middle-income countries. In addition, flood-related increases in diarrhoeal diseases have been reported in India and Bangladesh. The Indian National Assessment of Vulnerability and Adaptation addresses the potential impact of climate change on malaria.

Research question and methodology

This case study looks at the interlinks between climaterelated hazards and health impacts. It addresses the questions of how natural hazards like extreme rainfall events contribute to the further exacerbation of health risks/problems in Mumbai's informal settlements.

On this basis, the study seeks to generate spatial planning recommendations to contribute to healthier conditions. This is done using the case of Adarsh Nagar, an informal neighbourhood in Mumbai, India, which is located adjacent to the city's biggest dump yard. A qualitative and quantitative approach was adopted to increase understanding and interrelations between hazards, health issues, and informal conditions of living.

The underlying research questions of this study are as follows:

- 1. In which ways do (natural) hazards contribute to health risks/problems in Adarsh Nagar?
- 2. How does ongoing urban transformation impact the vulnerability of the informal community under scrutiny?

This research was carried out using a mix of methods, including document review, interviews, participatory risk mapping, and expert interviews. Seventy-two families were interviewed in a structured manner, participant observations were recorded, and on-site observations were documented. Respondent-driven sampling was used to encourage the number of respondents who participated, the results of which were documented in the form of participatory risk maps. Health issues in women, particularly during extreme weather conditions, were procured from the municipal health centre, and the physician interview provided critical insights into understanding the health conditions of residents. Interviews conducted with various NGOs, such as Ghar Bachao Andolan Samiti ('Save Our Homes') and Apnalaya, which have been working with local communities on legal and health issues, revealed three risk indicators: environmental (sanitation and toxicity); man-made hazards (fires); and social (livelihood). (The last is not investigated in detail in this study.) Air-quality tests and health and sanitation data were procured from published work.

Health and climate change nexus. The case of Adarsh Nagar, Mumbai

From 1972-73, poorer residents from inner-city areas were relocated to Shivaji Nagar, Baiganwadi, and Lotus Colony. Most people, largely Dalits (formerly known as untouchables) and Muslims, relocated around the Deonar dumping ground following acute droughts in rural Maharashtra and other parts of the country. The Prime Minister's special grant for urban renewal from 1986 to 1993 resulted in the massive eviction of poor people from



Impact of Pollution 8-10 Km radius

High Flood Zone

inner-city areas to Adarsh Nagar. World Bank-funded infrastructure projects initiated the trend of relocating large numbers of slum households in the city to facilitate urban development, which continued from 2003 to 2006. The camp was intended to be transitory, so municipal water connections were not granted. What was not envisaged was the humungous scale of the project: the processing and resettlement of over 20,000 families (one of the largest human displacements in recorded history at the time) outsized the capabilities of the NGO placed in charge of the resettlement process and currently thousands of families are still waiting to be rehoused, with many still living in transit camps (Parasuraman 2016).

The exponential growth of the Adarsh Nagar settlements resulted primarily from the rag-picking livelihood opportunities that the dump yard presents. Over half a million people of the M-East ward, living in the most challenging conditions, contribute immensely to the city's sanitation-worker population and household help by maintaining the antiquated colonial sewage disposal system, cleaning the streets, collecting and sorting garbage, working as maids in well-off households and as security staff or constables, and providing other basic services.

Living conditions by the dump yard

In Adarsh Nagar, Deonar, the inhabitants face multiple health issues related to the poor environmental conditions and lack of basic services. In the Adarsh Nagar settlements, only 2% have access to safe sanitation and Concentration of de dump

Figure 1: Deonar dump yard and surroundings. Source: Municipal Corporation of Greater Mumbai.

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Artificial alterations to the city's geography aggravate this situation: large areas of the land are reclaimed, and are situated barely above sea level, if not below the high-tide level. This inhibits the natural runoff of surface water. The complicated network of drains, rivers, creeks, and ponds drains directly into the sea. meaning that seawater can enter the system during high tides, preventing drainage and, in extreme cases, leading to a saltwater deluge.

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Photos 1: Living conditions by the dump yard. Source: Author.

Photos 2: Sanitation and drinking water. Source: Author.

Photos 3: Narrow alley space between settlements. Source: Author.









hygienic practices, only 5% have access to safe drinking water, and over 80% live below the poverty line (LSS 2007).

The inhabitants, including children, have been engaged in rag-picking for years. The place has also become a hub of several entrepreneurial activities and businesses based on waste collection from the dumping ground. The constant fear of eviction and experiences of the unprofitability of the livelihood of rag-picking haunt the lives of men, women, and children as they sift through the garbage. At times, the *nallahs* (open drains) are perpetually



Garbage dumped here is often mixed waste including paper, plastic containers, bottles, cans, and electronic goods. This becomes a health problem when the plastic mixes with decomposable food waste, construction debris, and even industrial waste. Burning of plastic and rubber is often done, which releases hazardous chemicals. Those closest to the fire, who inhale the smoke, face the greatest health risk from the open burning of garbage at a waste-disposal ground. The pollutants, depending on their concentration, are toxic and can cause irritation and skin and respiratory problems; some are carcinogenic. Individuals with respiratory problems, such as asthma or allergies, may be more sensitive to smoke (D'Amato et al. 2010).

Layout and density of dwellings

At Adarsh Nagar, the place under study, the dwellings reflect the paucity of funds at the inhabitants' disposal. Therefore, it is important to delve into the details of the make-up of the dwelling units to understand the very deplorable state of life of the inhabitants. The makeshift shelters, built on marshy land and garbage heaps, are characterised by tarpaulin sheets, tin shades, crowded and filthy lanes, overflowing drains, and the overpowering stench of the dumping ground (see Photos 1–3). The units are precariously close-knit and extremely tightly spaced, and many dwellings consist of only a single room of around 10 x 12 ft (3.05 x 3.66 metres) made of thin tin sheets with light wood beams supporting the structure. Most are less than one metre apart. Windows are mostly absent, and as the doors are the only means of ventilation, the interiors are very hot. The belongings usually consist of a few ragged beds, a large mat, a kerosene stove, some aluminium utensils, two large jerry cans for water storage, a bucket, an airbag, a suitcase, and a few clothes – casually strewn about the shelter.

The storage drums for water are placed in the alleys, where most of the washing and cleaning activity also takes place. Most of the drains are damaged and often strewn with garbage. This leads to clogged drains and the build-up of contaminated water, leading to unhygienic



conditions. This also forms a breeding ground for mosquitoes, which carry vector-borne diseases (see Photos 3).

Lack of basic services and its relation to health issues

The illegal status of the slums does not merit them to be authorised for individual water connections by the municipal authorities. Nevertheless, recently every lane was provided with only one municipal drinking water supply pipeline. Illegal water connections can be procured at the steep price of Rs. 16,000 each, and are nearly impossible to obtain for those with meagre incomes.

A typical day at these settlements starts at around 4 A.M., when the municipal water becomes available. Everyone is involved in filling their water containers. The drinking water provided is of poor quality, as mentioned by the residents, and is further contaminated by the inappropriate storage methods arising out of the lack of space. Residents commented that the water is visibly turbid at times. The containers are often left open, and children often take a comforting dip to beat the heat.

Kamla Nagar has one public toilet for women and men in the entire locality (see line 5 in Figure 3). There are no provisions for water taps, and hence the users carry a single bucket per person. This quantity hardly suffices for personal hygiene and keeping the toilets clean, and although the municipality cleans the toilets twice a day, the condition is deplorable.

Due to a low ratio of toilets per person (Figure 3), inhabitants resort to open defecation. Hygiene during menstruation is compromised as well. The interviews with local inhabitants and the public health officer establish a high occurrence of chronic skin allergies among the women, Figure 2: Characteristic section of the Deonar dump and neighbouring slums. Source: KRVIA M.Arch Elective work.

Figure 3: Mapping of sanitation services. Source: Author.



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Moreover, the doctor reiterated that skin infections are on the rise: the increasing temperature during summers. which causes an increase in sweating, also aggravates the situation. He treats around 200 women a day for skin-related ailments. Timely medical attention is not provided due to both the absence of an adequate number of health centres and the economic conditions, which do not permit the women to be treated at private clinics.

Table 1: Secondary data of the health issues in women after extreme weather conditions. which arises from these unhygienic conditions; a large percentage of women suffer from genital infections as well. Spillages of raw sewage can be observed; they collect on the streets or flow into the open *nallahs* (drains). There have been instances where the toilet floor has collapsed, and users have fallen into the septic tank below (Bhide et al. 2016).

On the occurrence of heavy rainfall, waterlogging and flooding are experienced in the narrow lanes, which are in a state of disrepair and usually strewn with garbage. It is only natural that the stagnant and unclean water accruing in these places becomes a breeding ground for mosquitoes. An escalation in vector-borne diseases, especially malaria and cholera, can be observed after such rainfall events (health data procured from the public health centre). The quality of drinking water worsens during such events, and the health officer at the public health centre stated that an aggravation of waterborne diseases is also then evident. Some NGOs provide free medication during times of disasters, but that serves only as a temporary relief.

The information from the health centre reveals that the number of women suffering from waterborne diseases escalated from 20 to 65, while the number of women suffering from vector-borne diseases escalated from 28 to 47, during the extreme weather event in discussion (Table 1).

The sanitation requirements of women and girls differ from that of men because the former must be concerned about personal safety, dignity, and menstrual hygiene. Women have the burden of spending long hours standing in a queue and are often compelled to use the early morning hours to ensure their safety and timely reporting to their place of work or labour. Skin allergies are frequent. There have been several instances when women and girls who have had to resort to open defecation have been subject to molestation. Notwithstanding that, women with disabilities, pregnant women, and early mothers are exposed to health problems arising from reduced immunity levels.

A woman who is a rag picker earning 300-400 Rs/day (3.50 USD/day) said, 'There are no toilets in this area, and we have to resort to open defecation, which is unhygienic as well as dangerous. Our homes are made of temporary materials, and in case of demolition, it takes almost ten years to recover from the debt.' Another indicated, 'I need to carry out sonography tests almost every month due to menstrual problems. I can hardly afford it and have learned to live with it. All our belongings were burnt during the fire. We even used drain water to try to dowse it, but it didn't help. Since the girls were at home, all of them were affected with acute respiratory issues months after the fire was put out.' This clearly shows how the women suffer prominently from menstrual and respiratory issues.

Health and environment quality

The physician interviewed attributes the pollution oozing from the dumpsites to the spiralling incidence of respiratory infections. A recent study on Deonar revealed the presence of a high concentration of the air pollutants PM10, NO2, and SO2. Inhabitants exposed to these pollutants are at risk of contracting and suffering from chronic obstructive pulmonary disease (COPD), allergic rhinitis, and lower respiratory diseases like cardiac ailments and other chest illnesses. These pollutants are observed to be at eight times the permissible limits during the morning hours in residential areas close to the Deonar dumping ground (Kumar et al. 2016). On 29 January, two days after thick smog was released by the fire at the dumping ground, the levels of PM10 monitored between 8 AM and 9 AM by the System of Air Quality Weather Forecasting and Research (SAFAR) were observed to be seven times higher than the safety limit of 100ug/m3. Similarly, PM2.5 – pollutants measuring 2.5 microns or less - between 8 AM and 9 AM were more than nine times the acceptable standards; consisting of soot, organic matter, and chemicals, PM2.5 can stick to the sides of the windpipe or travel deeper into the lungs.

The concentration of the air pollutants is highest in winter and lowest during monsoons (Kumar et al. 2016). According to the physician interviewed, though the cases of respiratory ailments may drop during the monsoon, the cases of inhabitants suffering from waterborne ailments increase. The nature of the disease may vary at different times in the year, but people in this area are perpetually exposed to health risks. Moreover, as most women tend to be at home tending the children, this exposes them to the toxic gases in the environment for a more extended period.

The highly combustible methane generated by the decomposition of garbage is the leading cause of fires. The high summer temperatures increase the frequency of fires due to this combustibility. The urban heat island effect aggravates the release of methane and other toxic gases into the atmosphere, which in turn increases the number of respiratory ailments (D'Amato et al. 2010).

The doctor at the public health centre explained the depleted conditions of living in the Adarsh Nagar, Deonar slums. His observations and practice reveal that though there is an increase in respiratory issues at the time of fires, not all affected visit the medical centres and, instead, tend to remain untreated. He also stated that those already suffering from diseases like asthma and tuberculosis face an aggravation in health problems during the summer and after fires. Existing health problems make people more vulnerable to climate-related impacts.³

Our study of accessibility in and around the sampled houses revealed the threat level of both possible waterlogging and fire. These hazard levels were mapped through the visual inspection of the lane width and the lane's proximity to the dump yard, as the fires originate in

	Respiratory diseases	Skin allergies	Waterborne	Vector-borne
Normal	35%	100%	25%	35%
Extreme weather	55%	100%	50%	55%



KAMALA NAGAR, DEONAR - FIRE HAZARD MAPPING

the dump yard owing to the toxic gases generated by the waste (Figure 4). The inspection revealed that the only escape routes available can pose a challenge for evacuation should a fire occur. There is also the insecurity of the loss of house and belongings, which prevents the residents from leaving the place until the situation becomes dire and they are forced to leave. This leads to life-threatening situations during fires and extreme rainfall events. Notably, a large part of the population at home consists of women and children, and so once again they are the ones who are most affected.

We see that the inhabitants are exposed to multiple risks. Firstly, the hazardous levels take on alarming proportions during the breakout of major fires. Immediate escape is virtually impossible, and the implications on health are huge. Raging fires lead to difficulty in breathing and the aggravation of respiratory ailments like bronchitis, asthma, and tuberculosis. Secondly, being in a flood-prone area subjects the inhabitants to frequent waterlogging and flood conditions. Inhabitants allude to a sharp escalation in waterborne diseases in such settlement areas, creating an unbearable foul odour in the area and an upsurge in unhygienic conditions.

Figure 5 shows the interplay between the fire risk and resultant respiratory ailments arising from a fire. During a fire, the area is filled with toxic smoke from the dump yard. Smoke engulfs the densely packed houses almost immediately, not allowing for a quick escape. This results in the inhabitants being affected by the toxic fumes, and hence the aggravation of respiratory ailments.

Risk reduction or adaptive practices

It was observed that no attempt has been made toward reducing risks. The priority of the inhabitants begins with protecting belongings and home first, and it is only when the circumstances are unbearable that they contemplate their personal safety. The drinking water is now in covered containers. Of the 72 households that were interviewed, only one family had raised the plinth of their house to keep the floodwaters away. This arose from the need to protect their belongings more than from addressing the health issue.

One of the respondents said, 'When the last major fire broke in 2001, it burnt all our belongings. We tried to stop the fire by every means we could. We even threw drain water to stop the fire, but it didn't. So, we all ran with the children and let our belongings burn. It caused massive coughing due to the smoke emitted. The smoke remained there for a week, and the smell reached distant places.'

There are daily visits made to the public health centre for free medication, which can be termed an adaptive shortterm practice. The root cause of the risks lies in the proximity to the dump yard and the toxicity that comes with it. It is, therefore, imperative that appropriate adaptive strategies be developed with the assistance of urban planning measures.

Indeed, due to the lack of awareness and the poor economic status of the inhabitants, no formal risk-reduction or adaptive practices are being followed.⁴ An important factor here is that insecure tenure harbours the 100M

Figure 4: Fire hazard mapping. Source: Author.

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The people co-exist with the hazards: fires, caused by the high temperatures and methane, burn persistently in the dump yard. The respondents mentioned that they first prod at the garbage in the dump with sticks to explore if there is a fire and then proceed to pick garbage and segregate the refuse.

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Figure 5: Flood Mapping. Source: Author

5

For more details on tools for building urban resilience, including slum/urban upgrading, see: The World Bank (2012) Building Urban Resilience: Principles, Tools, and Practice.

Figure 6: Diagram representing the problem (centre) and four types of integrated responses. Source: Author.

fear of eviction, which hampers the residents from investing in more-permanent and safer building materials, thus aggravating the exposure to fire risks. Building resilience to upcoming disasters presents financial challenges for the inhabitants. The step taken to risk reduction where fires are concerned is taken by the government, and construction waste is dumped in the yard to contain the fires

Figure 7 summarises the health and climate change nexus, while Figure 6 presents the planning framework that attempts to bridge the gap between urban planning, housing, and risk reduction and provide a holistic approach to risk-based planning in the affected area of study.

The relationship or nexus between the site/slum conditions and the extreme rainfall and environmental hazards leads to highly vulnerable conditions and poor health conditions.

The planning framework found in Figure 8 above was developed based on the relationship understood between the site/slum conditions, the extreme rainfall hazards, and the environmental hazards). It works around the crucial aspect that this paper discusses, namely the increased vulnerable conditions of the inhabitants arising from various aspects, and recommends four methods that should be undertaken:

- 1. Tackling tenure issues related to informal settlements/slums since these slums are not considered as notified slums and do not merit authorised water connections, etc.
- 2. Incorporating risk-based land use planning for addressing risks.
- 3. Risk reduction by design.
- 4. Overall slum upgradation. 5

Conclusions

(Climate change **Risk Reduction**

and Health)

This paper examines the interlinkages between climaterelated hazards and the health issues of the vulnerable population at the Adarsh Nagar (Deonar) settlements. We see indirectly that the population's vulnerability can be attributed to the lack of essential services, the

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POOR HEALTH/INCREASED

VULNERABITY/HIGH MORTALITY RATE

Responsible Land Governance

(Safeguarding Ternure/Environmenr Policy/ Formalization of Waste-picking profession)

Participatory Land Use Planning and Control (Risk based / People centred, bottom-up approach)

(Participatory In-situ

solutions)

Slum Upgradation



deficient institutional support, and the social and health inequities, all of which aggravate the level of vulnerability. Indeed, we observe a cascading of risks arising from rapid urbanisation, climate change, and social exclusion.

This study provides crucial and critical insight into the various risks during different weather conditions and examines how extreme weather events result in near epidemic circumstances. Heavy rainfall results in entire households being infected with waterborne or vector-borne diseases. Entire populations in the slums have been affected by chronic respiratory ailments, evidently reducing life spans and increasing mortality rates.

Importantly, our study shows (and affirms) that women (and children) are at a higher risk than male populations, and are most susceptible to health issues arising from the prevailing living conditions. The lack of adequate toilets, water supply, and access to safe drinking water is the primary cause of health issues in women, which are aggravated during extreme climate events.

It is essential to observe that all residents grapple with developing risk-reduction or adaptive strategies. Tenure insecurity coupled with the lack of financial resources play an essential role in the non-prioritisation of investments that would increase resilience. During extreme rainfall events, safeguarding the dwelling is prioritised because rebuilding involves a five-year economic setback. At the same time, an attitude of destiny prevails; e.g., a few houses have been rebuilt with raised plinths to keep the rainwater from entering the house. The primary aim of the inhabitants during disasters is to protect lives and belongings. Moreover, the consideration of health impacts post-disaster is not dealt with at all.

Cities and regions are home to disparate spatial and economic conditions. Consequently, the distribution of employment opportunities, infrastructure, adequate housing, and other daily needs determine the degree to which the communities are resilient to climate change impacts. On the other hand, due attention needs to be paid to individual and community-level vulnerabilities to prepare them for extreme events and provide for a justice orientation that recognises both the procedural and distributive implications of resilience (Ziervogel et al. 2017).

Keeping environmental justice in mind, it is essential to prioritise the risks that need to be mitigated and to be wary of the undesirable outcomes. Resilience in the informal settlements must be re-imagined with a focus on rights and justice. The possibilities for rights- and justice-based resilience approaches need to be delved into. As explored in the paper, Adarsh Nagar clearly exhibits the interlinkages between climate-related hazards and the health issues of the vulnerable population at the Adarsh Nagar (Deonar) settlements.

As a consequence, we need planning approaches that are risk-based and that bridge the gap between spatial planning, housing and risk reduction, and provide a holistic approach to the affected area of study. Figure 7: Multiple risks. Source: Author.

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Figure 8: Diagram representing the slum conditions, health issues, and climate change impact nexus. Source: Author.

The relationship or nexus between the site/slum conditions and the extreme rainfall and environmental hazards leads to highly vulnerable conditions and poor health conditions.



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The Liveable Life Index A Guideline on How to Realise Urban Slum Upgrading Based on Local Preferences. Bhubaneswar (India) as an Example

Berrit Neele Eicker, Jörg Rainer Noennig, and J. Alexander Schmidt

Slum upgrading is a complex process requiring multidisciplinary integration of different stakeholder groups. With a strong focus on the Sustainable Development Goals, an examination of the slum-upgrading/liveable life nexus suggests that urban areas have to focus on customised upgrading at local level to build environments that reflect locally rooted liveable life perceptions. This paper hypothesises that a community's perceptions of a liveable life are the most influential indicators, yet they perform weakest in current slum-upgrading strategies. In order to address upgrading challenges, a Liveable Life Index (LLI) is introduced that aims to support in identifying and classifying relevant, locally rooted liveable life components that can be translated into upgrading priorities and strategies at policy level. The established framework and conducted review of the LLI was done in the form of primary research (expert interviews and focus group discussions) in Bhubaneswar, the capital of the Indian state Odisha and centre of pilot upgrading projects under the Odisha Liveable Habitat Mission (OLHM). Key findings of the research are that upgrading components considered under the OLHM rarely reflect the full set of realistic local demands. Whereby the OLHM relies on a standardised set of physical upgrading components (sanitation, street paving, etc.), this research sheds light on the importance of location-dependent non-physical upgrading components (socialising, belonging, etc.). In general, the history of slum upgrading confirms that top-down approaches (based on authoritative assumptions) tend to dominate over bottom-up approaches (based on dwellers' viewpoints). The results show that the intention to create liveable neighbourhoods using the LLI approach can be successful when local participation displays a key determinant in planning approaches. The research findings provide relevant information about participation and its influences on citizen communication and engagement with the goal to improve slum-upgrading processes. Against this background, this paper examines how locally rooted liveable life indicators support sustainable upgrading approaches at policy level.

Ein Index für lebenswertes Leben. Ein Leitfaden für die Aufwertung von städtischen Slums auf der Grundlage lokaler Präferenzen. Bhubaneswar (Indien) als Beispiel

Die Aufwertung von Slums ist ein komplexer Prozess der die multidisziplinäre Einbeziehung verschiedener Interessengruppen erfordert. Mit einem starken Fokus auf die Ziele für nachhaltige Entwicklung legt eine Untersuchung des Zusammenhangs zwischen Slumaufwertung und lebenswertem Leben nahe, dass sich städtische Gebiete auf eine maßgeschneiderte Aufwertung auf lokaler Ebene konzentrieren müssen, um ein Umfeld zu schaffen, das die lokal verwurzelten Vorstellungen von einem lebenswerten Leben widerspiegelt. In diesem Paper wird die Hypothese aufgestellt, dass die Vorstellungen einer Gemeinschaft von einem lebenswerten Leben, als Indikatoren bei derzeitigen Strategien zur Aufwertung von Slums am wenisten zum Tragen kommen. zur Aufwertung von Slums am wenigsten zum Tragen kommen. Daher wird ein Index für lebenswertes Leben (LLI) vorgestellt, der bei der Identifizierung und Klassifizierung relevanter, lokal verwurzelter Komponenten des lebenswerten Lebens helfen soll die in Aufwertungsprioritäten und -strategien auf politischer Ebene umzusetzen. Die Erstellung des Rahmens und die Überprüfung des LLI erfolgten in Form von Primärerhebungen (Experteninterviews und Fokusgruppen) in Bhubaneswar, der Hauptstadt des indischen Bundesstaates Odisha und Zentrum von Pilotprojekten zur Slum-Aufwertung im Rahmen der Odisha Liveable Habitat Mission (OLHM). Die wichtigsten Ergebnisse der Untersuchung sind, dass die im Rahmen der OLHM in Betracht gezogenen Aufwertungskomponenten nur selten den gesamten lokalen Bedarf widerspiegeln. Während sich die OLHM auf eine standardisierte Reihe von physischen Aufwertungskomponenten stützt (sanitäre Anlagen, Straßenbelag usw.), beleuchtet diese Untersuchung auch die Bedeutung der ortsabhängigen nicht-physischen Aufwertungskomponenten (Sozialisierung, Zugehörigkeit usw.). Generell bestätigt die Geschichte der Slumaufwertung, dass Top-Down-Ansätze (die auf authoritativen Annahmen beruhen) tendenziell gegenüber bottom-up Ansätzen (die auf der Sichtweise der Bewohner basieren) dominieren. Die Ergebnisse zeigen, dass mit Hilfe des LLI-Ansatzes lebenswerte Viertel erfolgreich entstehen können wenn die lokale Beteiligung eine Schlüsseldeterminante in den Planungsansätzen darstellt. Die Forschungsergebnisse liefern relevante Informationen über Partizipation und ihren Einfluss auf die Kommunikation und das Engagement der Bürger mit dem Ziel, Slum-Sanierungsprozesse zu verbessern. Vor diesem Hintergrund wird in diesem hier untersucht untersucht, wie lokal verankerte Indikatoren für lebenswertes Leben nachhaltige Aufwertungsansätze auf politischer Ebene unterstützen.

1. Introduction

Poverty is a phenomenon that is increasingly attributed to urban agglomerations in the Global South. Low incomes, poor infrastructure, and social exclusion are key factors that contribute to a poor quality of life. Long since, the need for higher living standards for citizens in informal environments has been recognised. The focus on creating worldwide sustainable livelihoods peaked in 2015, with the formulation of the Sustainable Development Goals (SDGs), followed by the New Urban Agenda (NUA) in 2016. Liveable urban environments became a priority focus, and the concept of liveability evoked a new sense for sustainable improvements of human life. Still, liveability remains a complex concept that includes a variety of elements. It can be operationalised through a set of sub-dimensions that encompass objective indicators as well as subjective indicators, the latter being based on the specific perceptions of the local people (Okulicz-Kozaryn 2013). Problematic is, however, that in most cases liveability indicators are measured and quantified for entire urban regions but not for individual neighbourhoods: 'You can live in a city that ranks high in terms of quality of living and still suffer from a low quality of life because of unfortunate personal circumstances [...]" (Katil 2020). In existing studies, such disparities in the perceptions of a liveable life mostly refer to differences between types of formal neighbourhoods. But in countries of the Global South, such as India, a large proportion of the population lives in informal neighbourhoods.

With a lack of studies about liveable life perceptions in informal settlements, it is often assumed that upgrading actions (such as improved construction, social service provision, or access to water) automatically lead to improved local living conditions (Higgs, et al. 2019). This perspective has been analysed in the frame of two interview types conducted in Bhubaneswar: Slum-upgrading expert interviews aimed to identify expert assumptions about a liveable life in slums, and focus group discussions aimed to identify realistic perceptions about a liveable life in slums. Comparing expert interviews with focus group discussions sheds light on the value of a structured approach that considers the holistic integration of locally rooted liveable life indicators in the upgrading design. As a major outcome, non-physical upgrading elements (socialising, belonging, acceptance, etc.) far outreached the importance of physical upgrading. To identify the optimal balance of both elements in slum upgrading, the LLI, composed of liveable life indicators, aims to identify and rate indicators based on their importance, thus providing a guideline for the implementation of locally prioritised measures. Decisive in this approach is the participative nature of the LLI, which views local dwellers as the key and only authors of locally rooted indicators of a liveable life in order to provide valuable information for upgrading opportunities.

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The added value of this work is based on the focus of participative slum-upgrading strategies viewing liveable life indicators as a guideline and considering slum dwellers as inevitable key stakeholders in upgrading. Therewith, it is not solely about the improvement of informal neighbourhoods, but about the emancipation of residents and their independence. Every project starts with a problem. In this case, the problem is informal settlements, as they quite often reflect fragile and poor living space. Thus, slums have to be upgraded, based on incremental participatory work steps to ensure sustainability in approaches, such as described within the LLI. Participatory neighbourhood designs, and the active integration of expert knowledge in upgrading approaches to reach sustainable solutions, are deeply intertwined in such a way that a lean and efficient structure has to be created, where development activities target neighbourhood realities. As highlighted, the majority of approaches calculate liveability on the basis of fixed quantitative indicators, and rarely differentiate between social classes or focus on individual perceptions (Kovacs-Györi, et al. 2019). The Liveable Life Index approach, however, reaches further as it addresses liveable life perceptions at specific community levels (Alderton, et al. 2019).

2. The Present Research Gap of Upgrading in the Global South

With global poverty moving to cities, the developing world has to be prepared for sustainable integration. Inclusive

strategies and practices that prioritise local concerns, local environments, and environmental values are rare. Low incomes, poor infrastructure and rising exclusion are just minor stimulators that contribute to a poor quality of life. Nations, governments and local administrations have long since recognised the need for higher living standards for each and every citizen. In 2003, the UN already stated in its report The Challenge of the Slums: Global Report on Human Settlements that slums and urban poverty are not only a consequence of urbanisation and the corresponding rapid demographic change, but the 'result of a failure of housing policies, laws and delivery systems, as well as of national and urban policies' (United Nations 2020). Twelve years later, in 2015, the focus on creating worldwide sustainable livelihoods peaked with the international acceptance of the Sustainable Development Goals (SDG – 2030 Agenda for Sustainable Development), followed by the New Urban Agenda (NUA) in 2016. The centrepiece of the agenda displays 17 SGDs (Sustainable Development Goals 2020). The need for a stronger focus on and understanding of liveability in socially deprived communities evolves from SDG Goal 11. Goal 11 depicts the target of making cities and human settlements inclusive, safe, resilient, and sustainable. The New Urban Agenda, seen as the delivery vehicle for the SDGs, goes one step further and even mentions 'enhancing liveability [...] for all' (United Nations 2017) as an interlinked principle of SDG Goal 11.

The Invisibility of Problems

Even though international recognition about enhanced liveability exists, one of the biggest problems related to slum-upgrading programmes is that the concerns, demands and daily struggles dwellers face are often invisible due to a lack of participation in the development measures (Heller 2016). Upgrading is often based on top-down approaches, disregarding the potential of participative (bottom-up) methods (Singh 2016). Participation is required to identify local weaknesses and assure sustainability of approaches (Kuddus, et al. 2020). Further, bottom-up approaches ensure local community engagement and the development of networks among different stakeholders. The broader the network, the more sophisticated solutions can be developed and expert knowledge combined. The importance of sustainable actions is that upgraded areas do not easily revert back to old patterns. Without participation, it is difficult to ensure sustainability in measures, establish an environment with higher living standards, and ensure a locally recognised liveable life. There is a need for policy interventions targeted at local inclusion, if urbanisation is to provide a pathway to a liveable life in urban slums.

Many of the challenges described above are not new, but they are taking on new dimensions and urgency due to increased urbanisation in combination with inequalities and vulnerabilities. Additionally, they are confronted with the global environmental crises of the COVID-19 pandemic, biodiversity loss, and climate change. In urban slum-upgrading projects, participatory data collection and community involvement are considered vital (Aditya, et al. 2020). It is time for an integrated approach that considers the inclusion of local individuals to develop upgrading measures tailored to local needs (Magalhães 2016, Wagner 2018, Wagner et al. 2019, Patki et al. 2020). The focus on a locally rooted and socially connected upgrading approach would enable dwellers to attract attention to what is needed and support institutions to realise project work accordingly.

3. Background – Odisha's Liveable Habitat Mission

At local government level in the city of Bhubaneswar (capital of the Indian state Odisha), the Odisha Liveable Habitat Mission (OLHM), the leading political mission, aims to contribute towards improved living conditions in slums. The mission consists of two components: the Odisha Land Rights to Slum Dwellers Act and the Jaga Mission. In 2017, the government of Odisha enacted the landmark legislation, the Odisha Land Rights to Slum Dwellers Act, 2017 (Social Services India 2018). The "act [provides the assignment] of land rights to identified slum dwellers, for redevelopment, rehabilitation and upgradation of slums, and for matters connected therewith or incidental thereto" (Odisha Gazette 2017) in 114 notified area councils and municipalities. In the course of the act, the use of high-resolution drone imagery enabled the mapping of slums. Odisha thus became the only state in India with a spatial database of every slum in every city and town (Tata Trusts 2019). The database facilitated the identification of dwellers eligible for the Land Rights Act. By the end of 2019, 60,000 slum dwellers in Odisha had already received land titles (Chakrabarty 2020). Subsequent to the granting of land rights, the Jaga Mission was implemented. The second component aims at transforming informal settlements into liveable habitats by improving the standard of infrastructure and access to livelihood-opportunity services at par with the better-off areas within the same urban local body (Paty 2019). The upgrading focuses on six general habitat services: road access, sewage, individual household latrines, piped water supply, in-house electricity, and streetlighting. Local agreements to planned approaches are considered a prerequisite for upgradation, as well as local resident participation.

4. Primary Research: Expert Interviews and Focus Group Discussions

Based on field research carried out within the presented study, infrastructural upgrading is being well addressed, but the mental, social, and psychological dimensions are being rather disregarded. While new physical 'hardware' is provided, the social 'software' in slums appears to be widely disregarded in the enacted upgrading measures. To investigate these aspects, expert interviews and focus group discussions were carried out.

The scope and area of investigation were limited to two research phases in India. In the first research phase, expert interviews with slum-upgrading experts (n=8) and focus group discussions in slums (n=6, with each 15-20 participants) were conducted. Experts were selected from different local areas in India and professional backgrounds in order to draw a comprehensive picture of India's slum evolution, local upgrading practices, and the comprehension of a liveable life in the slum residents' living environment. Focus group discussions were only conducted in Bhubaneswar, focusing the research on a defined geographic area for the purpose of better comparability. The discussions aimed to identify the status quo in slums, liveable life indicators, relationships beyond slum boundaries (such as formal neighbours or stakeholders in general related to upgrading), and a subjective evaluation on current upgrading measures implemented.

In the second research phase, findings of the first research phase were deepened and consolidated with the support of expert interviews (n=10). Expert interviews in the second research phase were modified and carried out with individuals only of relevance to the Odisha Liveable Habitat Mission. The mission's pilot projects took place in 2019, and general implementations in 2020. The focus within expert interviews was on the analysis of already identified liveable life indicators (first research phase) in the mission, the application areas of participative strategies, as well as the identification of and collaboration among various stakeholders. Focus group discussions were not conducted in the second research phase, as the focus of attention was only on slums without any upgrading measures so far. In the second research phase, the local upgrading mission was already much advanced. Focussing only on undeveloped slums ensures a comprehensive understanding of basic needs that have the potential to form liveable life indicators. It is considered that with an increase in upgrading, basic needs become a matter of course and are not worth mentioning for residents. To develop a method that provides guidance for sustainable slum upgrading, it is important to identify and analyse exactly those liveable life indicators that are considered deep-rooted needs at local level and form the starting point for sustainable upgrading. Therefore, findings made in the first research phase within focus group discussions are further investigated to link with findings of expert interviews in the second research phase.

Research results enabled a holistic understanding of local approaches, as well as the need for the identification of a broader concept that considers liveable life perspectives within upgrading. In order to support the identification of liveable life indicators in slums and give guidance for sustainable slum upgrading, the next section discusses the development of a Liveable Life Index (LLI). The LLI serves as a basis for analysing slum upgrading from an individual perspective, and for implementing a participatory approach that provides guidance on upgrading components and contributes to a sustained increase in the quality of life.

5. A Method for Establishing a Liveable Life Index

Based on the first research phase conducted, a Liveable Live Index has been developed. As a basic structure, the LLI consists of a fixed and variable component. The fixed component, which displays the basic LLI framework, consists of four main elements: safety, society, infrastructure (physical space) and service (see Table 1, light blue box). The variable component, which displays 10-15 locationspecific sub-elements, forms the liveable life indicators, for example: tenure security, respectful behaviour, distance to education facilities, etc. (see Table, 1 dark blue box). Each main element has different sub-elements. Each sub-element is location-dependent and reflects a liveable life indicator that specifies a component that defines the local residents' perception of a liveable life. Location-dependent implies the local nature of climate, culture, society and geography, among others. Here, a general method for

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developing a LLI is provided, but no generally applicable instructions for concrete slum upgrading. However, instructions can be derived once a Liveable Life Index is developed at local level for a specifically defined area.

Three Steps for establishing the LLI

From the identification of individual sub-elements to the local Liveable Life Index (LLI), three essential steps are required. It is a simple, flexible and adaptable procedure. To establish an initial understanding of the LLI formation, in the following a brief summary is provided. The next section goes into greater detail on the LLI formation.

- 1. IDENTIFICATION. In a first step, liveable life indicators are identified on a sample basis in the neighbourhoods of a specific area. This implies support from institutions that work on the improvement of the quality of life in order to arrange slum visits with group discussions or household surveys. Locally identified indicators are aggregated and reduced to 25-30 indicators, based on frequency and local relevance.
- 2. VALIDATION. In a second step, the remaining liveable life indicators are - on a sample basis - verified or modified in the same urban area, but in other neighbourhoods, with regard to their weighting and priority. This test run is crucial: it ensures that only generally accepted and relevant indicators become part of the locally rooted index.
- 3. IMPLEMENTATION. In a third step, the LLI is set up based on the results of the previous two steps. The most eminent 10-15 liveable life indicators are related to the four main elements and ranked on their importance within each category. Indicator ranking is based on indicator frequency and determined importance of the team conducting research within the neighbourhoods. At policy level, the LLI can be used to deduce guidelines for upgrading orientation. Neighbourhoodspecific individual factors can be added or subtracted to ensure better adaptation. Thus, irrelevant measures

can be prevented and specific themes can be focused on in respect to the very neighbourhood at stake.

The here-developed LLI of Bhubaneswar can be used as guiding principle and example to provide a rough overview and prototype for local application. It is a particularly good starting point, because indicators were identified in neighbourhoods where rarely functioning infrastructure was present and thus essential needs could be identified.

The LLI of Slums in Bhubaneswar

The upgrading measures under the Jaga Mission represent a unique attempt towards slum upgrading in Odisha. Still, these measures do not cover all relevant upgrading areas. Primary research results showed that different slum neighbourhoods face similar liveable life perceptions, but also that location-specific priorities exist in regard to liveable life indicators. Slum development on the basis of an LLI implies that areas should be improved also in accordance to the location-specific perception of satisfaction on the side of the dwellers. How exactly an LLI will develop depends on the local situation and the set of priorities. These differences need to be taken into account in order to ensure sustainability for the implemented upgrading measures.

While the OLHM focuses on six general habitat services (road access, sewage, individual household latrines, piped water supply, in-house electricity and streetlighting), the here-presented LLI proposes a more flexible framework. Jaga's reduced scope of action can be traced back to the fact that it is a state programme in which standardised methods and procedures are predominant for the sake of swift implementation. As a result, not all relevant liveable life indicators are taken into account within the Jaga Mission.

The existing upgrading strategy pursues a fixed set of measures, which are mainly directed to the physical environment. As primary research indicated, non-physical aspects dominate over the physical ones. The locally identified liveable life components clearly go beyond the six thematic

Table 1: Liveable Life Index	he Liveable fe Index		Neighbourhood Safety (Crime & Environment)	Variable Component
tion).		Safety	Tenure Security	 Sub-elements
			Employment Security (Working Contract)	• Location-dependent
			Respectful Behaviour & Trust	
		Society	Sense of Belonging & Community Relations	•
			External Beighbourhood Relations	
			Basic Services	
		Infrastructure	Adequate Housing	
		(Physical Space)	Parks & Green Spaces	
			Neighbourhood Cleanliness	
	\rightarrow		Community Centre	
			Proximity to Doctors	
	Fixed Component	Service	Proximity to Schools	
	Main-elements		Proximity to Employment	
	Location-independent		Proximity to Public Transport	

upgrading areas of the Odisha Liveable Habitat Mission. From the focus group discussions, 15 liveable life indicators could be identified and categorised under the four main aspects (Table 1):

- SAFETY Neighbourhood Safety (Crime & Environment), Tenure Security, Employment Security (Working Contract).
- SOCIETY Respectful Behaviour & Trust, Sense of Belonging & Community Relations, External Neighbourhood Relations.
- 3. INFRASTRUCTURE (PHYSICAL SPACE) Basic Services, Adequate Housing, Parks & Green Spaces, Neighbourhood Cleanliness, Community Centre.
- SERVICE Proximity to Public Transport, Proximity to Doctors, Proximity to Schools, Proximity to Employment.

5.1. Safety

This aspect refers to a community's sense of safety from crime, protection against environmental risks, ownership of legal land rights, as well as employment security. Primary and secondary research shows that dwellers put clear emphasis on living in a crime-free neighbourhood as a prerequisite for selecting living sites (Leby, et al. 2010). With regard to tenure security, land rights are of high relevance only in specific cases. In peripheral areas where land is less in demand, dwellers rarely require land rights, as the granting of land rights accompanies the provision of personal data to governmental institutions and some dwellers fear authoritative observation (Quotation of Personal Correspondence, Antarin Chakrabarty 2020). In contrast, slums located in the urban centre prefer the possession of legal land rights, as living spaces close to economic centres are popular and expensive. The high demand for urban land is well-known and, in many cases, private land owners evict slums to build lucrative office or hotel complexes. In this case, tenure security prevents the fear of eviction and allows families to settle down and invest in home construction (Quotation of Personal Correspondence, Antarin Chakrabarty 2020). Next to a safe neighbourhood and tenure security, dwellers highlighted the importance of having access to contractual work in the near environment. Usually, slum dwellers attend several workplaces per day, which are irregularly paid and of insecure duration. In any case, contract work ensures a regular income, defined working hours, and the extension of knowledge and skills based on incremental learning, thus giving dwellers the opportunity to establish structured daily routines (Quotation of Personal Correspondence, Dr. Gaurav Raheja 2019).

5.2. Society

The social aspect refers to a community's sense of behaviour patterns, social integration, and interaction with individuals within their settlement, as well as connection to neighbourhoods in the immediate vicinity. Relationships to communities beyond slum boundaries form a crucial aspect of a liveable life, as they ensure social inclusion and a stronger feeling of belonging. Further, mutual tolerance, respectful interaction, and the acceptance of social responsibility are another part of slum dwellers' personal perception of a liveable life. Many dwellers are familiar with oppression, personal rejection and discrimination, also from the side of public institutions, and therefore regard respectful behaviour as a high social value. At Nala Muha Sahi Basti, the slum leader stated: 'We cannot offer you drinks, food, or a comfortable chair, but we will always welcome you with and show respect' (Quotation of Personal Correspondence, Slum Leader of Nala Muha Sahi 2019).

5.3. Infrastructure (Physical Space)

This element refers to the physical and socio-spatial infrastructures of a community's direct environment and identifies fundamental amenities and conditions that are indispensable for a liveable life from a slum-dweller perspective. Based on local research, the fundamental amenities and conditions include basic utilities, adequate housing, green and open spaces, clean neighbourhoods and community areas with a high quality of stay. Most identified physical elements are in par with the Jaga Mission's upgrading agenda and are aimed to be improved in each slum in Bhubaneswar (e.g., sanitation and drinking water, which fall under the category 'basic services'). Green open spaces are another fundamental amenity, as they catalyse community life and enable citizens to exercise, meet friends, and participate in outdoor activities. Besides, green spaces have a cooling effect and can reduce the temperature in urban heat islands, which is particularly important during hot summer seasons. A close analysis of the identified physical indicators shows that when it comes to categorising a certain area as a slum area, the indicators relate to the UN-Habitat definition of a slum, where the absence of one or more of these indicators defines a slum (UN-Habitat 2018).

5.4. Service

The service aspect refers to a community's proximity to vital services such as public transport, health care, education, or job opportunities. This dimension builds on the infrastructural dimension and illustrates how the physical environment meets local requirements from a service perspective. This aspect is a crucial determinant for the development of individual life, as opposed to the physical improvements, which rather focus on the external environment. In particular, the proximity to and affordability of healthcare services are high in demand, as insufficient waste management, lack of sanitation facilities, and broken drainage systems often impair the local hygiene and accelerate poor health conditions. In addition, the maintenance of physical and mental health is a requisite to attend school, receive formal education, and get access to further job opportunities and higher income. Access to any of the services mentioned ensures a balance between individual well-being, future interests, and all other achievements that contribute to a liveable everyday life from a personal point of view.

6. Discussion

This paper compiles a highly discussed and oftentimes controversial topic that urban areas of the developing world face today: sustainable slum upgrading. Research indicates that slum dwellers highly demand participation and inclusion in upgrading projects; they commonly bear a high interest in participative strategies, are willing to contribute



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Comparing the existing top-down upgrading strategies and thematic focus areas with the vital necessities that are expected from slum dwellers, significant discrepancies become apparent. Although the upgrading work under the OLHM – which follows a strict guideline – enables a rapid implementation of approaches in Bhubaneswar, its focus appears to be limited to a set of pre-defined physical upgrading measures. These cover some but not all aspects identified by the research as being decisive for a liveable life in slums. In the short run, the current upgrading measures might have positive effects, but in the long run the neglect of essential local needs will jeopardise the sustainability of these upgrading approaches. Settlements may easily revert back to old patterns of informality. Hence, it is important to employ upgrading strategies that integrate those liveable life indicators that residents themselves consider most effective for the improvement of their quality of life.

7. Conclusion

Liveability is indeed used in a myriad of ways and as an umbrella of indicators. In many cases, however, the indicators are chosen first and then gathered under the liveability 'umbrella' rather than following a distinct, location-specific conceptual framework. The analysis of local slum communities' perceptions of a liveable life and their interest in participation has indicated development demands that do not correspond with the Odisha Liveable Habitat Mission. Here, the present research aims to supply new knowledge. The suggested LLI methodology supports slum development in terms of identifying locally rooted perceptions of a liveable life and giving guidance for the coordination of key stakeholders to derive specific upgrading recommendations in accordance to local needs.

There is certainly no blueprint for optimal upgrading. Many slum-upgrading actions and surveys have been conducted, considerable resources have been invested, and a range of participation concepts have been tested – many of which failed because the assumed best practices and perceptions did not correspond with the real demands on the ground. To resolve the discrepancy of assumed and actual perceptions, attention has to focus on the interlinked potentials of top-down and bottom-up conceptions. Approaches and strategies need to be tailored to local conditions; they require iterative cycles of learning and feedback. It is well-known that slum upgrading needs long time spans until solutions are locally embedded. Rather than rushing towards swift results, an incremental process that acknowledges local pace and perceptions should be preferred in order to ensure sustainability of measures. The LLI provides a holistic basis for defining slum-upgrading actions from a locally shaped viewpoint. Important is the collateral community process, which consists of small

interdependent steps and entices interactions that define optimal solutions. The engagement, which follows when citizens are brought into the planning process from the beginning, facilitates constructive contributions, embossed by respect and positivity towards planning authorities and plans. The highly flexible nature of the LLI approach to individual requirements and available resources also contributes to a location-independent applicability. Key is to consider individual liveable life perspectives and enable participative community approaches that contribute to the sustained improvement in the quality of life in informal urban neighbourhoods.

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House Conditions and Public Health Case Study of Namutequeliua, an Informal Neighbourhood in the Municipality of Nampula, Mozambique

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Nampula, like other Mozambican cities, has a belt of informal settlements around the colonial core. Topographically, the city presents itself on a ridge with several water courses that run in different directions. We find high urban density, construction in risk areas, a lack of basic infrastructure, an absence of recreational spaces, and high crime rates. Many neighbourhoods feature precarious service and infrastructure conditions and low-quality housing material. The sanitation system is precarious. Residents often resort to the water courses and drainage ditches for waste and sewerage disposal. All these factors result in increased health risks.

In this setting, our research aimed to verify the influence of housing conditions and social coexistence on health of the informal area's inhabitants. To gather data, we used a combination of literature review, survey and observation. Some of the findings are that 40.2% of the houses have substandard materials, and 54.4% households use basic latrines. More than half of the households dump their garbage in open spaces, 64.6% do not treat water for drinking and food preparation, and about 17.1% acquire water from unprotected wells. There are statistically significant links between the sanitary conditions and the prevalence of infectious diseases (P=0.000). Diseases related to housing conditions, environmental sanitation, hygiene and water quality, such as malaria, diarrhoea and cholera are common, with a tendency to increase in recent years. Particularly children are exposed and face increased risks.

Wohnqualität und öffentliche Gesundheit in Namutequeliua, einem informellen Viertel in Nampula, Mosambik

Nampula, wie auch andere mosambikanische Städte, ist von einen Gürtel aus informellen Siedlungen außerhalb des kolonialen Kerns umgeben. Topografisch präsentiert sich die Stadt auf einem Bergrücken mit mehreren Wasserläufen, die in verschiedene Richtungen fließen. Die Situation ist geprägt von einer hohen Bevölkerungsdichte, Wohn hohe Bevölkerungsdichte, Wohnbebauung in gefährdeten Gebieten, einen Mangel an grundlegender Infrastruktur, das Fehlen von Erholungsräumen und hohe Kriminalitätsraten. Eine prekäre Versorgs und schlechte Infrastrukturbedingungen sowie minderwertiges Baumaterial prägen viele der Siedlungsstrukturen. Die BewohnerInnen greifen oft auf bestehende Wasserläufe und Entwässerungsgräben zurück, um Abfälle und Abwasser zu entsorgen. All diese Faktoren führen zu erhöhten Gesundheitsrisiken. In diesem Kontext zielte unsere Forschung darauf ab, den Einfluss der Wohnbedingungen und des sozialen Zusammenlebens auf die Gesundheit der BewohnerInnen eines ausgewählten informellen Gebiets zu untersuchen. Um Daten zu sammeln verwendeten wir eine Kombination aus Literaturrecherche, Umfragen und Beobachtungen. Einige der Ergebnisse sind, dass 40,2% der Häuser aus minderwertigen Materialien errichtet wurden und 54,4% der Haushalte einfache Latrinen nutzen. Mehr als die Hälfte der Haushalte entsorgt ihren Müll im Freien, 64,6% behandeln Wasser für Trinken und Zubereitung von Lebensmitteln nicht, und etwa 17,1% beziehen Wasser aus ungeschützten Brunnen. Es gibt statistisch signifikante Zusammenhänge zwischen den sanitären Bedingungen und der Häufigkeit von Infektionskrankheiten. Krankheiten wie Malaria, Durchfall und Cholera sind im Zusammenhang mit Wohnbedingungen, mangelnder Hygiene und Wasserqualität verbreitet und nehmen in den letzten Jahren zu. Insbesondere Kinder sind gefährdet und erhöhten Risiken ausgesetzt.

Introduction

Informal settlements are broadly defined as the incremental, unauthorised and self-organised production of urban neighbourhoods (Dovey et al. 2020). They appear both in the centre of cities and on their outskirts; they result both from traditional forms of occupation and from illegal squatting, or 'pirate urbanism'. Indeed, these settlements have become the dominant mode of absorbing rural-urban migration in developing cities, providing access to housing for over a billion people and establishing the primary infrastructure of neighbourhoods (Dovey et al. 2020). According to UN-HABITAT (2016), informal human settlements feature one or more of the following deprivations: (1) inadequate access to safe drinking water, (2) inadequate access to sanitation and other basic infrastructure, (3) low-quality housing structures, (4) overcrowding, and (5) unsafe residential situation.

In many cases we see a scenario that links poverty, which incorporates disadvantages over time, to increased risk of

diseases, injuries and premature death, and that is common in low-income countries like Mozambique. Generally, Mozambican cities are characterised by low-quality public infrastructure, leading many people to live in risk-prone areas. At the same time, governments have limited capacity to implement development programmes and apply spatial plans and regulations (HIS 2016).

The objective of our research was to verify some links between housing conditions (and social coexistence) on public health. Our case study was conducted in the west zone of the Namutequeliua neighbourhood, in the Municipality of Nampula in northern Mozambique.

Methods

To address our objective, we collected data through a combination of document review, observation (with documentation of physical conditions) and a survey. Firstly, we carried out a literature review on informal settlements,

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1

To verify the distribution and association between the variables of housing conditions and public health, the data was analysed using SPSS, using the chi-square test with a significance level of 5% of probability.

2

On the other hand, the existing literature on these urban agglomerations generally focuses on large cities in developing countries (Sverdlik 2011) such as Johannesburg in South Africa, Kinshasa in the DRC, Nairobi in Kenya, and Maputo in Mozambique, giving less importance to urban centres like Nampula, in northern Mozambique, although such centres are home to a significant proportion of urban dwellers.

3

Sanitation has a cross-cutting dimension based on its association with infrastructure, development and well-being, regarding its articulation with housing, the environment and, ultimately, its effects on health (Tavares & França 2020).

4

Previous research has concluded that, in these settings, the leading causes of child death are preventable and/ or treatable diseases, which include pneumonia, diarrhoea, malaria, and HIV/AIDS, at a rate of 18%, 15%, 8%, and 2% respectively. A study in informal settlements in Vellore, India, which included a 12-month follow-up on 400 children, showed that more than 99% of them suffered from respiratory and gastrointestinal diseases. In addition to the conditions of the housing structure, the diseases suffered by children under five are mediated by the nutritional status, quality of water and sanitation factors that increase their vulnerability to diseases such as diarrhoea, estimated at 80% of this age group. As evidence shows, there are high rates of food deficiency in informal settlements (Sverdlik 2011).

5

The phenomenon of inequalities and inequities in access to health services and care for most residents in informal settlements usually starts from childhood and reproduces itself throughout the individual's life, with a burden compounded by the impacts of climate change, communicable diseases and, later, by NCDs as well. housing conditions, sanitation systems and public health, as well as a documental consultation on the health sector reports of the last five years of the health units of the study area.

Furthermore, we conducted direct observation (and documentation of housing and infrastructure) through field visits. Not least, we carried out a complementary survey on household level (n=82).¹ We asked questions on health services, waste treatment and environmental sanitation, access to water, and living conditions. SPSS was used for analysis, and a reading and critical analysis was performed for each of the data collection platforms.

Literature review

Housing conditions, social coexistence, informal settlements, and public health

A majority of cities in developing and emerging countries experience significant housing deficits and profound health challenges, particularly in informal settlements (WHO & UN-Habitat 2016). Due to its rapid urbanisation, Sub-Saharan Africa has the highest rate of informal settlements in the world. However, there is a dearth of data and case studies on health risks and vulnerability in poor urban neighbourhoods (Zerbo et al. 2020).²

Housing, including its environment, is one the most important personal needs. It is closely linked to the wellbeing, quality of life, and health of people (Scabbia & Iervolino 2016). Residents of informal settlements face multiple and high risks. Among them are: (1) poor housing and local environmental conditions; (2) limited access to clean water, sanitation, public transport and clean energy; (3) tenure insecurity; (4) exclusion from affordable, high-quality health and education services, garbage collection, and other vital services; (5) spatial segregation; (6) violence and insecurity; and (7) political marginalisation (Corburn & Sverdlik 2018).

Poor water quality and inadequate sanitation are the leading causes of morbidity and mortality worldwide (JMP 2017, Corburn & Sverdlk 2019), with a high impact in informal settlements.³ Diarrhoeal diseases are a major contributor to global child mortality, causing around 20% of all under-5 deaths worldwide, and in the Global South, 58% of all diarrhoeal cases are attributed to inappropriate water, sanitation and hygiene (WASH) (Prüss-Ustün et al. 2016, Corburn & Sverdlk 2019).⁴ Therefore, the Sustainable Development Goals (SDGs) include the targets to improve slums and to recognise that reducing inequality⁵ will require attention to the environmental and social conditions that keep the urban poor unhealthy, fragile, and subject to early mortality (WHO & UN-Habitat 2016).

Social determinants of health (SDOH) are factors external to healthcare that shape health outcomes, such as safe housing, access to food, political and gender rights, education, and employment status (De Snyder et al. 2011, Corburn & Sverdlk 2019). In informal settlements, residents are often burdened with multiple and overlapping challenges that can exacerbate SDOH, from deep poverty to overcrowded shelters and inadequate infrastructure. These factors frequently combine and increase the risks of exposure to environmental pathogens and limit access to life support services, resulting in higher prevalence of infectious and non-communicable diseases (NCDs) in poor urban areas (Sverdlik 2011). The urban poor living in slums face a 'triple threat' of injuries, NCDs that include diabetes and heart disease (WHO & UN-Habitat 2016). Furthermore, due to extreme weather events, which are becoming more frequent and intense as a result of climate change, many informal settlements are disproportionally exposed to increased risks related to health and well-being (Satterthwaite et al. 2007, Sverdlik 2011).

Numerous factors, such as poor quality of housing, lack of infrastructure and basic public services, insufficient medical care, and lack or inefficiency of garbage collection system, have been attributed as health risks. For example, in the year 2000, about 650 million inhabitants in slums used inadequate water and 850 million had poor sanitation. This scenario has worsened over the last two decades because of the rapid increase of residents in informal settlements.

Furthermore, it is estimated that the situation will worsen due to the profound risks and impacts of climate change, as so far the 21st century has suffered from more frequent and severe climate events and their impacts are enormous for the poor in low-income countries (Sverdlik 2011).

Since late 2019, the world has faced a common health risk, COVID-19. Hygiene measures, social isolation, use of face masks and face shields, and physical distancing are essential aspects of the public health response to prevent the spread of this pandemic. Considering that there are about 863 million people living in informal settlements that lack potable water and depend on the 'hand-tomouth' trade to survive, the measures recommended by specialised health institutions are a major challenge for the residents of these environments (BID 2020b, Tavares & França 2020), consequently making it impossible to apply physical distancing and social isolation protocols.

Considering this, the control and prevention of HIV/AIDS, tuberculosis, and vector-borne diseases such as malaria are among the top priorities for global health.

As is recognised, the challenge in informal settlements is not to identify which interventions work, but to ensure that their residents are included in the health statistics that define the epidemiology of diseases and have equal opportunity to access proven interventions (David et al. 2007).⁶

Namutequeliua neighbourhood

Namutequeliua is in the administrative post of Muhala, in the municipality of Nampula, northern Mozambique. It shares boundaries with the city's business and institutional hub. Most residents have origins from the coastal part of Nampula province. Most are Muslims. Namutequeliua comprises six residential areas, set in an area of 2,742.71 hectares (Araújo 2012). Its population grew from 44,185 inhabitants in 2007 to 89,547 in 2017 (INE 2019). The population density is increasing from east to west, with the densest area being near the city centre. However, construction is also carried out in non-permitted areas, thus increasing the risks to residents' health and



safety. Furthermore, gentrification along the perimeter of the area isolates the informal settlement in the centre. Figure 1 shows the location of the neighbourhood in the city.

This research focuses on the western part of the neighbourhood, which covers 106 hectares, or circa 4% of the area. This part of the neighbourhood has the following (informal) characteristics: (1) garbage disposal in water courses, craters, ditch, springs and access roads; (2) poor construction on riverbanks and erosion areas, vulnerable to fall during the rainy season; (3) small slope of the ground; (4) poor accessibility; (4) electric infrastructure with unsafe posts in almost the entire study area; (5) poor water supply; and (6) a sanitation system directed to streams built along the watercourses. Figure 2 illustrates the delimitation of the study area in the Namutequeliua neighbourhood.

The results of a previous study⁷ show that most residents covered by the present research preferred to live in other parts of the city. Moreover, in the area adjacent to the colonial urban core, 88% of the homes surveyed were made of cement and row mud bricks, while in area two, about



Figure 1: Administrative division of the municipality of Nampula and location of the Namutequeliua neighbourhood. Source: Authors.

5

The Ebola outbreak in West Africa, and the subsequent spread during the years 2013 to 2015, was particularly virulent in the underserved slums of major coastal cities (Snyder et al. 2014, HABITAT 2016), proving that informal urban settlements harbour health risks.

7

In 2016, the Institute for Housing Studies and Urban Development at Erasmus University Rotterdam (IHS) identified eight areas for research related to housing location factors (see *Trialog* 128, 1/2017). The western part of the neighbourhood encompasses two of these areas.

◀

Figure 2: Delimitation of the study area. Source: Authors (based on Google Earth).



Figure 3: Living conditions of part of the neighbourhood. Source: Amurane, 2018.

Table 1: Epidemiologicaldata, comparing the first halfof 2020 and 2021. Source:Nampula Provincial HealthDepartment, 2021.

half of the houses (54%) were made of cement. Regarding the ways of acquiring the land, most of the interviewees (57%) stated that they obtained it with the house.

Disease	Nampu	la provir	ice	Nampula district			
Disease	2020	2021	%	2020	2021	%	
Malaria	864.041	968.240	12	258.272	276.029	7	
Diarrhoea	27.898	33.508	20	9.983	11.939	20	
Dysentery	2.083	2387	15	153	105	-31	
Cholera	1.495	1.451	-3	354	786	113.5	
Febrile syndrome	99.904	101.494	2	35.518	34.589	-3	

Malaria

2021

27,035

48,121

48,746

21,393

10,460

157,776

2020

16,404

43,558

37,466

15,376

8,399

123,223

Health unit

25 de Setembro

Namutequeliua

1º de Maio

Muhala-

Expansão

Namicopo

Total

The same study found that the most used fuel for cooking is of vegetal origin. Food is usually prepared outside the houses in open-air kitchens or on balconies. Analysing aerial images from previous years, there is a decrease in vegetation in this area, as it has been cleared for use as fuel as well as for construction (i.e., building space as well as construction material). Over time, there has been an increase in urban densities and a consolidation of houses. In this context, cement-based materials have been increasingly used. Even so, many buildings have gaps in the walls that facilitate the entry of infectious agents. Moreover, the very high temperatures make it necessary to leave doors and windows open during the day.⁸

Table 2: Comparison ofthe occurrence of diseasesaccording to the age groupregistered in the referencehealth units. Source: NampulaDistrict Health Department,2021.

Table 3: Prevalence of diseases related to water and sanitation quality. Source: Nampula District Health Department, 2021.

8

Average maximum temperatures in the last 20 years amounted to 33.4° Celsius (INAM 2021).

Lloolth unit	Malaria			Diarrhoea			D	ol, . l	Febrile syndrome		
Health unit	0-4	5+	Total	0-4	5+	Total	Dysentery	Cholera	0-4	5+	Total
1º de Maio	5,675	21,360	27,035	1,180	532	1,712	0	0	827	3,120	3,947
25 de Setembro	11,647	36,474	48,121	1,827	1,365	3,192	0	0	2,350	2,402	4,752
Muhala-Expansão	14,774	33,972	48,746	1,544	858	2,402	0	0	2,354	2,193	4,547
Namicopo	7,367	14,026	21,393	104	93	197	0	0	946	780	1,726
Namutequeliua	1,908	8,552	10,460	414	217	631	10	0	390	2,681	3,071
Total	41,371	114,384	155,755	5,069	3,065	8,134	10	0	6,867	11,176	18,043

Diarrhoea

2021

1,712

3,192

2,402

197

631

10,155

2020

1,100

2,066

807

143

295

6,431

%

65

10

30

39

25

28

Dysentery

2021

0

0

0

0

10

10

%

-100

0

0

-100

233

2020

3

0

0

2

0

3

%

56

55

198

38

114

58

Febrile syndrome

2021

3,947

4,752

4,547

1,726

3,071

20,064

%

50

-56

11.268

439

25

2020

2,634

10,846

40

0

570

16,110



Table 4: Cumulative frequency of epidemiological data in reference health units. Source: Nampula District Health Department, 2021.

9

The sample was based on the length of coverage and use by residents of the study area. All the analysed health units belong to the primary health care level. Of these health facilities, only the Namutequeliua Health Center is in the research area but residents will seek healthcare according to the vicinity of the health unit.

Because of the low coverage of the water supply network, people resort to traditional wells, which, however, in most cases are contaminated, putting people at health risk. Water courses are obstructed by construction and by improper disposal of solid waste. The presence of dirty and stagnant water increases the occurrence of diseases related to poor sanitation. Children often play in open-air drainage ditches, rubbish disposal areas and interstitial spaces. This is also related to the lack of public facilities and green spaces.

Epidemiological health data from secondary sources

The following table shows the epidemiological data of the main diseases related to lack of sanitation, comparing the first half of 2020 and 2021.

According to Direcção Provincial de Saúde (2021), the City of Nampula had the highest prevalence of malaria and diarrhoea and the second highest prevalence of cholera (in the years 2020 and 2021).

Analysing the data in Table 1, we can observe that there is a general increase in reported cases, with emphasis on the cases of cholera, which have increased by more than double in the district of Nampula, despite the slight decrease in cases in the province. Malaria continues to be the disease with the most cases and with the greatest tendency to increase. Diarrhoea also has the same tendency as malaria. Despite the increase in dysentery cases at the provincial level, there is a slight decrease in the district.

The local data on the occurrence of diseases related to inadequate sanitation and precarious housing was gathered from five local health units.⁹ The data from the epidemiological profile by the health sector of Nampula, for

the first nine months of 2020 and 2021, shows that in the health units under study, the occurrence of malaria in children under five years of age is about half that of adults. In contrast, diarrhoea is more common in children, with occurrences about twice as high as for other ages.

Table 5: Characteristics ofhousing and water used forconsumption.

Characteristics of the house and the water used for	Frequency	Percentage					
consumption							
	20	24.4					
Mortar/grout	19	59.8					
Moral/groat	10	12.2					
Others	2	2.4					
Sharing toilet/bathroom	2	2.4					
No	74	90.2					
Ves	8	9.8					
Toilet/bathroom features/characte	ristics	7.0					
The bathroom has an improved latrine	30	36.6					
Bathroom has unimproved latrine	.34	54.4					
The bathroom has a flush toilet inside the house	11	13.4					
The bathroom has a flush toilet outside the house	4	37					
Toilet without flushing	3	37					
Bathroom/toilet sealing material							
Cement bricks	51	62.2					
Grass	16	19.5					
Zinc sheets	4	4.9					
Plastic bags	4	4.9					
Sacks	6	7.3					
Main source of water for drinki	ing						
Piped/running water	68	82.9					
Water from fountain/public faucet	3	3.7					
Bore/well water protected with hand pump	5	6.1					
Unprotected well water	6	7.3					
Water treatment for drinking and food	preparation						
No	53	64.6					
Yes	29	35.4					

Figure 4: Percentual relationship between garbage disposal methods.

GARBAGE DISPOSAL METHODS

■ wasteland/swamp/lake/river ■ bury ■ Burn ■ collected by municipal authorities



Figure 5: Percentual relationship between major infectious diseases.

MAJOR INFECTIOUS DISEASES

between major Malaria Diarrhea/Cholera Diarrhea due to Dysentery seases.

11% 12% 86%

Table 6: Infectious diseasesaccording to housing.

10

The accumulated data for the first three quarters of 2021 exceed those of 2017 and 2019 and present a negative value difference of about 3500 compared to 2018 and 2020. Of the health units under study, Muhala-Expansão has the highest number of cases of this disease, followed by 25 de Setembro and 10 de Maio.



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Variable Infectious Diseases	p-value*
Where to buy essential products	0,218
What is the main source of water for drinking	0,00*
Type of bathroom/toilet	0,226
Main forms of waste treatment	0,285
Bathroom/toilet construction material	0.000*

*= P value associated with the chi-square test

Few cases of dysentery are reported. Regarding febrile symptoms, it was found that almost half of the reported cases were in children less than five years of age. Table 3 illustrates these data.

The occurrence of diarrhoea again registered fewer cases in people over five years old. Dysentery cases were reported only at the Namutequeliua Health Center, and were evident in ten people. Febrile symptoms in children younger than five years were 38%. It shows that there is a high prevalence of diseases related to the lack of basic sanitation in children under five years old. The following table shows this trend.

The increase in dysentery cases probably has the same source of contamination or the same risk factor, as only one health unit recorded an increase in cases of the disease. Regarding diarrhoea, among the five health units under study, the Namutequeliua Health Center showed a 100% increase in 2021 compared to cases recorded in the same period in 2020. Cholera was not included in the tables under analysis because it was not an occurrence in the health units under study because all cases of this disease are referred to the Diarrhoea Treatment Centre (CTD), which covers the entire province of Nampula. In this health unit, 395 cases of cholera were reported in the first nine months of 2020 and, in 2021, there were 764 cases, representing an increase of 93.42%. In the health units, from 2017 to 2020, the year 2018 had the highest frequency of diseases, with a total of 188,163 cases. The data shows a drastic increase from 2017 to 2018, and a slight decrease in the following years.

From 2017 to 2020, malaria is the disease with the most reported cases, with a total of 601,749 infected people. This number corresponds to 80% of the population of the district of Nampula in 2017. The peak of malaria cases was also in 2018. ¹⁰ For diarrhoea, the first nine months of 2021 had more cases of diarrhoea than 2018, 2019 and 2020 in their entirety. This trend is illustrated as follows.

Survey results

Dysentery

Profile of the study participants

Respondents represented an age spectrum of 15 to 74, with almost half (47.6%) in the group of 20-39. 60% were female, and 67.1% had completed secondary education. Ca 1/3 relied on the minimum wage. From the survey carried out, 88% of those questioned said that they seek healthcare at the health unit closest to their residence.

Characteristics of housing and WASH infrastructure

More than half of the participants own their house, 20.7% share a backyard, and 62.2% have their houses and balconies paved with mortar. Regarding the characteristics of the bathroom and toilet, 9.8% share it with other families, 54.4% do not have an improved latrine, and 37.8% have toilets made of grass, sacks, and plastic or zinc sheets.

As for the disposal of garbage, 53.7% of the families report that they dump waste in open spaces, the stream, or in the drainage. Regarding water for consumption and food preparation, 82.9% of participants use tap water, but 64.6% reported not treating it. Of those who reported treating water for drinking, 28.5% use chemical products (Table 7). Additionally, almost 10% fetch water from inappropriate sources, such as unprotected wells, and more than 23% fetch from piped water from neighbouring houses and public fountain.

Self-reported epidemiological condition of participants

Approximately 6/7 of the participants reported having had malaria in the last year, of which 92.7% sought healthcare at the health unit and 35.4% reported purchasing the medication at a private pharmacy (Table 8).

The most common disease in the study area is malaria, while in a smaller percentage are dysentery and diarrhoea due to dysentery.

Influence of housing on the emergence of diseases

According to the results presented in Table 9, there was a statistically significant relationship between the prevalence of infectious diseases (P=0.000) and the

construction material of the bathroom and toilets, the main source of water for drinking and for preparing food, and the method used to treat the water. The inhabitants of the houses built with precarious material registered a greater number of illnesses. The existence of several openings along the constructions makes it possible for many mosquitoes and other insects, which breed in the stagnant water due to the poor urban drainage, to enter the interior of the building. The plant material used for the covering of houses, as well as for the sealing of some bathrooms, is one of the habitats and breeding grounds for the mosquito that causes malaria. The grass used on the roof retains moisture for a long time, increasing habitability conditions for the mosquito. The non-treatment of water from unsafe sources increases the frequency of diarrhoeal diseases, as does the form of waste treatment that, among the interviewees, slightly more than half deposit in vacant places.

Conclusions

Our study results confirm that the spread of diseases is associated with inadequate sanitation and precarious housing conditions. In informal settlements, the characteristics of the infrastructure and existence of precarious locations are crucial conditions to the reproduction of many pathogens. A general trend in the increase of diseases related to poor environmental sanitation was observed. The correlation was present in the context of Nampula where diseases related to poor sanitation, poor water quality and poor housing (such as malaria, diarrhoea, cholera, febrile syndrome and dysentery) were common throughout the year with a high incidence during the rainy season.

The reported cases of diarrhoea, cholera and malaria, in the first nine months of 2021, were about double those diagnosed in 2020, revealing a general deterioration of health conditions. Rising amounts of solid waste that were deposited in open drainage ditches also accounted for the increase of these diseases. The frequency of disease cases never stopped rising, although fewer cases were reported in 2020 as a result of the reduced visits to health units due to COVID-19 and the demanded social isolation. Since 2021, however, reported cases have increased again.

Indeed, the high proportion of malaria cases and diarrhoeal diseases in the study area requires urgent and appropriate interventions. We propose action measures at three different levels:

- (1) Plans at urban level:
 - a) Plans to improve the neighbourhoods;
 - b) Development of sanitation and road infrastructures;
 - c) Assisted relocation of people who want to leave risky areas.
- (2) Adequate housing:
 - a) Improvement of the conditions of the houses with an emphasis on measures to prevent the entry of disease agents;
 - b) Improvement of construction materials and technology.

- (3) Social development:
 - a) Raising awareness among residents about the entire chain of diseases most prevalent in the area;
 - b) Holding workshops on urban problems related to the occurrence of diseases;
 - c) Creation of local associations focused on monitoring common diseases, with a view to safeguarding the gains of the different interventions carried out.

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Household Energy Management in Informal Settlements of Addis Ababa

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Better infrastructure and energy services for the poor are key measures in mitigating environmental risks to health. In line with SDG-7, encompassing the issue of inclusiveness, and raising the need for procedural environmental justice to strongly emphasise issues of health and housing, this study focuses on energy management in informal settlements. In this vein, we studied four types of settlements in Addis Ababa, Ethiopia, along the criteria of centre versus periphery, status, and environmental risk. Aiming to narrow current knowledge gaps, we sought to understand the relationship between the energy management of households and the social, economic, and environmental characteristics of the settlements. Towards these ends, we employed mixed method through in-depth interviews of key informants, a sample survey, and structured interviews of 520 households. These were complemented by literature reviews, digital mapping, photography, and sketching.

We found that 56% of the surveyed households prefer and use electricity (hydroelectric power) for cooking and 78% for light. Still, accessibility and affordability was a challenge for low-income households: 28% (145 households) earned under the minimum income threshold of 2,044 birr per month (66 USD, at the time of the study). 60% of these paid over 15% of their income on energy bills. Even so, the households demonstrated a strong preference for modern energy sources, opting for connecting illegally to nearby electricity grid lines. The study recommends extending the existing infrastructure and upgrading measures into informal settlements and embracing the existing social capital in the communities. Further research on decentralised energy provision of other renewable modern sources is suggested to mitigate environmental risks to health and ensure a permanent supply of modern renewable energy.

Energiemanagement von Haushalten in informellen Siedlungen in Addis Abeba

Bessere Infrastruktur und Energieversorgung für einkommensschwache StadtbewohnerInnen sind wichtige Maßnahmen zur Minderung von (Umwelt)risiken für deren Gesundheit. Diese Studie konzentriert sich auf das Energiemanagement in informellen Siedlungen im Einklang mit dem Ziel 7 der Nachhaltigen Entwicklungsagenda (SDGs). Dieses umfasst auch Fragen der Inklusivität und einer verfahrensbezogene Umweltgerechtigkeit, was die Bedeutung von Gesuldheits- und Wohungsfragen unterstreicht. In diesem Sinne untersuchten wir vier Arten von Siedlungen in Addis Abeba, Äthiopien, anhand der Kriterien Zentrum versus Peripherie, Status und Umweltrisiko. Mit dem Ziel, bestehende Wissenslücken zu schließen, wollten wir das Verhältnis zwischen dem Energiemanagement von Haushalten und den sozialen, wirtschaftlichen und umweltbezogenen Merkmalen der Siedlungen verstehen. Zu diesem Zweck verwendeten wir eine Kombination aus qualitativen Interviews mit Schlüsselpersonen, einer Stichprobenumfrage und strukturierten Interviews mit 520 Haushalten. Diese wurden durch Literaturrecherchen, digitales Mapping, Fotografie und Skizzierung ergänzt. Wir stellten fest, dass 56% der befragten Haushalte Strom zum Kochen und 78% zur Beleuchtung bevorzugen und nutzen. Dennoch stellt vor allem Zugänglichkeit moderner Energiedienstleistungen eine Herausforderung für einkommensschwache Haushalte dar: 28% (145 Haushalte) verdienten weniger als das Mindesteinkommen von 2.044 Birr pro Monat (66 USD zum Zeitpunkt der Studie). 60% von ihnen zahlten mehr als 15% ihres Einkommens für Energierechnungen. Dennoch zeigten die Haushalte eine starke Präferenz für moderne Energiequellen und entschieden sich dafür, sich illegal an nahegelegene Stromnetze anzuschließen. Die Studie empfiehlt, die bestehende Infrastruktur zu erweitern und Maßnahmen in informellen Siedlungen zu verbessern sowie das bestehende soziale Kapital in den Gemeinden zu nutzen. Es wird auch empfohlen, weitere Forschungen zur dezentralen Energieversorgung mit anderen erneuerbaren modernen Energiequellen durchzuführen, um Umweltrisiken für die Gesundheit zu mindern und eine dauerhafte Versorgung mit moderner erneuerbarer Energie zu gewährleisten.

Introduction

Rapid urban growth throughout the developing world is seriously outstripping the capacity of most cities to provide adequate services for their citizens (Cohen 2006). The growth in urban populations in the developing world has rapidly overtaken the capacity of governments to provide formal housing and services to the urban population. As a result, informal settlements continue to emerge in urban areas of the developing world (Lemaire et al. 2016). Informal settlements are defined by different sources, but according to UN-Habitat (2004 & 2015), informal settlements are residential areas where: 1) inhabitants have no security of tenure vis-à-vis the land or dwellings they inhabit, with modalities ranging from squatting to informal rental housing; 2) the neighbourhoods usually lack, or are cut off from, basic services and city infrastructure; and 3) the housing may not comply with current planning and building regulations, and is often situated in geographically and environmentally hazardous areas. Existing informality policies reveal substantial gaps related to community empowerment, wealth-building, quality of life, and long-term security (Basile & Ehlenz 2020). Informal settlements have a profound impact on the planning, intervention, and expansion of a city. Cities are produced not just by one group, nor are they planned and implemented by planners or politicians alone; they are, rather, the common product of a wide range of actors, some of whom are known and understood, while others are less known but play an equally important role (Herrle & Fokdal 2011). Studying and documenting their characteristics is essential to planning effective interventions.

The physical environment in which people live their daily lives significantly affects their health. Environmental health refers to those aspects of human health, including well-being, that are determined by physical, biological, social, and psychosocial factors in people's daily living environment – with health not just being the mere absence of disease or infirmity, according to the WHO's definition (UN General Assembly 1947). The environment-health nexus underlines that improvements in people's health require a holistic, multi-sectoral approach (WHO 2016, Sunyani 2006, United Nations Environment Programme 2016). The relational health and well-being approach follows a holistic and multidimensional approach as well (Corburn et al. 2016).

Informal settlements are responses of city dwellers to the pressing need of housing that is otherwise unattainable. As a result, the standard of living, quality of housing, and availability of infrastructure are often compromised in these settlements. Residents, and particularly the marginalised groups among the residents such as children and women, typically face greater exposure to environmental health risks in their surroundings because they live in 'unhealthy' locations bereft of basic infrastructure services. Better infrastructure and energy services for poor households are key measures in mitigating environmental risks to health (Rydin et al. 2012, Northridge et al. 2003, Hancock 1996), as are interventions to improve housing, healthcare systems, and education policies. Generally, efforts towards distributive and procedural environmental justice need to strongly focus on issues of health and housing.

Given the spontaneity and impermanent nature of informal settlements, in combination with public neglect, as is the case in Ethiopia, the social, economic, and physical aspects of most settlements often remain poorly documented. Among other, there is a gap in knowledge about the infrastructure adequacy in informal settlements of Ethiopia, including the energy management, provision, and use.

Accessibility to adequate, affordable, and reliable energy sources is vital for social and economic development in any country; it is especially vital for the disadvantaged groups of the population. This is also in line with SDG-7, which seeks 'to ensure access to affordable, reliable, sustainable, and modern energy for all'. The issue of inclusiveness also surfaces when it comes to the availability and affordability of energy, as poor households tend to spend more on energy in general and modern – or 'green' – energy tends to be harder to access and more expensive. Since 2011, urban households in Ethiopia mostly use hydropower-sourced electricity, unlike the rural households that predominantly continue to use biomass energy (Mondal et al. 2018). Nonetheless, the urban poor face many challenges regarding access to modern renewable energy sources, affordability, and sustainability.

Aim, objectives, and scope

As there is an urgent need to better understand the access and use of energy by poor urban communities in Ethiopia, this study sought to understand the characteristics of informal settlements regarding energy management, and the level of the dwellers' awareness of environmental risks to health.¹ We disaggregated energy management into the use pattern, availability, and affordability of energy, and gathered household-level data on these dimensions. Furthermore, we also sought to understand the linkages between the level of energy management by households and the neighbourhood with their social, economic, and environmental characteristics. Moreover, we focused on household energy consumption for cooking and light because these are most relevant in the local context. Among others, we included questions regarding the residents' awareness of the energy choices in relation to their health and wellbeing.

Context

This section sheds light on the informal settlements of Addis Ababa and the energy policy of Ethiopia. Moreover, we deliberate the existing energy-use pattern of households, and the availability and affordability of modern renewable energy sources in the city.

Addis Ababa, the political capital and most-important commercial and cultural centre of Ethiopia, is the home of over ca 5.2 million residents, or roughly 25% of the country's total urban population. In general, all land and housing-related policies are strongly affected by the fact that all land belongs to the public in Ethiopia and that land transactions work though a system of leases. The informal settlements in Addis Ababa comprise about 18.3% of the population (Butera et al. 2016), and two different types of houses can be identified within them: older *Kebele* houses and the newer expansion-area houses.

The informal houses in the inner areas of the city are commonly referred to as *Kebele* houses. They have formalised tenure and evolved over the past century in parallel with the emergence of Addis Ababa as a garrison town. The majority of *Kebeles* are owned by the government (Yitbarek 2009). The houses were nationalised by the socialist government as extra private holdings in 1975. In contrast, the informal houses in the expansion areas were built after 2005. Almost all originate on farmland in the Oromia regional state. Here, many farmers informally sell the use of a parcel of their land to migrants. As the city keeps growing, the informal communities become engulfed within the newer urban fabric.

Regarding energy access in Ethiopia, 71 million people – or 65% of the population – did not have access to electricity in 2010. More than 77% of Ethiopians live in rural areas and rely on biomass, in the form of traditional sources such as firewood and animal dung. The use of

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those materials is linked to deforestation and respiratory illness. Due to concentrated efforts by the government to develop electricity supply in urban areas, 87% of the population now have access to electricity (Energy Policy of Ethiopia 2013). Even so, due to fast demographic and economic growth, the energy demand is increasing enormously. It is expected to rise by a rate of 10% to 14% per year until 2037. At the same time, Ethiopia is endowed with significant renewable energy sources. These include predominantly hydropower, but also wind, geothermal, solar, and biomass. Only a small portion of that potential is harnessed today. The Africa Energy Outlook (2019: 225) indicates that 'Ethiopia has an electricity access rate of 45%, 11% of its population already have access through decentralised solutions. There is a strong government commitment to reach full access before 2030. Around 80% of new connections are cost-effectively delivered by grid densification and extension as a large part of the population lives close to the hydropower grid.'

The Ethiopian government's energy policy (2013) stipulates that Ethiopia should transform into a 'middle-income country before 2025', that development should not only be 'climate-proof' but also CO2-proof, and that this should include universal access to electricity. Currently, the ten-year development plan of Ethiopia posits equity in access to electricity services, energy access and quality, alternative sources of energy, reliability of electricity infrastructure, investment, and income in the energy sectors as areas of focus under enabling sectors (Ethiopian Development Plan 2021 – 2030).

When examining challenges of sustainable energy management, it is also crucial to look from the demand side, especially in informal settlements. According to Asfaw & Demissie (2012), Ethiopia's household energy consumption increased by 17% from 2010 to 2011. The energy expenditure per person tripled from US\$10 to US\$30 in the same year, mainly due to price increases. Between 1995 and 2005, traditional fuel use increased by 10% while modern energy use increased by 50%. Since 2005, the demand for hydroelectric-powered electricity has been increasing (ibid.). Per capita electric power consumption in 2014 was 64 kWh/year (World Bank Data 2014) - compared to a world average electricity demand of 3,000 kWh/year (IEA 2019) – and energy demand has been on the rise at 10% to 14% per year (MWIE 2017, Lloyd 2014, Getie 2020).

Informal settlements in the capital are characterised by low electricity consumption, corresponding to irregular income and poor capacity to pay connection fees and electricity charges (Gaunt et al. 2012, Karatasou et al. 2014, Onyekachi 2014, Butera et al. 2016, Subbiah et al. 2016). Connections are fragmented and irregular, with the availability and quality of electricity supply varying from place to place. This makes grid expansion difficult and expensive to connect (JICA 2011, Kovacic et al. 2016). Moreover, informal-settlement dwellers are disproportionally affected by rising prices, as mentioned above. Due to limited access as well as cultural grounds, many informal settlers (including electricity users) continue to rely on traditional energy sources such as firewood and charcoal for cooking/baking, roasting, boiling coffee, and drying and frying cereals. These fuels emit

high amounts of carbon monoxide and particles, and produce less heat (Yu et al. 2008, Karatasou et al. 2014), which causes significant health risks.

Despite the information presented above, our contextual review as part of this study revealed a gap in knowledge of the actual energy scenario of households in informal settlements of Addis Ababa. This study, hence, sets out to document and understand energy management at the household level in the selected case-study areas in relation to the characteristics of the settlements.

Methodology

In correspondence to our objective, we examined the economic, social, and environmental dimensions of energy management at household and community levels. Firstly, for the economic properties, we focused on the energy needs of households and the affordability of modern renewable energy sources. In addition, we analysed the economic activities in the settlements, the livelihoods of the residents, and the monthly incomes of the respondents. Secondly, we studied the social characteristics of the case-study areas by describing the social dynamics and checking the availability of existing community structures (social capital). Moreover, we examined the prevalence of social ills and violence in the case-study areas. Thirdly, we observed the environmental characteristics through indicators of sustainable access to common resources, extent of consumption of traditional resources, and consequent hazards to human health. Not least, we explored the role of the physical and environmental dimension of the case-study areas through examining access routes, availability of infrastructure, and prevalence and awareness of indoor air pollution and natural and man-made hazards.

The methodology is applied in the capital of Ethiopia, Addis Ababa, on selected case-study areas. It was found important to address a representative range of housing types and get an overall understanding of the energy management of households in settlements of the city. We selected them through purposeful sampling based on pre-defined criteria and access to local knowledge, and categorised them into four categories:

- A. Inner-city informally developed *Kebele* house areas (case of Gadam Sefer in Arada sub-city, n=199).
- B. Informal settlements both in the inner city and on the outskirts of the city in environmentally vulnerable areas (riverside) (case of Goro in Bole sub-city, n=216).
- C. Informal settlements on the outskirts of the city, on acquired farmlands (case of Ayat in Yeka sub-city, n=101).
- D. Informal settlements on the outskirts of the city, on environmentally vulnerable areas (case of Selam Sefer in Bole sub-city, n=212).

Mixed data collection techniques were employed, including a sample survey, in-depth interviews of key informants, structured interviews of households, mapping, photography, sketching of secondary data through literature, and contextual review. The key informants were composed of experts and local officials. A single questionnaire was used for all case-study sites. Structured questions were used to reduce interview time and ensure uniformity of the collected data. A total of 520 household surveys were conducted in all four case-study areas in March, April, and May 2018. Assisted by GIS, we used mainly randomised sampling for the selection.

GIS mapping and SPSS were used for the analysis of the data collected during the surveys and interviews. The preliminary findings were further validated through a focus-group discussion with stakeholders. The analysis outcome is a detailed picture of the energy management in the case-study areas.

Results and discussion

The following section presents selected outcomes of our inter-case and intra-case analysis results. Furthermore, a discussion on the implications of the findings in relation to relevant economic, social, and environmental characteristics of the settlements is provided.

Household energy management in the case-study areas

With regards to the energy-use pattern, 56% of the respondents indicate using electricity (a modern source of energy) and 44% use charcoal and firewood for cooking (see Table 1).

Disaggregated data shows that 78% of respondents use electricity as a source of light; in Selam Sefer alone, the share was 20% lower (see Table 2). This is a result that contrasts the situation in most other informal settlements worldwide, where access to electricity tends to be low.

Notably, a large share, or 89%, of the respondents reported access to power lines. This corresponds to the average level of access in the city. The data in Table 2 reveals that access seems to be most correlated with location and legal status. But even in Selam Sefer, the informal settlement that is on the periphery in an environmentally sensitive location, residents indicated connectivity of 74%. Remarkably, the findings revealed that the newly formed settlement in Ayat had more grid connections than the regularised Goro. So, it was worth examining the modes of connecting to the main grid and obtaining electric meters.

Table 1: Source of energy forcooking as indicated in eachcase-study area.

Site	Hydro Electric power	Charcoal and Firewood
Gedam Sefer	64.4%	35.6%
Ayat	50.0%	50.0%
Selam Sefer	46.6%	53.4%
Goro	58.3%	41.7%
Total	56.2%	43.8%

Site	Hydro Electric power	Candle and traditional sources
Gedam Sefer	89.4%	10.6%
Ayat	74.4%	25.6%
Selam Sefer	62.0%	38.0%
Goro	84.6%	15.4%
Total	78.1%	21.8%

The focus-group discussions revealed that despite their informal status, the 91% of those with legal connections and meters had managed to obtain title deed (proof of ownership of the house) or a Woreda permit (tax invoice). Indeed, a legal electric meter in informal settlements is considered a steppingstone to tenure security and regularisation. The remaining 9%, who were unable to acquire their own electric meters, use informal grid connections or buy electricity from neighbours. Improvised connections in both cases lead to increased physical risks. Moreover, buying electricity from neighbours is very costly.

In summary, we see that informal settlers obtain power services from the main grid one way or another. Importantly, electrical meters are considered a steppingstone toward tenure security.

Regarding energy affordability, our study found that households with relatively lower incomes in the casestudy areas struggle to afford energy. 28% of residents (145 households) earned under the minimum income threshold of 2,044 birr per month (66 USD, at the time of the study). 60% of these paid more than 15% of their income for energy bills. On the other hand, 70% of the households earning above 2,044 birr monthly, spend less than 10% of their income on energy expenditure (see Table 3).

A	
Table 2:	Source of energy
for light a	is indicated in each
case-stud	dy area.

◀

Table 3: Energy expenditureas a percentage of house-hold income.

◀		

Table 4: List of causes for electrocution.

Site	Household Inco	me - less tha	an 2044 Birr	Household Income - more than 2044 Birr			
	Less than 10%	1095%	More than 15%	Less than 10%	10-15%	More than 15%	
Gedam Sefer	15.4%	3.8%	80.8%	10.6%	14.8%	20.9%	
Ayat	13.3%	40.0%	46.7%	25.6%	24.1%	6.9%	
Selam Sefer	21.9%	28.1%	50.0%	38.0%	12.5%	18.8%	
Goro	16.0%	24.0%	60.0%	15.4%	9.5%	9.5%	
Total	17.3%	22.4%	60.2%	21.8%	13.9%	15.8%	

Site	Pole	Transformer	Faulty Wiring	Faulty	Lack of Proper	Electric Lines
	Collapse	issue		Appliance	Setback	Falling
Gedam Sefer	27.5%	24.2%	17.6%	12.1%	3.3%	15.4%
Ayat	55.6%	0.0%	22.2%	0.0%	0.0%	22.2%
Selam Sefer	18.2%	9.1%	4.5%	29.5%	13.6%	25.0%
Goro	0.0%	57.1%	7.1%	21.4%	0.0%	14.3%
Total	24.0%	21.5%	13.3%	17.1%	5.7%	18.4%



EEPCO Initiative Community Initiative Woreda Initiative NGO Initiative Individual Request

Table 5: Initiative to acquire electricity. Main grid hydroelectric power indicated for each case-study area, top: average of the four areas, below

Table 6: Impact of increase

in main grid hydroelectric

power connection.

0%

With regards to increased awareness towards the use of modern energy sources, 66% of the respondents reported an increased use of electricity for cooking and light since they moved to the area. Compared to traditional sources of energy, 42% of the respondents favoured electricity for its affordability, 16% favoured its positive impact on health, and 9% preferred its convenience.

With regards to environmental safety related to sources of energy, we saw that the major cause of fire in the case-study areas was cooking fires (38%), followed by electricity-related hazards (25%). Collapsing electric poles and transformer problems are major causes of electrocution. Illegally tapped electric grid lines with faulty wires also result in electrocution accidents and fire hazards (see Table 4).

With regards to spatial and social context impacting infrastructure and services

A second group of questions that were part of our survey addressed the inner and outer context of the respective settlements. Our study affirmed that spatial and social conditions in a neighbourhood are closely intertwined with conditions of infrastructure, services, and people's attitudes. A main finding was a strong spatial deprivation and fragmentation of the informal settlements related to disconnected infrastructure and

Site Increased **Better Health** Better Change of Land Income Security Use Gedam Sefer 21.8% 0.0% 23.9% 54.3% 21.0% Ayat 42.1% 21.0% 15.8% Selam Sefer 27.9% 27.1% 34.9% 10.1% Goro 23.4% 36.6% 40.0% 0.0% Total 27.7% 26.8% 38.4% 7.1%

services. The residents perceived lack of access (e.g., roads, etc.) to and within the settlements as a major issue affecting their quality of life. More than 40% of the respondents deplored a lack of proper access roads and reported that the internal roads were completely inaccessible for cars and very uncomfortable on foot. The situation deprived the households of social services such as ambulance and fire services. Consequently, the well-being of the people was at constant risk. The challenge was reported as especially severe at Selam Sefer, where many lots are connected by dilapidated stairs with no handrails.

Even so, we found that there is a strong community in the case-study areas, revealing the potential of social capital and community involvement. Respondents reported involvement in traditional social structures such as Mahiber, Iqub and Idir, especially at Gedam Sefer, in the inner-city, the oldest of the settlements. The remaining three case-study areas also possessed strong community structures. In our case-study areas, the high levels of social capital correlated to high levels of safety and security. The responses indicated low levels of crime and delinquency at all levels (from homicide, robbery to juvenile delinquency, prostitution, and sexual assault). Woreda officials confirmed during a key informant interview that the crime rates are even lower than in formal neighbourhoods. This finding is thought-provoking as, despite the economic deprivation and the lack of infrastructure and services, the case-study areas are far from the common perception of informal settlements.

Traditional institutions were not the only ones contributing to social capital: non-governmental organisations (NGOs) also play a vital role in this regard. For example, we found that various NGOs had initiated most of the electric-meter acquisitions of the households (see Table 5).

When asked about the impact of increased main grid electric power connections in their neighbourhoods, many residents reported that: security has been enhanced (Gedam Sefer), health conditions improved thanks to cleaner cooking methods (Goro), incomes have increased due to better small-scale business opportunities (Ayat), and, not least, that land uses had changed from purely residential to mixed-use, incorporating more economic activities (Ayat) (see Table 6).

Conclusion

Our study indicates that residents in informal settlements of Addis Ababa are social, aspirant, and law-abiding citizens. The case-study areas demonstrate strong bonds and healthy social dynamics. Economically, the residents represent various income levels, both affluent and poor. More than 70% of the households studied earn more than the average per capita income of Ethiopia. However, in contrast to the strong social capital, the physical and environmental condition of the study areas is dilapidated. Most of the places are cut off from municipal infrastructure and service networks. These factors, among others, clearly increase the economic and physical vulnerability of the households.

When focusing on access to modern energy, our study affirmed that electricity is often among the services that

arrive first in informal settlements. Most of the households in the case-study areas had access to electricity even though the acquisition method was informal in some cases. Electrical (hydroelectric) power appeared to be cheaper and available in the case-study areas. This seems to be a unique characteristic of the Ethiopian context. Accordingly, electricity was used as the main energy source for light and to a large extent also for cooking. The infrastructure development, particularly main grid hydroelectric power was situated in proximity. Substations of the main grid were in close vicinity to the case-study areas; the legal acquisition modality however, was the main challenge. Households without any form of tenure documentation struggled to acquire a main grid hydroelectric power connection. Most residents of the case-study areas that were ineligible to acquire access to main grid hydropower took the (informal) initiative to do it themselves. But these households either ended up paying extra for rental electricity per light bulb from their neighbours, or engaged in (risky) illegal taping from the main grid in their effort to acquire a modern renewable energy source. The substandard infrastructure provision and further informal intervention of the settlers in the areas also resulted in high rates of fire and electricity-related accidents.

We have also seen that access to the main grid hydroelectric power played a significant role in ensuring tenure security in that, for example, new meters contributed to consolidating tenure security.

Even so, economic affordability of modern energy remained a significant challenge for most of the 28% of the residents in the areas studied who were below the minimum income threshold. However, we found that all households exhibited great awareness of the health and environmental benefits of modern renewable energy. Not least, it was vital to observe a strong role of social capital in the four neighbourhoods and that a lion's share of electric meter acquisition to the households was initiated by NGOs.

In general, the issue of the process of recognition by the state and by local governments remains central. Indeed, despite decades of studies and interventions on informality, 'recognising informality' is still key. Reducing informality to non-permanence and self-help solutions excludes informal-settlement households from being treated according to the standards that apply to the rest of the population. This can impede the local political will in trying to get a grip on urbanisation challenges in informal areas. This study, we believe, provides a glimpse into the actual situation on the ground and narrows the knowledge gap that exists in the energy management of informal settlements by a few steps, providing ammunition for planners and policymakers to plan inclusively and for researchers to further narrow the knowledge gap.

The Addis Ababa city administration should take the lead in housing and infrastructure provision through a shift to self-help, community involvement, and controlled development. This can be achieved by encouraging the formal sector to be more inclusive instead of depriving the settlers of their basic right to tenure and infrastructure (including energy). So, this study recommends to fully exploit the existing social bond and community structure to create a link between the informal settlers and the local authority. Permanent assurance of supply could be achieved by the integration of these settlements with the existing infrastructure and by further investigating the decentralised energy provision of other renewable sources by the Addis Ababa Electric Utility Bureau. This would benefit the government through avoiding the misuse of energy and achieving sustainable energy and environmental protection initiatives by further promoting the utilisation of modern renewable energy sources. An important side effect of these actions is the mitigation of environmental and health hazards for the inhabitants.

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Urban Heat and the Housing-Health Nexus How Do They Affect Livelihoods of Low-income Residents in India?

Tania Berger and Faiz Ahmed Chundeli

Increased frequency, duration and severity of hot weather periods are predicted to be among the most prominent consequences of global climate change in India, where elevated summer temperatures are already a lived reality today. As direct connections between heat and health can be established, such extreme heat conditions present considerable health risks to vulnerable and poor populations, especially in urban heat islands. Furthermore, links between poor health and sustained poverty are well documented, especially in the Global South, where many households' livelihoods in the informal economy depend upon the capacity to work daily and earn a living. Health problems that endanger this capacity impair livelihoods. Thus, if excessive heat threatens the health and well-being of low-income residents, it also puts their livelihoods at risk. In qualitative interviews, this study explores heat-coping strategies of low-income households in a resettlement colony in Vijayawada, India, and triangulates these with temperature readings and simulations. It investigates how heat, mediated by housing, affects the residents' livelihoods. The findings demonstrate how the quality of people's housing mediates the link between heat and health: Defective building materials cause overheating homes and thereby engender unhealthy living environments. These ultimately jeopardise the people's health and ability to work and earn money, impacting their livelihoods.

Städtische Hitze und der Zusammenhang zwischen Wohnen und Gesundheit: Wie wirken sie sich auf den Lebensunterhalt einkommensschwacher Einwohner in Indien aus?

Zunehmende Häufigkeit, Dauer und Intensität von Hitzeperioden werden zu den wichtigsten Folgen des globalen Klimawandels in Indien zählen, wo erhöhte Sommertemperaturen bereits heute zur gelebten Realität gehören. Da Zusammenhänge zwischen Hitze und Gesundheitsbeeinträchtigungen belegt sind, stellen solche extremen Hitzebedingungen erhebliche Gesundheitsrisiken für gefährdete und einkommensschwache Bevölkerungsgruppen dar, insbesondere im Einflussbereich städtischer Wärmeinseln. Darüber hinaus sind Zusammenhänge zwischen beeinträchtigter Gesundheit und anhaltender Armut gut dokumentiert, besonders im globalen Süden, wo der Lebensunterhalt vieler Haushalte in informellen Wirtschaftsbereichen von der Fähigkeit abhängt täglich arbeiten und Geld verdienen zu können. Gesundheitliche Probleme, die diese Fähigkeit gefährden beeinträchtigen die Lebensgrundlagen. Wenn also übermäßige Hitze das gesundheitliche Wohlergehen von BewohnerInnen mit niedrigem Einkommen bedroht, gefährdet sie damit auch unmittelbar ihren tagtäglichen Unterhalt. In qualitativen Interviews untersucht die vorliegende Studie Hitzebewältigungsstrategien von einkommensschwachen Haushalten in einer staatlichen Wohnsiedlung in Vijayawada, Indien, und trianguliert diese mit Temperaturmessungen und -simulationen. Es wird untersucht, wie sich Hitze, vermittelt über den Wohnraum, auf Gesundheit und Lebensgrundlagen von BewohnerInnen auswirkt. Die Ergebnisse zeigen, wie Wohnqualität von Menschen einen Zusammenhang zwischen Hitze und der Gesundheit der Betroffenen herstellt: Minderwertige Baumaterialien und klimainsensitives Design tragen zur Überhitzung von Wohngebäuden bei und erzeugen dadurch ein potentiell gesundheitsgefährdendes Wohnumfeld. Sie gefährden dadurch letztlich die Fähigkeit der BewohnerInnen, zu arbeiten und Geld zu verdienen, und wirken sich so auf ihren Unterhalt und ihre Lebensgrundlagen aus.

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Introduction

Increased frequency, duration and severity of hot weather periods are predicted to be the most prominent consequences of global climate change. Besides many other countries, this is especially true for India (Dutta et al. 2020), where elevated summer temperatures are already a lived reality. Such extreme heat conditions are known to present considerable health risks to vulnerable populations, causing increased mortality rates (Chambers 2020): Despite intensifying public debate on matters of heat and the welldocumented risks associated with its impacts, heat waves remain less visible and appear less dramatic than many other disasters expected to occur more frequently due to global warming, such as flooding, hurricanes and earthquakes. Heat remains a 'silent killer' (Dutta et al. 2020).

Urban heat islands (UHI) and the risks from increased inner-city temperatures are well documented on the macro level. On the meso and micro level, residential location and housing influence whether residents of a particular region, quarter or even building complex are more or less susceptible to heat-induced illnesses (Ellena et al. 2020). It is evident that, given rapid urbanisation in countries of the Global South, UHI effects are becoming more pronounced in the cities and metropolises of these regions (Adger et al. 2003, Gasparrini et al. 2017, Chambers 2020).

Thermal conditions experienced by individuals in cities also depend upon the immediate built environments (Huang et al. 2018). Densely packed, poorly ventilated, overcrowded hutments within a hot surrounding urban fabric are vulnerable to overheating (Corburn & Sverdlik 2017). Unlike in much wealthier neighbourhoods, residents of such environments may not be in a position to alleviate heat using cooling devices or other amenities. Therefore, people in poor residential quarters are generally more at risk of adverse health outcomes due to urban heat (Ellena et al. 2020). A direct connection can thus be established between heat and health, mediated by the quality of housing stock.

Likewise, links between poor health and sustained poverty are well documented (Vaid & Evans 2017). With the share of the informal economy being substantial in many countries of the Global South, and hardly any welfare systems in place, the livelihoods of many households strongly depend upon the capacity of the households' members to work daily and earn a living. Health problems that endanger this capacity logically impair livelihoods, engendering poverty for those incapacitated by illness. Thus, if excessive heat threatens the health and well-being of low-income residents in poor living quarters, it also puts their livelihoods at risk.

The impacts of climate in general and heat, including the effects of urban heat islands, get mediated by housing. Via this mediator, heat affects residents' health and, consequently, their livelihoods (see Figure 1). On the other hand, the social fabric dictates which quality of housing residents can afford and, hence, their homes may be more or less prone to overheated, uncomfortable and unhealthy living conditions. Following Cutter's (1996) hazard-of-place model of vulnerability, which sees local hazard potential filtered through the social fabric as well as geographical context, it can be seen how these two framework conditions shape how housing can mediate the heat-related risks of residents: The geographical contexts of housing set the frame for what can and is usually built in a specific location (in terms of available materials, local construction techniques, and skills). Additionally, the geographic context also forms the microclimate into which any housing is placed.

To these theoretical underpinnings, the study presented hereafter investigates heat-coping strategies of households in a low-income resettlement colony in Vijayawada, India. It examines how heat, mediated by housing, affects the residents' livelihoods. In the context of the household homes, such coping strategies are understood as ways of invigorating the filtering/mediating role of housing in protecting residents from the threat of heat. Throughout the research, the particular link between heat, housing, and health and impacts on the respondents' livelihoods became very evident.

Methodology

Between July and September 2019, ten qualitative interviews were conducted in low-income households in Vijayawada, India. Vijayawada, in the union state of Andhra Pradesh, had roughly one million inhabitants by 2011 (the year of the last census currently available). Like many Indian cities, Vijayawada has experienced considerable population growth over the past decades (e.g., 3.73 % annual growth rate between 2001 and 2011¹). This increase in population can be expected to be linked to increases in built-up areas and more pronounced urban heat island effects. This, in turn, almost certainly impacts ambient temperatures as perceived by the city's inhabitants.

For this study, several of the few government-provided rehabilitation colonies for low-income households in the



city were scrutinised for their size and representativeness with regard to the general model for such kinds of colonies in the state. The colony finally selected was constructed in the early 2000s. It houses residents who had previously informally encroached on nearby rivers and canals. They had been frequently exposed to floods, and so resettlement became necessary. Two distinct housing schemes were constructed here: row housing and multistorey apartment blocks (see Figure 2).

Within the colony, there are more than a hundred individual housing units and thirty-three apartment blocks (with thirty-two units in each apartment block). The detailed methodology as developed by Ali et al. (2019) and Cerezo et al. (2017) was used for archetype characterisation of study area and identification of specific buildings for further study. A representative sample of housing units from individual housing and apartments blocks was derived using archetype characterisation for documentation, conducting surveys, and field measurements.

Several units in both schemes were identified, based on a preliminary survey, for qualitative interviews and thermal analysis (see Figure 3). Therein, the aim was to select housing units of different types, sizes and exposure to solar radiation (e.g., different floor levels and orientation of units in the multi-storey apartment blocks with potential for different indoor comfort situations).

Qualitative interviews

This paper presents the results of the in-depth qualitative interviews. In so doing, it looks at linkages between human and climatic systems that exacerbate heat-related vulnerabilities. A qualitative approach can provide deeper insights into how vulnerabilities are constructed by allowing interviewers to go more in-depth and pursue follow-up questions. Understanding why specific households (more than others) are vulnerable to heatwave impacts is a prerequisite to developing effective responses (Brown & Walker 2008). Such adaptation needs to be understood as a socio-ecological practice embedded in people's daily practices (Farbotko & Waitt 2011).

Therefore, the qualitative interviews conducted in this area aimed to elicit residents' perceptions of heat, and their strategies for dealing and coping with heat-related stressors. These semi-structured interviews were conducted based on an interview guide with open questions. The sequence of questions varied, as did the depth with Figure 1: Housing mediating heat in the hazard-of-place model of vulnerability.

Effects of climate such as heat (exacerbated by global warming and urbanisation driving urban heat island effects) in a particular place get mediated/ filtered by housing. Housing, in turn, is determined by social fabric (What kind of housing can households afford?) and geographic context (In which localities do households reside?).

1

See: Census of Republic of India (https://en.wikipedia.org/ wiki/List_of_million-plus_urban_agglomerations_in_India, accessed 29 April 2022). **Figure 2:** Location of the resettlement colony in Vijayawada, Andhra Pradesh, India.



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which each one was dealt with in each interview, following the model of responsive interviewing (Rubin 2012: 7).

Interviews, on average, lasted 30 minutes to one hour and were translated and transcribed from the local Telugu into English by students who functioned as translators. An extensive research diary kept during the entire fieldwork allowed for continuous reflection on observations during interviews. Based thereupon, minor reframing of questions was enacted in the briefing and debriefing of translators and in conducting the interviews. Throughout the research, this allowed for adaptation and fine-tuning of the investigative approach.

Interview transcripts and field notes were analysed by reading and coding text sections, retaining participants' language and concepts as much as possible. Data was compared to construct categories, and to organise and explain them. Memos were written to record impressions and explore relationships. By comparing different data, it was possible to have more confidence in the validity of the finding. The interviews conducted in Vijayawada looked at how and when heat is perceived as a burden by residents of low-income neighbourhoods. The interviews also identified the coping strategies already applied by residents, and influences of local microclimate on residents' perception of heat. The results allow understanding if/how buildings contribute to reducing the impacts of heat on residents and how the interviewees navigate and negotiate such potential/perceived protective properties.

This article focuses on distinct but overlapping theoretical accounts derived from these interviews, using the lens of a housing-health nexus: It first looks at how housing mediates the effects of urban heat and, thereby, determines how strong the inhabitants feel heat and how much heat represents a burden for them. It then investigates how these combined effects impact residents' health. Finally, it concludes by looking at which consequences these perceived health outcomes of residential heat have on low-income households' livelihoods. Other theoretical accounts uncovered include: gender differences in perception of heat, tolerance of heat, and attitudes towards technology-based coping strategies. For reasons of space, these will be described in articles elsewhere.

Thermal-sensation survey, field measurements, and thermal simulation

To probe residents' heat perceptions with thermal measurements, triangulation was enabled by the following means of data collection:

- Based on a technical survey of the respondents' homes, a detailed three-dimensional thermal model of individual and apartment housing units was elaborated in DesignBuilder software. This simulation used an extrapolated TMY file of Vijayawada from Meteonorm as weather file. This thermal simulation helped to gain a clear picture of the thermal performance of the investigated homes throughout the year, thereby identifying peak temperatures and periods of extreme heat.
- Using a Testo-480 and thermal imager camera, temperature, humidity, air velocity and iso-thermal



images were recorded and mapped, for an exemplary day, following the due protocol (Benton et al. 2020, Johansson et al. 2014). These measured data were used for validating the simulated results.

 A thermal sensation survey was performed in all the interviewed households. This thermal sensation survey was developed based on Ashrae 55 thermal comfort standards. It served to assess the thermal perceptions of the residents in relation to the temperature readings.

Results

Existent heat-coping strategies in housing and their limitations

A recurring statement of interviewees went like this: 'We don't bother about heat; we are used to it.' This quote indicates that tolerance of heat functions as a coping strategy for residents. Other coping strategies often mentioned include: drinking more (water, buttermilk, etc.), covering one's head in direct sunlight, and wetting curtains and other textiles. Most of these were mentioned by all the interviewees. They focus on the respondents' bodies rather than on the buildings inhabited. Asked about the sources for knowledge of such remedial measures, most interviewees referred to socialisation: They had seen their mothers and grandmothers doing so or said that this 'is simply in our blood'.

While most interviewees perceived staying at home as advantageous (in terms of perceived lower temperature indoors) during morning and midday hours, the picture starts to change during and after the hottest hours of the day. Most interviewees indicated heat to be most prevalent between 11 am and 4 pm. Several households – both in single-family units and apartment blocks – reported that they would start sitting outside in the shade (of trees or buildings) after 4 pm. This behaviour is partly due to their houses and flats heating up and turning uncomfortably hot in the afternoon and evening. However, mostly they sit outside to chat with neighbours and relax. This behaviour thus has both climatic as well as social reasons (see Figure 4).

For most of the day, the interviewees evidently regarded their homes as a means of protection against hot, direct sunlight. This ascription is counter-indicative to the results of both temperature measurements and simulations in these buildings: Results for all investigated homes show average indoor temperature for all cases constantly ranging above 30°C, with the highest temperature up to 50°C for some hours. Indoor temperatures are always higher than those outside for 24 hours of the day. Temperature differences between indoors and outdoors get especially stark during and after the hottest hours of the day. In terms of thermal protection, people's homes are, therefore, by no means the protective devices that residents perceive them to be. These buildings only protect residents against direct sunlight.

The dissatisfying indoor temperatures are hardly surprising from a technical point of view. As was found in the technical survey conducted along with the interviews, these buildings lack any heat-protective properties. They are made of hollow block walls, which do not dispose of sufficient thermal mass to dampen and buffer peaks in Figure 3: Housing schemes of the resettlement colony in Vijayawada, Andhra Pradesh, India: row housing and multistorey apartment blocks.

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heat. Neither are these walls insulated in any way that would help uncouple the indoor temperature from the outdoor. Moreover, while wall openings are equipped with shutters and therefore provide external shade during the day, many interviewees report that due to a lack of mosquito nets, they keep these shutters closed even during the night to prevent mosquitoes from entering the house. In turn, these closed shutters block ventilation, which could cool down buildings with the help of fresh night air. Due to these technical shortcomings, the houses fail to live up to the heat-protective role assigned to them by residents.

Most households had no choice in selecting their homes, whether row houses or apartments in multi-storey buildings. They also had no say in the design of their homes regarding climatic conditions, for example, for openings to enable ventilation, shutters and shades. They had to accept what was provided to them by the authorities.

In the interviews, it became apparent that not being able to alleviate inconvenient climatic situations leaves many residents with a genuine feeling of helplessness in the face of external powers. The government provided them with their inadequately designed homes, and they cannot afford any improvements.

Figure 4: Example of housing of interviewees, Vijayawada.



Most of the low-income households interviewed in this study live in crowded housing of inferior quality, which cannot sufficiently protect them against severe heat waves. The incomes of the interviewees are insufficient to purchase or run a fan even though they may have access to electricity (*Sustainable Energy for All* 2020). They are thus subjected to energy poverty, which is generally understood to constitute a condition whereby people cannot secure adequate home energy service – be it due to lack of grid connection or affordability (Sareen et al. 2020).

Health-related problems due to residential heat

Interviewees generally referred to health-related problems due to heat rather vaguely as 'heat stroke', indicating symptoms like vomiting, dehydration and exhaustion. Some mentioned rashes due to excessive sweating, especially in children.

Furthermore, the presence of mosquitoes was found to be linked to the situation in some interviewees' immediate surroundings. They complained that open sewers were not adequately cleaned with sufficient frequency. Therefore, the sewers regularly get clogged with garbage. Stagnant water builds up in these sewers, which, in turn, attracts mosquito breeding. With mosquitoes breeding so close to their windows, residents have to make a rational choice: They keep shutters closed during night-time to prevent mosquitoes from coming in and potentially infecting them with malaria, dengue and other infectious diseases. However, this also keeps much-needed cool night air out and increases heat loads on residents.

The impact of residential heat on livelihoods

While most interviewed women tended to indicate that they were used to heat, men openly cited a range of instances of when and how heat was a burden to them. Many male interviewees are engaged in informal manual work, mostly outdoors. The interviewed women mostly stay home during the day and care for their children. Due to their work, men are more exposed to direct sunlight during the day.

One interviewee can exemplify these linkages: As her husband is a manual labourer with the city cooperation office, he often works outside (to clean tanks, sewers and the like) and gets affected by heat strokes. Due to this, he had to take sick leave for several weeks during the summer preceding the interview. At the same time, she mostly stays at home and does not report any heatrelated health problems.

Slightly contrary to this, another male resident reports difficulties faced at home as well:

'We come home after working all along the day; at least we expect a peaceful sleep during the night so that we can go for work the day after. But we are not able to sleep in the house.'

This lack of sleep due to heat in the house combined with heat during the workday can take a heavy toll, as the same interviewee explains:
'Because of these extreme heat conditions, we stopped our works for almost two months.'

It is apparent that not being able to work due to either heat itself or heat-induced illnesses/sleeplessness represents a significant problem for daily workers and selfemployed alike. In the informal labour market, each day without work is equivalent to a loss of income. These examples demonstrate how summer heat negatively affects the income of poor households. Not being able to work at all or working less invariably diminishes their earnings during sweltering days. As a consequence of loss of income due to heat, one male interviewee even mentioned plans for international labour migration.

The role of housing

While interviewees see buildings to be essential means of protection against heat stress, design restrictions and cheap building materials limit the effectiveness of this protection, especially during the evening and night-time.

The study revealed how daily practices of dealing with climate-change impacts, such as extreme heat, are intertwined with people's perceptions, attitudes and social activities. Therefore, attempts to promote these communities' resilience need to consider the embeddedness of such practices in community life. Acknowledging that homes are people's primary means of protection against heat demands improvements that make buildings satisfy these necessities. In so doing, an agency needs to be vested in residents choosing solutions they are comfortable with.

This study looked at how residents interact with their built environments daily, and how these environments hinder or support residents in their striving to cope with extreme heat. Identifying supportive and obstructive features allows for deriving recommendations for planning future low-income settlements and improvements in existing ones. Buildings play a significant role in the way people cope with high summer temperatures in their cities. Five central thermal agents of built structures feature in respondents' statements: insulation, thermal mass, shade, ventilation and vegetation. The relevance of these agents regarding heat protection, how interviewees referred to them, and possible improvements are swiftly pointed out hereafter.

Insulation

One primary function of any building material is to – at least partly – disconnect the indoor temperature from the outdoor, be it to keep the interior warm during cold outside conditions or cool during hot weather. The efficacy in doing so obviously differs considerably in different materials. The most effective insulating materials are denominated as 'insulation', such as petrochemical products applied as external insulation on brick and concrete structures in moderate climates of industrialised countries. However, other, biodegradable materials such as hemp and straw likewise function well in decoupling the internal environment from the external. In either material, it is primarily the air enclosed in myriads of infinitely tiny cavities within the material that provides the insulating effect. None of these materials is at play in the houses of those interviewed for this study. Consequently, indoor temperatures differ only slightly from those outside (even though some lagging-behind and dampening in absolute temperatures may be present due to thermal mass – see below). Still, some references to the insulating effects of biodegradable materials were made by interviewees who mentioned putting leaves and/or grass on their roofs for cooling. As long as these are freshly cut, their cooling effect may be due mainly to the evaporation of the water contained. Later on, enclosed air might come into effect. Nevertheless, it must be doubted whether this effect is substantial as this air is not disconnected from surrounding airflows and thus gets quickly heated up.

Undoubtedly, insulation would be one of the most effective ways of protecting residents from excess heat. For the row houses in the investigated colony, insulation of the flat roof could help dampen the room temperatures below. However, not only are interviewees not aware of this option - as it does not correlate with local building habits, and the roofs are often in use for activities such as drying laundry and sleeping outside - nor are they able to afford it. Still, one interviewed household had constructed a makeshift hut of palm leaves on the roof, and while this structure itself often gets uncomfortably hot, residents indicated that overall temperatures in the rooms below were now slightly lower than before the hut's construction. This improvement is most certainly due to the shading rather than the insulation effect of the hut, but demonstrates how residents apply their limited resources for minor adaptations.

Thermal mass

The hollow bricks and concrete used in most respondents' houses can absorb heat, utilising their thermal mass during the daytime but start overloading during evening hours. During cooler night hours, walls charged with heat emit this and thereby keep residents from sleeping – as a consequence, many respondents indicate sleeping outside regularly during the hottest months. Despite the crucial influence of thermal mass (or lack thereof) on the respondents' daily thermal comfort, only one interviewee explicitly mentioned different (thermal) qualities of bricks as impacting indoor conditions. On the other hand, nearly all respondents described the inconvenient heating up of their homes during the afternoon and night hours. In any way, changes in building mass are clearly beyond all interviewees' sphere of influence. Some of them later added extensions to these buildings. In doing so, they were likewise restricted by both the preexistent design of the core house as well as their plot and their financial limitations.

Shading

The given house or apartment per se serves as the most prominent shading device of the interviewed households, especially for women and kids staying at home during the day. Additionally, trees were cited as providers of convenient shade and locations for interaction with neighbours simultaneously. In two cases, the given house's veranda was also mentioned as providing shade and ventilation during hot afternoon hours. Apart from

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2

Vastu shastra is a traditional Indian system of architecture. It incorporates traditional Hindu beliefs. Design, according to Vastu, aims to integrate architecture with nature, the relative functions of the structure, and ancient beliefs utilising geometric patterns, symmetry and directional alignments.



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that, hardly any horizontal shading devices are used, while vertical, moveable window shutters keep out direct sun during the day and prevent hot air from entering. Closed shutters leave the interior in relative darkness throughout the day, but inhabitants do not conceive this darkness as inconvenient. The respondents did not mention horizontal and/or flexible shading in front of windows and building facades or over street spaces as an option even though, from a thermal point of view, these would represent improvements worth considering.

Ventilation

Renters and house owners alike did not have any means of influencing the design of their buildings and flats regarding possible or blocked ventilation, and can do hardly anything about it now. In several instances, they were found to intentionally block windows, either to prevent smoke in the kitchen from penetrating to other parts of their premises or to keep out mosquitoes. With adjacent buildings close by, respondents found it challenging to create convenient airflows through the buildings due to traditional design considerations of Vastu.² Minor setbacks exist between single units in the particular rehabilitation scheme where interviews were conducted. More detailed CFD (computational fluid dynamics) simulations of micro-scale flows could help explore options for improved ventilation in these buildings.

Vegetation

In abundant literature on climate change adaptation, the targeted planting of trees and vegetation, more generally, is shown to provide residents with much-needed shade within their neighbourhoods in urban areas (e.g., Benedict & McMahon 2002, Haase et al. 2017). Improvements of such kind require small-scale investments for seedlings and a clear designation of responsibilities for care and maintenance, such as regular watering. Local authorities are often hard-pressed and too underfunded to satisfyingly live up to this responsibility. In this dilemma, engaging residents in such activities in their neighbourhoods may emerge as a pragmatic and empowering solution. On the other hand, it can also influence their already constrained time and resources, and the availability of water resources to keep vegetation alive might be a challenge.

Conclusion and discussion: housing as a mediator in promoting health and wellbeing

Thermal properties of building materials have been studied extensively, and passive solar design has been frequently tested for its virtue in keeping buildings cool under hot outdoor conditions (Raman et al. 2014). More effort is needed to find low-cost solutions on a mass scale in the Indian context. Thermal simulations of large-scale resettlement colonies such as the one studied here in Vijayawada need to be run. Thereby, it would be possible to assess the potential of night-time ventilation and identify alternative building designs and material choices that can still satisfy budgetary requirements while providing a better thermal environment and heat protection. Thereby, heat-related health risks for residents can be limited, and thermal comfort increased.

Health

In existing colonies, the most low-profile measures for alleviating heat stress can only target heat problems indirectly. Safeguarding regular and sufficiently frequent garbage removal, especially from open drains near homes, is one indirect approach to increasing the thermal comfort of households. This measure will help avoid drain clogging, stagnant water, mosquito breeding, and the consequent necessity of blocking openings for much-needed night-time ventilation. Recurrent provision of mosquito nets to the affected households could likewise address this hindrance for thermal relief.

Livelihood

Investigating how heat, mediated by housing, affects the livelihoods of residents, this study found that critically uncomfortable indoor temperatures impact not only the residents' health. These uncomfortable temperatures also imprint on their livelihoods: Constantly bereft of refreshing night-time sleep, they have to report to work in an already compromised bodily status, and consequently, their long-term productivity gets affected.

Beyond this influence via the mediation of buildings, heat further threatens the incomes of poor households. Those earning their daily wages outdoors are mostly low-skilled, low-income manual workers in informal working arrangements. Physically, they are the most-exposed to urban heat and, consequently, may be incapacitated by heat in such a way that they are not be able to work and thus earn money. Cases of heat-induced illnesses and deaths are expected to rise in number (Gasparrini et al. 2017). Household budgets that are already limited today will get even tighter in the years to come due to excessive heat.

Looking at urban heat through the lens of the housinghealth nexus helps reveal the multi-dimensionalities of poverty. This poverty goes way beyond just housing itself: Extreme heat, via the mediation of poor-quality housing, also affects livelihoods and can thus potentially start a downward spiral (less productivity due to bad health means less income, which in turn further restricts budgets for heat protective measures in the home).

This lens also makes clear how future extreme-heat events induced by global climate change can impact the lives and livelihoods of low-income residents, especially in resettlement and rehabilitation schemes in India. By doing so, it becomes evident how the residents' health and livelihoods in times of heat waves hinge on the heat-protective qualities of their homes. These interdependencies would have remained unclear when only looking at health, housing or livelihood in isolation. By contrast, an integrated view of these aspects reveals how improvements in housing can further resilience to heat regarding both health and livelihood. Considering the well-established link between poverty and ill-health (Vaid & Evans 2017), the critical role played by housing in promoting health and well-being becomes immediately apparent.

The Nexus Between Human Well-Being of Peri-urban Communities and Ecosystem Services A Case Study of Panju Island, Mumbai Metropolitan Region, India

Anirudh Somadas, Sandeep B. Menon, Javier Martinez, and Funda Atun

The well-being of humans depends on the natural environment in multiple ways. For example, the benefits we receive from the natural environment – ecosystem services – play a major role in sustaining our well-being. The dependency ranges from food and fibre, as provisioning ecosystem services, to enjoying a beautiful landscape, as a cultural ecosystem service. However, the question is whether everyone receives these benefits in the same way. Does assessing the cumulative availability of ecosystem services translate to well-being outcomes? No, multiple factors mediate the outcome, such as the capabilities of individuals (e.g., education level and skills). Current mainstream ecosystem service research does not consider these mediating factors and focuses on aggregated perspectives. This is because such explicit characterisations are complex in large-scale studies. This study investigates such aspects at a micro-level through a bottom-up approach. It explores the availability, use, and changes related to ecosystem services at an individual level. It highlights the importance of such ecosystem service information in the local-level decision-making process and management.

Der Zusammenhang zwischen menschlichem Wohlergehen in Stadtrandgemeinden und Ökosystemleistungen: Der Fall der Insel Panju, Metropolregion Mumbai, Indien

Menschliches Wohlergehen hängt in vielfacher Hinsicht von der natürlichen Umwelt ab. So spielen etwa Vorteile, die wir aus der natürlichen Umwelt beziehen - Ökosystemleistungen - eine wichtige Rolle für unser Wohlbefinden. Dieser Zusammenhang schließt etwa Nahrung als bereitstellende Ökosystemleistungen ebenso ein wie Freude an einer schönen Landschaft als kulturelle Ökosystemleistung. Die Frage ist jedoch, ob jede/r diese Vorteile auf die gleiche Weise erhält. Führt die Bewertung der kumulativen Verfügbarkeit von Ökosystemleistungen zu Wohlergehen? Nein, mehrere Faktoren beeinflussen das Ergebnis, wie zum Beispiel die Fähigkeiten einzelner Personen (z.B. Bildungsstand). Die aktuell vorherrschende Forschung zu Ökosystemleistungen berücksichtigt diese vermittelnden Faktoren nicht und konzentriert sich auf aggregierte Perspektiven. Dies liegt daran, dass solche expliziten Charakterisierungen in groß angelegten Studien komplex sind. Die vorliegende Studie dagegen untersucht diese Aspekte auf Mikroebene durch einen Bottom-up-Ansatz. Sie betrachtet die Verfügbarkeit, Nutzung und Veränderungen im Zusammenhang mit Ökosystemleistungen auf individueller Ebene. Sie unterstreicht die Bedeutung solcher Informationen über Ökosystemleistungen im Entscheidungsprozess und Management auf lokaler Ebene.

Introduction

This study was triggered with a thought-provoking question on how the nexus between ecosystem services and human well-being can be operationalised. It is well established that ecosystem services (ES), understood as the benefits humans receive from nature, are indispensable for their survival and well-being (Cumming et al. 2005). The interlinks between human well-being and ES define human beings' benefits from nature and their contributions to well-being (Burkhard, Petrosillo & Costanza 2010, Costanza 2000). At the fundamental level, the survival of human beings on Earth depends on the benefits that societies receive from nature (Pakzad, Osmond & Corkery 2017). Costanza argues that the benefits provided by assessments of interventions to conserve ecosystems show that the benefits are more significant than the actual costs of interventions (Sangha, Le Brocque, Costanza & Cadet-James 2015). Assessments of ES in economic metrics convey the controversial message of substituting ES with money and support of the idea of short-term, non-sustainable solutions. Although such assessments, at a large scale, support the policymaking process, they are not inclusive as they miss out on local perspectives.

The benefits received from ES account for one or more components of well-being, such as providing basic materials for a good life and reducing vulnerability to ecological shocks (Butler & Oluoch-Kosura 2006, Helka 2016). Global studies on disasters by the World Bank (Dilley et al. 2005) strongly argue that abandonment or changes that occur to ecosystems lead to negative impacts on human well-being, and communities are likely to suffer unduly. So, exploring the changes occurring in ecosystems is essential for a holistic understanding of interlinks between ecosystem services and human wellbeing (Ramirez-Gomez et al. 2015). Natural and anthropogenic are the two significant drivers of change; both act as direct (e.g., land-use change, management practices) or indirect drivers (e.g., climate, weather events) of change based on the situation. Seasonality (natural driver) is also an important dimension. Interannual variability in the benefits received from ES significantly impacts the transitory nature of human well-being (Leitão, Ferreira & Ferreira 2019, Pereira, Queiroz, Pereira & Vicente 2005).

Assigning generalised importance and values to ecosystems is often problematic and challenging due to differences in perception among stakeholders (Cordero, Suma, Krishnan, Bauch & Anand 2018). A perception-based

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assessment of ecosystem services is required to tackle the differences and assign values (Deka, Tripathi & Paul 2019) because the behaviour of human beings towards ecosystems depends on how they perceive this relationship. Many factors influence this variation, for example, a fisherman and a farmer perceive benefits from ES differently, and this difference determines their behaviour towards ecosystems. So above-mentioned variations and differences are often masked by current monetary measurements, which consider annual average production and consumption measures as indicators of well-being or growth (Dercon, Hoddinott, Krishnan & Woldehanna 2012). Non-monetary assessments, including the concept of capability (Sugden & Sen 1986), can be brought in to understand and differentiate how different stakeholders enjoy the benefits of ES.

Despite the well-known importance of ecosystems, many principles of human-environment relationships are not well explored, especially in a country like India with diverse cultures and ecosystems. This research focuses on Panju Island, an estuarine island (it reduced the complexity of interconnected ecosystem services and the problem of defining ecosystem boundaries) in the peri-urban region of Mumbai. The study focuses on the temporal changes to the traditional livelihood/occupation of the Panju Island dwellers. It explores the role of ecosystem services (ES) on the island and the threats posed by the extreme weather events triggered due to climate change. The topic of this case study is situated in the domain of island ES and the well-being of their communities (Millennial Ecosystem Assessment Vol. 1 Ch. 23, Balzan et al. 2018). In particular, those ES are associated with Mumbai's coastal environments (Chouhan et al. 2016). The supply of small island ecosystem services is particularly vulnerable due to limited resources and the ecological fragility of the systems they rely on (Balzan et al. 2018).

The approach chosen to understand human-environment relationships from nonaggregate perspectives highlights the need for instruments that support informative and inclusive local decision-making. Furthermore, it looks at understanding participatory and sectorally coordinated approaches to sustain local well-being and ecosystem services.

To untangle the complex interlinks between human well-being and ES, the perception of different stakeholders is essential because they are the active managers of ES (Maes et al. 2014). One of the experienced utilities mentioned is the human aversion toward nature. It is stipulated in the biophilia hypothesis that contact with nature or the environment is fundamental to the wellbeing of human beings (Tzoulas et al. 2007). It is important to look at different ecosystems and their contributions to well-being, how humans perceive the current state of ecosystems, and their aspirations to contribute to well-being. This study is an approach to exploring



Figure 1: Study area map. The map is based on the inputs received from the residents of the island and satellite imagery. Source: First author. such perceptions by conducting semi-structured interviews and participatory mapping.

In this study, stakeholders benefiting from ES are the island residents. The experts are the environmentalists, researchers, and people related to the local self-government involved in similar research, policymaking, and governance. The major focus of this study is the island residents and their perceptions.

Methods

This study followed a mixed-method approach (Bryman 2016). Participatory learning for action plans (PLA or PRA) is a methodology followed by many NGOs and government organisations to build common perspectives in urban and rural development studies and projects (Ricaurte, Wantzen, Agudelo, Betancourt & Jokela 2014), and it served as the base for the methodology we formulated for this study.

The methodological approach adopted for this study emphasises the stakeholder-identified issues and their priorities. The study was divided into three phases: 1. Secondary data collection; 2. Field visit /primary data collection through participatory GIS; and 3. Data analysis-synthesis.

In the first phase, scientific and grey literature were collected to understand the social and environmental history of the study area, and it was crucial to operationalise the main aim of this study. During the field visit in December 2019, the first author carried out participatory GIS mapping and semi-structured interviews to explore the geographic distribution of various environmental services and the values the island's residents assigned to them. The initial sample size for the semistructured interviews was estimated to be 90, with a 95% confidence level and confidence interval of 10 (considering the total population is 1358 according to the census [Government of India 2011]). However, to avoid issues with no data and possible uncertainties with data quality, we carried out 130 semi-structured interviews with 108 valid responses. We identified key issues and stakeholder priorities and compared them with the secondary data. To triangulate the results, findings from different methods were used. The primary source of data was the 130 stakeholder semi-structured interviews. The findings were compared with the literature collected during the secondary data collection stage and expert interviews at the end.

The interlinks, synergies and trade-offs between communities and ecosystem services

Panju Island lies in Vasai Creek (Figure 1), north of the greater Mumbai region in India. It has a maximum elevation of one metre above mean sea level. The island comprises around 1358 residents on 600 acres of land with approximately 400 houses. The island margins have mangroves, and the interior of the island has been cleared for cultivation and saltpans. The ferry is the only safe transport mode available to the village. Residents of Panju were initially farmers and fisherfolk, and some are into sand excavation and salt production (salt pan) (Dabre 2019).



The study identified many bivariate relationships between different ecosystem services. There were incidents where ecosystem management practices of one ES led to another indirect benefit; for example, saltpans do not just support the livelihood but also act as regulating ecosystem services to mitigate flood damage. The relationships identified were positive and negative. An example of a positive relationship is the government rules and regulations that prevent the residents from extracting timber from the mangrove forests, directly contributing to the quality and extent of the mangroves in the study area. The awareness campaigns regarding the protection of mangroves have also had an effect on influencing the community's perceptions regarding the flood protection aspects rendered by the mangrove forests. An example of the negative relationship is the sand-mining industry as a provisioning ES. Even though it may provide temporary employment to the community, it will also lead to long-term environmental damage.

Stakeholders and experts identified nine major ES¹ (Table 1, Figure 2). The presence and continuous supply of these are essential for the well-being of the island's residents. In addition, changes that happened to two of them (agriculture and saltpans) negatively affected their well-being. Proper management and policy instruments can positively impact these ES provisioning areas and ensure the well-being of the stakeholders. Saltpans are the most important among them. They support the livelihoods of the stakeholders and have efficiency in regulating floods. In addition to that, saltpans also have cultural values associated with them. The stakeholders have been involved in saltpan work since the last century (for over 90 years); their life and culture have evolved around it. It contributes to their sense of belonging to the place and aids in social cohesion.

Results

The well-being of stakeholders, in general, retains various levels of dependency on multiple ecosystems of the study area. However, dependency on the ecosystem does not mean that the stakeholders' well-being is completely dependent on the ecosystem services provided by the local ecosystem. The study also identified two major interrelated factors that significantly influence the dependency and perception of different

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Figure 2: Major ecosystem services identified in the study area. Each circle represents a type of ecosystem service (provisioning, regulating, and cultural), the overlapping area indicates the same ecosystem provides more than one type of service. Source: First author.

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Saltpan, agriculture, fishing, mangroves, freshwater, fruits, medicinal plants, spiritual values, and other vegetation.



Figure 3: Skill level plotted against age.

ecosystems. They are livelihood activity and safety (in terms of natural disasters [flood], perception about future safety and safety in terms of livelihood). They are directly related to all other dimensions of well-being. The skill levels of the community members were analysed based on the skill classification scheme (OECD & The World Bank 2013) and plotted against the age of the individuals. The findings of this study are considered valid owing to the poor rural nature of the island, which is situated in a vulnerable geographical location and consistent with the literature on island ES (Balzan et al. 2018). The four trades in which the island residents are involved (livelihood activities: agriculture, saltpans work, fishing, and sand mining) have predominantly shaped their culture and ways of living. Their skills are also based on these trades. Most stakeholders still belong to skill level 1 in the skill classification scheme (Figure 3). The results of this part of the study agree with the response from one of the experts:



"All three major trades have been stolen away from the people of the island: sand mining is illegal, saltpans have been taken over by private companies, bad weather, and the lack of proper infrastructure not supporting agriculture. Most children there are first-generation learners."

The stakeholders who work in the areas outside the island are a part of the unorganised sector, and their jobs are either temporary or seasonal in nature.

The change in income levels at different seasons (Figure 4) indicates the vulnerability faced by the residents during the monsoon months attributed to various external factors, including bad weather and lack of transportation to the island due to the suspension of ferry services in the heavy rains. Resource availability and livelihoods also shape their food habits and food systems. One of the experts mentioned that the 'availability of fish and allied edible crustaceans - prawns, crabs, etc. – is important to the stakeholders because it is a part of their diet'. This can be related to nutrition issues mentioned by the stakeholders.

The lack of proper skills is a factor that influences other dimensions. Due to the lack of proper skills, most residents do not earn well. However, they possess skills in their traditional occupations (agriculture, saltpans, fishing, sand mining), and most want government interventions to support those trades. Most households on Panju Island have a combined household income of less than or equal to 20,000 INR (235 euros) per month. For the same reason, the newer generation tends to leave school early as the families do not have enough resources to support them (e.g., to pay for tuition and

in income



travel). As these trades shape the community, their social relationships are based on this.

Based on their knowledge and livelihood activities, the stakeholders perceive and value ecosystem provisioning areas differently in the study area. Figure 5 shows the hotspots of ecosystem services. The hotspots were identified based on the number of responses received from the residents during the participatory GIS exercise.

Table 1 shows the values mentioned by the stakeholders. Abundant values are the ones that are direct and per-

Ecosystem Services Hotspots

ceived by the stakeholders. Rare values are the ones that are not visible or not perceived by everyone. Threats are the drivers of change that affect the provisioning area or ecosystem and influence abundant and rare values.

The participatory mapping results suggested that a larger share of the stakeholders is aware of the island's ecosystem services provision. Furthermore, Figure 6 (right box)

ES provisioning area	Abundant values	Rare values	Threats
Saltpans	Provides livelihood Sense of place and belonging Supports the local economy	Flood prevention	Government rules prevent the residents from own- ing the land Increased taxes Opening of saltpans for new development
Agricultural land	Provides livelihood Supports the local economy	Sense of place and belonging. Ensures local food production	Due to the zoning regulations, the residents are not allowed to sell the land or construct new infra- structure required for efficient farming
The creek (fishing)	Provides livelihood	Importance in the local food sys- tem and nutrition	Lack of external support for maintenance
The creek (sand mining)		Provides livelihood; this is a rare value as it is not considered a legit- imate activity	CRZ rules prevent sand mining Unsustainable and large-scale sand mining may lead to ecological problems
Mangrove	Flood prevention Timber The role of mangroves in maintain- ing marine fish quantity (Anneboi- na & Kavi Kumar 2017)	Medicinal plants	
Freshwater pond		Provision of freshwater Provision of water for agriculture	These ponds are not being appropriately managed after implementing the freshwater pipeline from Bhayandar, south of the island

Figure 5: Frequency of

ES mentions. Source: First author.

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Table 1: Ecosystem services (ES), abundant values, rare values and threats mentioned by stakeholders.

Figure 6: Ecosystem service categories. The classification of stakeholder's responses was done based on MEA 2005. Source: First author.



ecosystem service



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shows two land parcels assigned cultural and provisioning ES values.

The study identified five important ecosystems that have a direct and indirect relationship with different well-being indicators. Saltpan, agriculture, and the creek are the top three among the others with a strong relationship with material and non-material well-being indicators (Figure 7). Figure 7 also shows the important drivers of change that have affected the provisioning of different ecosystem services; it helps decide where to focus while designing a policy instrument or planning an intervention.

Conclusion, reflection, and further implications

This study aimed to explore the nexus between ecosystem services and human well-being. In summary, the well-being of stakeholders is not primarily dependent on locally produced ecosystem services, but dependency is on a much larger scale. However, changes in local ES have impacted their well-being to an extent. Regarding the relationship with well-being, the factors of livelihood and safety directly and indirectly influence all dimensions. Livelihood is considered the most important by the stakeholders (Figure 7). Regardless of the direct dependency on ES, most residents recognise the major ecosystem services: agriculture, saltpans, fishing, and sand mining. Even though everyone recognises the values, the presence of one ecosystem service does not have a linear relationship with the well-being outcomes of the stakeholders. The relationship and outcomes vary based on individual capabilities like livelihood activity, skill level, and education. Opportunities to enhance well-being through ecosystem services can be found using the non-monetary evaluation of ecosystem services and combining them with capability.

The methodological approach of measurement at an individual level gives the freedom to analyse at different levels (community and individual levels) and support the decision-making process based on the requirement. The primary aim of this study is to explore the interlinks between ES and human well-being, and how such information can better inform the decision-making process. Existing ideas of ES and well-being use an aggregated perspective. The assumptions suggest that the combined availability of ecosystem services leads to well-being outcomes.

The study complements and contributes to existing approaches exploring the interlinks between human well-being and ecosystem services. The novelty of the approach lies in the efforts made to bring in the capabilities of the stakeholders while exploring interlinks between ES and well-being at the local level. This study identified more effective opportunities that would lead to well-being.

The results of this study showing the interlinks between ES and human well-being could help operationalise ES information in the local policymaking process. The opportunities mentioned or the integrated policy responses suggested are in no way related to bringing back traditional practices or supporting traditional life and livelihood. However, it is more towards making the process more inclusive and highlighting the importance of making the local policymaking process more inclusive and informed by integrating feedback loops in the local decision-making process.

Policies and future plans can be adapted to recognise the implications of the different ES and ensure the community's well-being. Proper management and policy instruments can create a positive impact on the ES. For example, as the most important ES, saltpans must be preserved to keep their role in regulating floods and cultural values contributing to the community's sense of belonging. Mangroves,



Figure 7: This is a comprehensive overview of all the findings from the previous sections. The diagram explains how different ecosystems provide important ecosystem benefits and how this influences different well-being indicators. The blue arrow indicates the relationships the stakeholders assigned more priority to. Source: First author.



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also part of the identity of the village, need to be preserved as they provide provisioning (e.g., firewood, fish), regulating (flood control), and cultural services (e.g., tourism, sense of place). At the same time, decision-making processes can be supported by strengthening awareness about the community's current cultural services and capabilities. As a result of these locally informed decision-making processes, policies could be identified - e.g., to train the community in the skills required to better benefit from available ES.

The current trends of delinking the communities/occupational interdependencies with the local environment seem to lead to the degradation of the local conditions, which in the past may have aided the human well-being on the island. As the need to develop approaches for ES assessments informed by local knowledge is recognised (Balzan et al. 2018), this and future case studies could help build a base for co-designing a context-sensitive ES-language for developing policies.

This study contributes to a better understanding of the major opportunities in well-being at the local level, which can be operationalised with the help of ES information. However, further in-depth sector-oriented research can be done to understand the micro-level issues faced in each sector. For example, in agriculture, the study can be done with farmers to understand issues and opportunities related to farming. The disaggregated well-being outcomes analysis needs to be explored further, especially in rural areas. Policies and development plans with a deeper understanding of the capabilities of rural people and the opportunities available will help people stay where they are instead of migrating to the city for better opportunities. This is very relevant concerning the current issues with internal migration in India.

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Built Form and Energy Transition The Case of Condominium Housing in Mekelle, Ethiopia

Sara Amare Gebremeskel and Tania Berger

Each year millions of people die prematurely from illnesses attributable to household air pollution from inefficient and polluting stoves fired with solid fuels and kerosene. With regards to the transition to cleaner sources of energy in households, the concept of 'fuel stacking' is gaining support in scientific literature, which acknowledges that while households, with increases in income, generally shift towards more-modern energy carriers, they often use several different fuels simultaneously. Against the backdrop of Ethiopia's massive condominium housing programme, this case study explores the implications of living in such multi-storey buildings on household energy usage. Ninety-nine residents and eight members of residents' committees in four selected condominium sites were interviewed, and a focus group discussion was conducted with twelve community representatives and professionals in 2017. The case study found electricity to constitute the significant supply source for all of the investigated condominium households. This finding suggests that living in condominiums pushes households to use modern energy options. This is due to the fact that the buildings provide the necessary grid connection. At the same time, they do not offer residents the required space and facilities to use other energy sources. The mixing of energy sources, which is otherwise often applied by households to increase their security of supply, is thus hampered by the physical built structure of multi-storey condominiums.

Bauform und Energiewende: Der Fall des Mehrgeschosswohnbaus in Mekelle, Äthiopien

Jedes Jahr sterben Millionen von Menschen vorzeitig an Krankheiten, die auf Luftverschmutzung durch ineffiziente Feststoffherde und Kerosin in Innenräumen zurückzuführen sind. Im Hinblick auf den Übergang zu saubereren Energiequellen in Haushalten wird das Konzept des "Fuel Stacking" in der wissenschaftlichen Literatur diskutiert: Dabei wird anerkannt, dass Haushalte mit steigendem Einkommen in der Regel zu moderneren Energiequellen wechseln, aber oft gleichzeitig weiterhin mehrere verschiedene Brennstoffe verwenden, um ihre Versorgungssicherheit zu erhöhen.

Vor dem Hintergrund eines massiven staatlichen Bauprogramms für Eigentumswohnungen in Äthiopien untersucht die vorliegende Fallstudie die Auswirkungen des Lebens in solchen Mehrfamilienhäusern auf die Energienutzung in den Haushalten. 2017 wurden hierfür BewohnerInnen und Mitglieder von BewohnerInnenkomitees an vier ausgewählten Standorten in der nordäthiopischen Stadt Mekelle befragt, und es fand eine Gruppendiskussion mit GemeindevertreterInnen und Fachleuten statt. Die Fallstudie ergab, dass Strom für alle untersuchten Wohnungen eine bedeutende Energiequelle darstellt. Das Leben in den mehrgeschossigen Wohngebäuden gibt den Haushalte fast zwingend vor, moderne Energieoptionen zu nutzen und auf "Fuel Stacking" zu verzichten. Dies liegt zum einen daran, dass die Gebäude die erforderlichen Stromanschlüsse aufweisen. Gleichzeitig bieten sie den BewohnerInnen jedoch nicht den erforderlichen Platz und die Einrichtungen zur Nutzung anderer Energiequellen. Die Kombination von unterschiedlichen Energiequellen, um Versorgungssicherheit – beispielsweise bei häufigen Stromausfällen - zu erhöhen, wird daher durch die physische Baustruktur dieser Mehrfamilienhäusern verhindert.

Energy consumption and housing in Ethiopia

The World Health Organization (WHO) estimates that each year close to four million people die prematurely from illness attributable to household air pollution from inefficient cooking practices using polluting stoves paired with solid fuels and kerosene (https://www.who.int/ news-room/fact-sheets/ detail/household-airpollution-and-health, last accessed 09/11/2021).

When it comes to transition to efficient energy carriers, research has long adhered to the idea of an energy ladder (Masera et al. 2000, Reddy & Reddy 1994): According to this concept, households in developing countries with rising incomes metaphorically ascend the ladder from traditional biomass fuels to more-advanced and less-polluting fuels by increasingly using more-modern energy carriers, preferring electricity and natural gas over crop residues, dung, firewood and other traditional biomass fuels. Electrification is regarded as preferable because it is found to improve indoor air quality by replacing polluting lighting and cooking sources, thereby improving the health status of residents (Peters & Sievert 2015, Barron & Terero 2015).¹

However, the more-nuanced metaphor of 'fuel stacking' is gaining support in scientific literature when it comes to processes of transition to more-modern sources of energy: This concept acknowledges that poor households do not simply ascend the ladder one step after the other but often use several fuels simultaneously even while they generally shift towards cleaner, more-efficient energy carriers (Masera et al. 2000, Leiwen & O'Neill 2003, Pachuari & Spreng 2003). Thus, many households do not stick to just one energy source at any one point in time (Masera et al. 2000). Besides the sheer availability, access and affordability, and considerations on energy security – the flexibility to switch to other sources if one becomes very expensive or unavailable – this energy mix is often also motivated by taste preferences and perceived inadequacies of modern devices to fulfil traditional cooking practices (Masera et al. 2000, Gebreegziabher et al. 2012).

However, it can be observed that users of mixed energy sources tend to rely more on the purchase of wood rather than collecting it themselves (Masera et al. 2000).

On the other hand, sheer availability and access and affordability of related appliances (stoves, cookers and other dedicated devices) are essential factors determining the use of electricity (Gebreegziabher et al. 2012).

Determinants of household energy consumption

Building orientation, building services and energy systems (e.g., space cooling/heating, hot water supply, etc.), building operation and maintenance, occupant activity and behaviour, and indoor environmental quality are the determinant factors in household energy consumption (Steemers & Yun 2009).

While a building as a structure is represented by its architectural layout, materials and HVAC equipment used in the building, many parameters need to be considered when evaluating its energy performance (Virote & Neves-Silva 2012). This may include passive solar usage, indoor and outdoor conditions, ventilation, thermal characteristics of the building (Zhao & Magoulès 2012), occupant behaviour with regards to energy usage, as well as climatic conditions in a specified region (Hassan et al. 2014). Improved understanding of occupant behaviour related to energy usage, in any case, supports a more realistic prediction of a building's energy consumption (Hassan et al. 2014).

Occupant activities and attitudes towards energy consumption are major determining factors in a residential building's energy consumption. A case study in residential areas of Addis Ababa city (Gebreyesus 2016) identifies different purposes that determine household energy consumption, such as cooking, lighting and heating, development level of the country, economic status of the household (socio-economic status as in terms of income and level of education). Household awareness likewise influences patterns and scopes of consumption.²

Energy affordability, supply vs. demand

The majority of the Ethiopian population uses biomass energy such as wood, crop waste and animal dung as their primary energy source, implying heavy dependence on biomass fuels (Kebede et al. 2002). The high consumption of biomass energy has contributed to the continuing destruction of forests and woodlands. With biofuels and waste still comprising nearly 90% of the country's total energy supply in 2019 (see Figure 1), Ethiopia depends more heavily on this energy source than the African continent on average (see Figure 2).

In terms of energy consumption, the residential sector remains absolutely dominant in Ethiopia (see Figure 3). Again, a similar composition of supply sources exists on the broader African scale, albeit less pronounced (see Figure 4).

The mean budget share of poor Ethiopian households for energy supply is 10%, while that of non-poor is around 7%. The dependence of households on biomass fuels significantly decreases with an increase in income. The lowest income group expends 70% of its energy budget on biomass fuels, but the corresponding figure for the richest is only 42% (ibid.).

While 85% of the population of Ethiopia live in rural areas (with less than 10% electricity coverage), electricity supply from the grid is almost entirely concentrated in urban areas (Khan & Singh 2017). By contrast, the dependence on biomass fuels in urban centres varies widely. The shares of biomass fuels range from 26% in the capital



Addis Ababa to 85% in Gondar, an urban centre in the Amhara region. Still, in 2002, a study noted considerable differences in energy usage patterns in Ethiopian cities (Kebede et al. 2002).

Energy expenditure

In a region where average incomes are low, the importance of the relationships between incomes, energy prices and energy expenditure are starkly evident. Across sub-Saharan Africa, the wealthiest 20% of households account for about half of the total residential spending on energy, on average, while the poorest 20% of the population account for around 5% of the expenditure (International Energy Agency 2014). Roughly 40% of the total energy expenditure is on electricity, and 25% is on kerosene, but this picture is distorted by the consumption of unpriced solid biomass (ibid.).

In general, as one would expect, the heavy burden of energy expenditures tends to get lighter as household incomes increase. For instance, energy expenditure in South Africa accounts for around 3.5% of total income, while in Malawi, where income levels are typically much lower, the share is more than double (National Institute of Statistics of Rwanda 2012). Significant disparities in electricity consumption are also evident: In countries with intermediate levels of income, the wealthiest 20% of households tend to account for around 40% of the consumption while, in the extreme case of Malawi, the richest 20% consume more than 80% of the total (ibid.). Urban and rural households are also very different, with urban households typically having higher incomes and better access to electricity services. In Rwanda, for example, more than 40% of urban households report

Figure 1: Total energy supply by source in Ethiopia (1990–2019; in %).

Figure 2: Total energy supply by source in Africa (1990–2019, in %).

Cf to Gezahegn & Gotsch in this issue who study electricity use by households in informal settlements.



ly 4% (ibid, IEA 2014).

her et al. 2012).

Figure 3: Total final consumption by sector in Ethiopia (1990–2019, in %).

Figure 4: Total final consumption by sector in Africa (1990–2019, in %).

Figure 5: Focus group

discussion

However, research has focused on rural energy usage, and little has been found on energy transition in urban areas (ibid.). There is a lack of knowledge on how exactly this

household transition to more-modern energy carriers

electricity spending, while in rural areas, the figure is on-

Given that increases in income and raising education lev-

els are associated with an increased transition to modern

more-modern energy carriers in the country (Gebreegziab-

energy services, recent Ethiopian achievements in both

these areas motivate expectations of further shifts to



takes place and which behaviours motivate it. Furthermore, to our knowledge, the mutual conditionalities of housing and energy transitions in countries of the Global South have not yet been investigated. Therefore, this case study mainly looks at energy consumption in multi-storey urban residential buildings for low-income groups, generally referred to in the Ethiopian context as condominiums.

Condominium housing

Under Section 2 of the Ethiopian Condominium Proclamation No.370/2003,³ a 'condominium' is defined as 'a building for residential or other purposes with five or more separately owned units and common elements, in a high-rise building or a row of houses and includes the landholding of the building'. Generally, a condominium is a multiple-unit dwelling in which there is separate and distinct ownership of individual units and joint ownership of common areas. The building is managed by the condominium association, either directly or through a professional manager. The owners of the individual units are jointly responsible for the costs of maintaining the building and common areas, but they are individually responsible for the maintenance expenses of their particular units.

The Ethiopian Integrated Housing Development Programme (IHDP) was the eighth core component of the Plan for Accelerated and Sustained Development to End Poverty (PASDEP). The PASDEP was Ethiopia's second five-year national strategic plan, which got into action by 2005/06. The IHDP is an urban strategy that integrates initiatives to address poor housing quality and housing shortages, and to reduce slum areas in Ethiopia's main cities by 50%. The programme was initiated by the Ministry of Works and Urban Development (MWUD) in 2005 to increase the housing supply for the low-income population, recognising existing urban slum areas and mitigating their expansion in the future.

IHDP was developed with the intention of clearing all slums within ten years by introducing condominium housing stocks so that Ethiopia could become a middle-income country by 2025 (MWUD 2007). The IHDP aimed at providing affordable housing for those middle- and lower-income households that do not own a house (ibid.). The initial goal of the housing development programme, during the four-year programme period 2006/7 to 2009/10, was to construct 360,000 condominium units in cities (ibid.).

Methodology

While several shortcomings of the IHDP and its implementation have been documented elsewhere (Abate 2011, Delz 2017, MWUD 2007, Weibusch 2017), this case study explores the implication of living in condominiums on household energy usage.

As part of this IHDP programme, 3322 total housing units were constructed and transferred to users in six sub-cities in Mekelle, the regional capital of the Tigray region,⁴ in 2006 and 2007.⁵

Household energy consumption and management constitute one of the challenging factors for affordability in these condominiums. During extensive fieldwork in 2017, this case study assessed energy management in condominium housing according to occupant activity and behaviour. Specifically, it investigated questions regarding the current household fuel usage and monthly average energy expenditure.

An exploratory case study approach was adopted to look at these questions.

This case study was conducted in condominium housing at four sites (Merha Tibeb, Ayder, QelQel Debri, and Quiha). The sites were selected according to their location within the city to represent sites in four different sub-cities. Each site has 8-41 condominium blocks in a cluster; they are G+3 and/or G+4, and with plastered and painted HCB wall façades. Each condominium site has condominium blocks that accommodate studio and one-to-three-bedroom housing typologies.

The assessment of existing energy challenges and household energy management was based on user perception, as elucidated employing surveys. The research was carried out with randomly sampled households in the selected condominium sites. It included different gender, income and occupational groups that had moved to the condominium from different neighbourhoods.

Primary data generation for assessing existing energy challenges and energy management trends was tackled through three methods: In-depth interviews, focus group discussion, and questionnaires. In-depth interviews were conducted with condominium committee members, while a focus group discussion was held with stakeholders and community representatives, and interviews based on questionnaires were used for household respondents.

In-depth Interview: In-depth interviews were designed both in semi-structured and unstructured modes. Extensive interviews were conducted with two committee members of each condominium site (eight in-depth interviews altogether).

Focus Group Discussion: The questions for the focus group discussion were designed to extract the householders' views on energy usage and management. This method was also employed to understand the difference in household energy management in condominium housing and other housing. The focus group discussion was held with twelve stakeholders and community representatives during a local dissemination workshop (see Figure 5).

Questionnaire: This case study's questionnaire addressed condominium dwellers and their dependency on each energy source, their level of satisfaction with each energy type they use, their energy consumption and expenditures, and their ways of management at the household level. The questionnaires were filled by the researchers through guided interviews with total of 103 residents of the four condominium sites in their respective homes. This number amounts to 10% of the selected condominiums' total population (four incomplete questionnaires were not included in the analysis).

The data collected through in-depth interviews, questionnaires and focus group discussion was analysed case by case according to the respondents' housing conditions,



energy consumption and management. Then, the analysed data was interpreted under the categories of fuel-type dependency and monthly average energy expenditure according to the respondents' socio-economic group.

Findings and discussion

In this case study, the energy consumption and management of the interviewed households were scrutinised and discussed mainly in relation to their family size, educational level, economic status and occupation group.

Household energy mix

Contrary to the situation in Ethiopia in general, for most households interviewed in this case study, electricity and charcoal are the significant sources of energy (42% for QelQel Debri, 58% for Merha Tibeb, 52.5% for Ayder and 40% for Quiha). There is thus a considerable contradiction between the primary data gained from the existing condominium sites in this case study, as electricity and charcoal are the primary source of energy for all households, and what is documented in secondary data.

Interviewed households nearly exclusively use electricity when it comes to baking and cooking (see Figure 6), including traditional dishes such as *injera* bread.⁶ Moreover, the absolute majority of respondents indicate that they use electricity for all their energy needs (see Figure 7). The only prominent exception is coffee, which is mainly prepared using charcoal. Coffee is Ethiopia's national drink, and the Ethiopian coffee ceremony is an integral part of the social and cultural life in the country. Residents interviewed in this case study cite improved management of preparation speed and better taste as reasons for using charcoal instead of electricity for coffee brewing (see Figure 8). These findings thus strongly correlate with literature pointing out inadequacies of modern devices to fulfil traditional cooking practices as reasons for sticking with less efficient energy sources (Masera et al. 2000, Gebreegziabher et al. 2012).

In a similar vein, Abate (2011) found, in condominiums in Addis Ababa, that infrastructural provision for electricity was mostly satisfactory for residents (in stark contrast, for

Figure 6: Electric cooking devices.

3

Ministry of Works and Urban Development (MWUD): The Federal Condominium Proclamation, Proclamation No. 370/2003.

4

Since November 2020, armed conflict between the Tigray People's Liberation Front (TPLF) and the federal Ethiopian government has raged in this and neighbouring regions. At the time of writing this article, the outcomes of the same and the implications it will have, also with regards to the further validity of this article's findings, are unclear.

5

Information provided to the authors by Mekelle Housing Development Agency (MHDA).

6

Injera is a sour, fermented flatbread with a slightly spongy texture, traditionally made of teff flour, widely popular in Ethiopia, Eritrea, and some parts of Sudan. It is central to the dining process, like bread or rice elsewhere.



▲
Figure 7: Injera baking devices, powered by electricity.

Figure 8: Charcoal stoves for coffee preparation.

All interviewed households possess their own meter. This finding points to the fact that the necessary infrastructure for electricity usage is in place in all these condominiums.

7 Tł

The *lakech* stove is an improved biomass cooking stove widely used in Ethiopia.

8

During the year of study, one Ethiopian birr was worth 0,038 EUR on average. example, to water and sewage supply, which were largely dysfunctional). This finding demonstrates that sheer availability and access of appliances are provided in the investigated condominiums in Mekelle, and thus a lack of access does not – as frequently documented elsewhere – constitute a hindrance to the usage of modern energy carriers (Gebreegziabher et al. 2012). On the other hand, it seems as if existent infrastructure provision combined with building typology and layout does leave residents with little option other than using electricity: Room layouts in these multi-storey residential buildings de facto inhibit burning wood in traditional three-stone fires. Therefore, living in condominiums does not allow households to use energy options other than electricity, even if this may be unreliable and costly.

As residents thus depend strongly upon the availability of electricity, the question of supply security becomes crucial. Slight differences are discernible in this regard: Respondents in two of the four condominium sites investigated in this case study predominately indicate that episodes of electricity outage generally do occur (and, to a lesser degree, that they occur only from time to time). Interviewees in the other two condominium sites do not or only seldom experience such episodes of power cuts.

In the case of such outages, respondents mostly use charcoal as an alternative. They usually purchase the charcoal (they do not collect it) and use it mostly in traditional iron stoves, although some households use more efficient *lakech* stoves.**7**

The majority of households only occasionally buy charcoal; however, a substantial group (roughly 25% to 50%, depending on the condominium site) indicate even regularly buying it. Some stock it to save for times of high charcoal prices, and they store it on their balconies (see Figure 9).

The exclusive dependence on electricity supply renders residents vulnerable in times of outage: This became extremely apparent with the ongoing armed conflict raging in the entire Tigray region of Ethiopia since November 2020. Power cuts of up to three-week duration have forced people to expend unsustainable costs for extra-expensive candles and portable solar lights for lighting, as well as charcoal for cooking and firewood for baking.

Household monthly average energy expenditure

The households' average monthly expenditures on energy in birr⁸ were analysed in relation to educational status, family size, and income group.

Income group: Mean monthly household incomes in Mekelle ranged between 2100 and 3100 birr in 2014 (Negese et al. 2017). Among the households interviewed in this case study in 2017, 9% had an income of less than 2000 birr, 82% earned between 2000 and 8000 birr, and 9% earned more than 8000 birr per month.

Interviewed households earning less than 2000 birr on average spend 271 birr monthly (or 17.5% of their income) for energy, which is higher than the national average of 10% (Kebede et al. 2002). Households with an average income of between 2000 to 8000 birr pay 323.5 birr per month, and respondents within the income group of above 8000 birr pay 364 birr (or less than 4.4% of their income) for energy. The average absolute monthly expenditure on energy increases along with income increases, while the share spent on energy falls – a finding in line with the literature discussed above.

Educational level: With regards to the households' average monthly expenditure on energy (sum of the electricity and charcoal), the case study found that illiterate households and those with just basic literacy with an average of 378 birr display higher expenditures for energy than those with elementary and higher education levels (320 birr).

Family size is another determining factor that influences average monthly expenditure on energy. Among the visited households, 32% have one to three family members, 44% have between four and five members, 22% comprise six to ten persons, and 3% have more than ten family members. Hardly surprisingly, monthly expenditure for energy increases with an increase in family size.

Conclusions

Literature on Ethiopia's urban energy demand generally demonstrates that most of the country's population uses biomass as a source of their energy supply, even in urban areas (Kebede et al. 2002, IEA 2019). However, this case study found electricity and charcoal to constitute significant sources of supply for all of the investigated condominium households. This finding demonstrates how living in multi-storey condominium buildings pushes households to use modern energy options: Interviewees clarified why they can't use firewood for baking even when power is scarce and costly, and the difficulties they face in storing traditional energy sources and appliances. From these observations in the interviews, it became clear that while the condominiums provide the necessary infrastructure and electricity grid connection, the building typology and the design do not, at the same time, offer residents space and facilities for the use of other sources. The mixing of energy sources often applied by households to increase their security of supply is thus hampered by the physical built

structure. While not outrightly impeding a specific (more traditional, rural) lifestyle of residents, the buildings at least favour a more modern one. Still, many residents keep some aspects of tradition by sticking to charcoal for the preparation of coffee, the country's national drink.

This persistence of traditional energy use is motivated by taste preferences and the inadequacies of modern devices to fulfil traditional cooking practices. In this case study, interviewees cited the difficulty to manage speed of preparation with electric devices as a reason for sticking with charcoal.

Overall, the usage of electricity - instead of more-traditional sources such as firewood and biomass - has clear health benefits for residents: Indoor air pollution by fire and smoke is limited to occasional coffee brewing on the charcoal stoves used for this particular purpose only. However, questions of the security of energy supply remain crucial - as tragically exposed during the current armed conflict in which power cuts force people to expend heavily to cover their most basic energy needs.

This study focuses exclusively on the residents' lived experiences and daily practices related to energy consumption. Further research is needed to explore how these interlink with the overall energy management of the built structure (meso-level) and policy related to housing and energy provision (macro-level).



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Figure 9: Charcoal storage on balcony.



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Social Capital Across Three Different Neighbourhoods in Gondar, Ethiopia

Hone Mandefro and Bekele Molla Ayele

The impact of neighbourhoods on social relationships has always been an area of focus for social scientists. This study examines whether neighbourhood design influences the social capital of residents. It compares social capital across three different neighbourhood types in Gondar, Ethiopia: an inner-city slum (Enkoye Mesk), a squatter settlement at the outskirts of the city (Gefo Kuch), and a condominium (the Aba Samuel condominium). Specifically, the study explores residents' perspectives on their social capital, comparing different dimensions of social capital and factors that affect the development and maintenance of social capital. Neighbourhood social capital is conceptualised to include four dimensions: trust and reciprocity, neighbour attachment, social network, and neighbourhood behaviour. The study followed a concurrent qualitative dominant mixed-methods research approach. Thus, questionnaires and in-depth interview methods were used to collect data. The findings indicate that residents' perspectives about a good neighbourhood across the three different settlement areas were similar. On the other hand, compared to the inner-city slum and outskirt squatter settlement, the condominium residents were found to have the lowest social capital in Gondar. The vertical nature of condominium houses and the divergent backgrounds of the neighbours uniquely contributed to the poorer social capital among the condominium residents.

Sozialkapital in drei verschiedenen Stadtteiltypen in Gondar, Äthiopien

Der Einfluss von Stadtvierteln auf soziale Beziehungen war schon immer im Fokus von SozialwissenschaftlerInnen von SozialwissenschaftlerInnen dar. Die vorliegende Studie untersucht, ob das physische Gestalt von Stadtvierteln das soziale Kapital der BewohnerInnen beeinflusst. Sie vergleicht das soziale Kapital in drei verschiedenen Stadtvierteltypen in Gondar, Äthiopien: ein Slum in der Innenstadt (Enkoye Mesk), eine informelle Siedlung am Stadtrand (Gefo Kuch) und ein staatliches Wohnungsprojekt (Aba Samuel). Insbesondere untersucht die Arbeit die Perspektiven der BewohnerInnen auf ihr soziales Kapital und vergleicht verschiedene Dimensionen des sozialen Kapitals sowie die Faktoren, die seine Entwicklung und Aufrechterhaltung beeinflussen.

Soziales Kapital in der Nachbarschaft umfasst vier Dimensionen: Vertrauen und Gegenseitigkeit, Nachbarschaftsbindung, soziales Netzwerk und Nachbarschaftsverhalten. Die Studie verwendet einen qualitativ dominanten Mixed-Methods-Ansatz, bei dem Fragebögen und qualitative Interviews verwendet wurden. Fragebögen und qualitative Interviews wurden verwendet. Die Ergebnisse deuten darauf hin, dass sich die Ansichten der BewohnerInnen darüber was ein gutes Stadtviertel ausmacht in den drei verschiedenen Siedlungsgebieten ähnelten. Andererseits hatte das Wohnungsprojekt im Vergleich zum Slum in der Innenstadt und der informellen Siedlung am Stadtrand das geringste soziale Kapital. Die vertikale Struktur der Wohnungen im Wohnungsprojekt und die unterschiedlichen Hintergründe der NachbarnInnen trugen zu einem geringeren sozialen Kapital unter den BewohnernInnen des Wohnungsprojekts bei.

Introduction

The impact of neighbourhood characteristics on social relationships has always been an area of focus for social scientists. Nevertheless, there is no agreement on the possible effect of neighbourhood design on social relationships. Sociologists such as Wirth (1938) and others from the Chicago school believed that the size, density and heterogeneity of cities led to impersonality and a high degree of anomie across communities. However, Gans (1968: 25) argues that context is relatively less important in understanding neighbourhood life, stating that 'the neighbourhood plays a minor role in people's lives and their predisposition'. Villalonga-Olives and Kawachi (2015: 1) define social capital as 'the resources available to individuals and groups through membership in social networks', which consist of individualistic approaches, resources that are accessed by individuals through their network connections, and collective approaches, such as the ability of a community to engage in collective action. This study aims to identify the impact of neighbourhood design on residents' social capital in Gondar, one of the

historical cities in Ethiopia, located in the Central Gondar Zone of the Amhara Region of Ethiopia. This study compares the social capital of residents in three different neighbourhoods: an inner-city slum, a squatter settlement on the outskirts of the city, and a condominium.

In Ethiopia, new high-rise condominium neighbourhoods are emerging in the major cities. These neighbourhoods result from the massive Integrated Housing Development Programme (IHDP) piloted in Addis Ababa in 2004 and scaled up to the national level in subsequent years. The IHDP aims to ease the acute housing shortage with the massive construction of houses, thereby creating employment for urban residents.

According to Hamdan, Yusof, and Marzukhi (2014), different neighbourhoods in different localities, with the diversity of their people and surrounding developments, influence the level of social capital dimensions differently. Differences in neighbourhood social capital can arise because there is something inherently different about the neighbourhoods themselves (Subramanian, Lochner & Kawachi 2003). Following the introduction of the condominiums, there has been a perception that the design of these neighbourhoods (which are vertical and densely populated in comparison with other neighbourhoods) has contributed to the weak social interaction among residents (Gezahegn et al. 2011, Ingwani, Gondo & Mazhindu 2010). For instance, a community assessment of the Gotera condominium site by Gezahegn et al. (2011) has put the low level of social interaction as a top community issue.

Although condominiums have been criticised for their unaffordability (Pienaar 2022), many individuals who otherwise could not afford a private dwelling have become home owners. The housing programme has also created job opportunities for hundreds of thousands of unemployed people, mainly in Addis Ababa (UN-HABITAT 2010). For these reasons, the government of Ethiopia decided to continue with the programme while simultaneously exploring policy actions to increase the private sector's contribution in addressing the chronic shortage of housing.

A better understanding of the determinants of social capital in communities can help to create opportunities to foster psychological and community empowerment (Gracia & Herrero 2004). However, there is a lack of research on the influence of the neighbourhood on the social capital of its residents. To do so, this study compares social capital in three different neighbourhood settlements in Gondar. Investing in the issue would help to improve neighbourhood relationships and the quality of life in neighbourhoods in general, and improve social capital in condominium neighbourhoods in particular.

Objectives of the study

The general objective of the study is to compare residents' social capital in three different neighbourhood settlements in Gondar, Ethiopia. Specifically, the study aims to:

- Explore the perspectives of residents about their social capital in three selected neighbourhoods of Gondar.
- Compare different dimensions of social capital in the three selected neighbourhoods of Gondar.
- Identify factors that affect the development and maintenance of social capital in the three selected neighbourhoods of Gondar.

The conceptualisation of social capital

Social capital has been used in various ways and sometimes to mean different things. The discussion presents perspectives, dimensions and determinant factors of social capital to inform the operationalisation of the concept in this article. According to Häuberer (2011), Bourdieu and Coleman were among the first authors to systematically define the term, while Robert Putnam's series of works (1995, 2000) with the title *Bowling Alone* led to the 'routinisation' of the term (Woolcock 2010). Bourdieu (1986: 248-249) defines social capital as: [T]he aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition – or in other words, to membership in a group – which provides each of its members with the backing of the collectively-owned capital, a "credential" which entitles them to credit, in the various senses of the word.'

Coleman (1990) on the other hand, emphasises the structural sources of social capital. For Coleman, social capital is not a possession of an individual but a community or group-level. This discussion on different social capital spheres has led social capital theorists to develop different types of social capital: bonding, bridging and linking social capital. Bonding social capital is defined as 'strong, intense personal relationships, offering mutual support, understanding and exchange', including people nearby like family members, colleagues and friends (Power & Wilmot 2007: 1). Bridging social capital consists of ties with members of other groups with similar economic and political status, such as the relationship between the neighbourhoods (Setarge 2011: 13-14). Linking social capital consists of vertical relations with formal institutions and organisations, which is the level of trust between farmers and extension agents or the staff of government agencies (APO 2006).

Alaimo, Reischl and Allen's (2010) discussion of the three dimensions of neighbourhood social capital (Table 1) was particularly informative for this research. Bonding social capital is measured through trust and reciprocity, knowing neighbours, intergenerational relationships, and social support. Secondly, they identified the *linking social* capital dimension, which is measured through people's connection with people who can influence what happens in the neighbourhood and awareness of neighbourhood organisations. The third dimension is neighbourhood norms and values, which is measured through the feeling of responsibility to the neighbourhood, neighbourhood involvement, informal social control, collective efficacy, neighbourhood influence, and neighbourhood satisfaction. Other authors have identified slightly different dimensions of neighbourhood social capital. Dekker (2007) identified social networks, trust, and norms as dimensions of social capital. Social network refers to the connection people have within the neighbourhood, like membership in groups and organisations and having friendships with residents. According to Dekker, trust refers to the view of residents as to what extent they believe other residents in the neighbourhood can be trusted. She also used neighbourhood attachment to refer to the residents' socio-emotional feelings toward the neighbourhood as a place.

Determinants of neighbourhood social capital

This section presents a conceptual framework of the study based on the reviewed literature. Previous studies investigated neighbourhood social capital with strands like healthy community, sense of community, social cohesion, neighbourhood cohesion, community solidarity, social integration, social interaction, and neighbourhood ties. Forest and Kearns (2001), Gracia and Herrero (2004), Guest et al. (2006) and Williams (2005) identify several

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Table 1: Dimensions ofneighbourhood social capital.Source: Alaimo, Reischl &Allen 2010.

Dimension	Indicators
Bonding neighbourhood	Trust and reciprocity
social capital	Knowing neighbours
	Neighbourhood people get along
	Social support
Linking social capital	Neighbourhood people have connections
	Aware of neighbourhood organisations
Neighbourhood norms and values	Feel responsible for the neighbourhood.
	Neighbourhood residents' involvement
	Informal social control
	Collective efficacy
	Neighbourhood influence
	Neighbourhood satisfaction

factors as significant determinants of neighbourhood social capital. These factors can be divided into two groups: neighbourhood residents' characteristics and neighbourhood physical design factors.

Factors related to residents' characteristics can be further divided into two groups: psychological factors and social factors. For instance, Gracia and Herrero (2004) identify personality, self-esteem, distress, cognitive process, loss of control, community participants' perceptions, and personal attitude as psychological factors. In relation to social factors, Wilkinson (2008) has also identified level of education, level of income, presence of children, age, being born in the community, and years spent in the community as significant determinants of social integration.

Guest et al. (2006) identify homeownership as determin-

ing the level of social integration, whereas Ha (2009) indi-

cates that housing tenure (being an owner or short-term

and long-term renter) has a significant correlation with

Figure 1: Conceptual framework of determinants of neighbourhood social capital. Source: Adapted from Dekker 2007, Guest et al. 2006 & Wilkinson 2008.



that long-term tenants were better in terms of social capital than short-term tenants. Hanka and Engbers (2017) also report differences in social capital across income categories. Figure one summarises the factors contributing to neighbourhood social capital identified in the literature.

Methods and tools

Study design

This study used a concurrent qualitative dominant mixed-methods research design. Bryman (2007) argues that bringing quantitative and qualitative findings together can offer insights that could not otherwise be gleaned. Dudwick, Kuehnast, Jones and Woolcock (2006: 5) argue that social capital, as a multidimensional concept, 'lends itself to a mixed-methods research approach'. A quantitative method was employed to identify factors such as housing tenure (owner and renter), duration of stay, socioeconomic status, sociodemographic demographic factors and housing physical factors, and to explain the social capital of residents. On the other hand, the qualitative method analysed residents' perspectives regarding social capital in their neighbourhood and how the unique features of the condominium buildings affected the social capital of residents.

Study sites

The study was conducted in three neighbourhoods in Gondar, Ethiopia: Gefo Kuch, Enkoye Mesk and the Aba Samuel condominium.

Gefo Kuch is a newly emerged, outskirt squatter settlement neighbourhood of almost comparable age to the Aba Samuel condominium. In contrast, Enkoye Mesk is one of the oldest, if not the oldest, neighbourhoods in Gondar City and is characterised as an innercity slum neighbourhood. The Aba Samuel condominium structures are vertical buildings built recently by the government, and are densely populated compared to other neighbourhoods. The pictures below show some aspects of the physical features of the three neighbourhoods.

While there are no official statistics about the sociodemographic characteristics of residents in these neighbourhoods, the popular perception is that lower socioeconomic classes occupy Gefo Kuch and Enkoye Mesk. In contrast, the condominium residents are middle- and higher-income class, contrary to the government's aspiration for the owners and residents to be lower-income people.

Data collection methods in Gefo Kuch

In this study, 165 households participated in a questionnaire survey and interviews. An average of forty households in each neighbourhood (a total of 120) was selected using a random sampling technique and participated in the survey. Respondents of the survey were household heads or their partners. The survey measured the stock of social capital in each of these neighbourhoods and their residents. As anyone who stayed less than a year in a neighbourhood might not have had enough time to connect and form opinions about their neighbourhood, they were excluded from this survey and interview.

The contents of the questionnaire items were drawn on and adopted from previous studies on neighbourhood social capital (Williams 2005, Dekker 2007). The questionnaire items passed through a double review of validity and reliability. The first stage involved seeking comments from experts. The second stage involved pre-testing the items on 30 respondents. Cronbach's alpha was calculated to test the reliability and validity of the instrument. Factor analysis was also conducted to see the multidimensional aspects of the questionnaire. Modification based on the results of the pre-test was made. Four dimensions of social capital were developed based on the review of the literature as well as factor analysis of the pilot data. Reduction of the dimensions of variables and rewriting of questions and statements was also done.

Semi-structured interviews gathered qualitative data about the neighbourhood and factors that affect each neighbourhood's social capital stock. Interview respondents were selected purposively to ensure diversity of opinions and representation of neighbourhood subgroups. Fifteen interviews were held in each neighbourhood (a total of 45), in which the final number was decided based on the extent of data saturation.

Data analysis

The quantitative data were analysed using SPSS 17.0. Descriptive statistics gave an overview of the characteristics of the population. Social capital in its four dimensions (neighbourhood behaviour, trust and neighbourhood attachment) was analysed, and the means were compared and tested for significant differences.

The qualitative data were analysed thematically and using content analysis. Before the qualitative data analysis was conducted, the authors navigated double translation (English to Amharic and Amharic to English) as the interviews were conducted in Amharic, the local language of the participants. After a separate presentation of the quantitative and qualitative data findings, the results were discussed integratively given the implication of the two data sets to the research questions posed.

Ethical considerations

Written consent was received from each respondent in line with the study's objective; their right to reject answering questions and/or terminate participation in the study whenever they wanted to do so was clearly expressed. In addition, utmost care was taken to ensure the confidentiality of the information collected from each respondent. To this end, at the moment of collecting the survey questionnaires, a code was given to each respondent that would be used to identify the respondent in the process of data analysis. Similarly, interview sessions held with respondents were recorded, but no identifier was presented in the report to ensure the confidentiality of the information. The main findings are discussed in the ensuing sections.







Findings

Demographic characteristics of the residents

Demographic characteristics are one of the intermediate variables affecting neighbourhood social capital. Tenure status, having children or not, and level of education were among the demographic characteristics that the study examined in the three study sites.

Table 2 shows the tenure status of the residents in the three study areas. There was no significant difference in

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Figure 2: The three neighbourhoods in which the study was conducted. From left to right: Enkoye Mesk (inner-city slum), Aba Samual (condominium houses) and Gefo Kuch (scattered, outskirt settlement). Source: Authors 2018.

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Table 2: Tenure status of theresidents in the study areas.Source: Survey data.

Cito	Rented		Ow	n	Missing/Other		
Sile	Number	%	Number	%	Number	%	
Enkoye Mesk	20	50%	19	47.5%	1	2.5%	
Gefo Kuch	26	65%	14	35%	0	0	
Aba Samuel	25	62.5%	11	27.5%	4	10%	

terms of tenure status among the three neighbourhoods. Similarly, the in-depth interviews conducted with Gefo Kuch and Aba Samuel participants indicated that most of the residents rented houses and faced challenges building sustained social ties with their neighbours. For instance, a female interviewee, aged forty-three, from Gefo Kuch explained the tenure status of her neighbours and stressed that most of her immediate neighbours were tenants. She believed that though she had a good relationship with them for the time being, she expected them to move out at some point. Likewise, an eighteen-year-old female interviewee from Aba Samuel stated that living in the condominium adversely affected people's social life. The interviewee claimed that the high turnover of tenants in condominiums made establishing longer and deeper social relationships with these residents very difficult. Most residents were not owners, so they would be forced to change their residence periodically due to the fluxional cost of renting a house.

The importance of children in initiating and strengthening interaction among neighbourhoods is one of the common highlights of the literature on social capital. Another important factor in social capital among neighbours is whether they have children or not. Thus, before

of ne	Site	Yes		No		Missing			
		Number	%	Number	%	Number	%		
	Enkoye Mesk	18	45	22	55	0	0		
	Gefo Kuch	16	40	24	60	0	0		
s of ree	Aba Samuel	13	32.5	26	65.0	1	2.5%		

35%00three neighbourhoods is very small (Table 3).27.5%410%Besides the number of children, the educational status of
the residents also determines social capital in the neigh-
bourhoods. Table 4 below shows the variation in the level
of education. Accordingly, condominium residents have a
higher level of education (Master's and above) than the

Perspectives about a good neighbourhood

residents in the squatter and inner-city slums.

The residents' views and perspectives about good neighbours were gathered using a qualitative data collection approach. The data revealed that a good neighbourhood involved a process of managing collective social life across different life conditions. For instance, data generated from participants in Gefo Kuch indicated that good neighbours are those who support, help, collaborate and tolerate each other during good and bad times. Participants also said that good neighbours could live together by overcoming the various challenges they may face. One of the comprehensive descriptions of a good community was given by a 36-year-old participant: 'Good neighbourhood is the establishment of the peaceful social life of humankind in a given small territory what we call village.' According to them, good neighbours spend their good and bad times together. One of the participants, aged 67, used an Ethiopian proverb to describe a good neighbourhood as follows:

comparing the social capital of the three neighbourhoods,

among residents in terms of having children or not. While

the proportion of participants who do not have a child is higher across the three neighbourhoods, the difference in the proportion of participants who have children in the

we needed to examine if there is a significant variation

'We Ethiopians have a saying: (ከሩቅ ሀገር ዘሞድ፣ የቅርብ ጎረቤት) [a neighbour nearby is far more important that a relative living away]. This shows how much a good relationship with neighbours is valued in our lives – more than blood relatives who live away from us.'

Likewise, the data generated from the participants of the Aba Samuel condominium indicates that good neighbours are committed to living collectively with others, such as those who can share costs for common life, collaborate in good and bad times, and celebrate a holiday together with people around them. Participants from this neighbourhood uniquely stressed the importance of communication. One of the participants said, 'Good neighbours discuss matters frankly and communicate effectively to live together, whatever situations

Site		Primary school or below	Secondary school	Diploma	First degree	Master's and above	Missing	Total
Enkoye Mek	Count	3	10	19	3	5	0	40
	% within site	7.5%	25.0%	47.5%	7.5%	12.5%	0.0%	100%
Gefo Kuch -	Count	2	12	2	8	10	6	40
	% within site	5.0%	30.0%	5.0%	20.0%	25.0%	15.0%	100%
Aba Samual -	Count	2	2	3	6	17	10	40
	% within site	5.0%	5.0%	7.5%	15.0%	42.5%	25.0%	100%

Table 3: Residents' status of having children or not in the study areas.

 Table 4: Educational levels of respondents across the three study sites.
 they are facing, blissfully.' Similar opinions valuing neighbourly relations were reflected in other neighbourhoods as well.

Four dimensions of social capital

Memberships and participation in social networks

Membership in social networks is one of the four dimensions of social capital. The questionnaire assessed residents' membership in three indigenous social networks: *Iddir, Ikub* and *Mahber*. An *Iddir* is a stable, traditional association in Ethiopia to facilitate funerals and provide grief support when neighbours lose their families or loved ones. On the other hand, an *Ikub* is a temporary, traditional association established by neighbours to facilitate financial savings. Lastly, a *Mahber* can be defined as a religious-based association of neighbours, mostly Orthodox Christians, to gather monthly in the name of saints.

In Table 5 (presented below), types social network are presented as: 0 = none, 1.00 = Iddir, 2.00 = Ikub, and 3.00 = Mahber.

Table 5 shows the proportion of residents in one or more of the three social networks described above. Many residents of all three sites (more than 75%) were members of at least one of the social networks. Ikub is the most common type of social network in all three neighbourhoods. None of the residents in the Aba Samuel condominium reported membership in an Iddir. Given the almost lifetime commitment an Iddir membership requires, this is not surprising regarding the lower number of owner residents in the Aba Samuel condominium. According to the participants, even though they participated in different social associations and events, the most common one was an Ikub (83.3%). However, due to its financial savings nature, an Ikub is not limited to residential neighbourhoods. Instead, it is highly prevalent in business areas and workplaces such as marketplaces and offices. Hence, it has little impact on showing the social capital of residents in the Aba Samuel condominium.

Participants from Gefo Kuch identified several social events and activities they participate and engage in, strengthening their social bond. Some of these social events and activities were *lkub*, *lddir*, coffee ceremonies, Christmas, Epiphany, Easter, and *Ginbot Lideta* (commemorating the birthday of Saint Mary). In line with Table 5, participants also reported their celebration of different religious gatherings, such as *Mahber*, a monthly social gathering to observe holidays commemorating angels and saints.

The qualitative data from Enkoye Mesk also indicated that participants were involved in different social activities to demonstrate their neighbourhood's togetherness. The participants were involved in different kinds of social events such as *Ikub*, *Iddir* and other dimensions of an association like those in Gefo Kuch. A male participant, aged 40, stated his involvement in different social activities in Enkoye Mesk as:

'I am involved in the different social events such as Ikub, Iddir and associations. I benefited most from such social events by building a good social bond with others around me. We also help each other in wedding ceremonies... In funeral ceremonies, we also spend a day together with people who lost their loved ones.'

In the Aba Samuel condominium, most residents were not house owners and did not have children. They were also not members of durable, lifetime-commitment social networks such as an *Iddir*. Congruent to this finding, Guest et al. (2006), Ha (2009 & 2008) and the community limited-liability perspective (Chaskin 1997, Guest et al. 2006, Bottermann, Hooghe & Reeskens 2011) indicated that instrumental values such as tenure status and childbearing practices have significant correlation with the social capital of residents. However, residents in the Aba Samuel condominium were highly active in social networks such as an *Ikub*, which are not limited to residential neighbourhoods since they are equally common in business areas and workplaces.

Social connections among immediate neighbours

Social capital in its three dimensions (neighbours' behaviour, trust and attachment to the neighbourhood) was also analysed using mean comparison in the three different settlement areas (Table 6). The overall mean comparison can be stated as ($\chi 2 = 23.34 \alpha = 0.001$). The mean shows that, though not significant, Aba Samuel

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Site		00	1.00	2.00	3.00	Total
Enkoye Mesk	Count	6	3	11	11	31
	% within site	19.4%	9.7%	35.5%	35.5%	100%
Gefo Kuch	Count	10	3	20	2	35
	% within site	28.6%	8.6%	57.1%	5.7%	100%
Aba Samuel	Count	1	0	25	4	30
	% within site	3.3%	0.0%	83.3%	13.3%	100%
	Count	17	6	56	17	96
Total	% within site	17.7%	6.3%	58.3%	17.7%	100%

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Table 5: Social networkcross-tabulation table (0 =none, 1.00 = Iddir, 2.00 = Ikub,

3.00 = Mahber).

Table 6: Mean comparisonof the three dimensions ofsocial capital among thestudy sites

Sito	Mean				
Sile	Neighbours' Behaviour	Trust	Attachment to the neighbourhood		
Enkoye Mesk	3.7650	3.7663	3.1998		
Gefo Kuch	3.6000	3.9758	3.4845		
Aba Samuel	2.8775	2.8500	2.8415		

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Table 7: ANOVA table.

registered the lowest mean in all three dimensions of social capital. In the Aba Samuel condominium, the mean for three dimensions of social capital accounted as neighbourhood behaviour (2.8775), trust (2.8500) and neighbourhood attachment (2.8415). The mean for three dimensions of social capital registered in Enkoye Mesk and Gefo Kuch shows strong social connections among the neighbourhoods.

The ANOVA table (Table 7) shows a statistically significant difference in mean comparisons. The ANOVA table was used to report whether the mean differences were statistically significant. The mean differences, at 99.9%, are significant. That would mean that the differences in means did not happen randomly but are patterned differences. This corresponds to the finding that the Aba Samuel condominium residents have the lowest social capital compared to the inner-city slum and outskirt squatter settlement.

Likewise, the qualitative data indicated that participants from the inner-city slum (Enkoye Mesk) and the outskirt squatter settlement (Gefo Kuch) engage in more social life than the condominium (Aba Samuel) residents. According to the qualitative data, in Gefo Kuch, the relationship among the participants is a recent phenomenon and that has improved significantly over time. The participants stipulated that most of the residents in the Gefo Kuch neighbourhood came from different areas, mainly rural areas with divergent backgrounds, and failed to develop relationships easily. However, over time the residents started to develop strong social relationships. A woman who has lived in the area for about seven years described the relationship she has with her immediate neighbours as follows:

When we came to this area, I think we were the first family. There was no one with whom we shared [the challenges] we were facing. Almost all the newly built houses were empty. Later, people started to come to the area, and we started to establish a neighbourhood. Initially, we were facing challenges to create a good relationship with people around us since we all came from different backgrounds. Right now, it has improved a lot and we have a good relationship with our immediate neighbours, especially people who are renting [a room] here from me.'

The qualitative data collected from Enkoye Mesk also indicates that they have a strong relationship with their immediate neighbours. Moreover, participants in Enkoye Mesk stressed mutual respect and sharing what each other has. One of the participants, aged 24, who has lived in the neighbourhood for the last eight years, described their strong social ties as:

'The relation among the neighbourhood is better than another neighbourhood by far. Because most of the families in this neighbourhood are from a low socioeconomic background, to survive in this life situation, people around the neighbour are involved

	Sum of squares	Df	Mean square	F	Sig.		
Neighbourhood behaviour * Site	Between groups	(Combined)	17.825	2	8.913	26.806	.001
	Within groups	38.901	117	.332			
	Total	56.726	119				
Trust * Site	Between groups	(Combined)	28.676	2	14.338	21.779	.001
	Within groups	77.027	117	.658			
	Total	105.704	119				
Attachment to neighbourhood	Between groups	(Combined)	8.305	2	4.152	16.962	.001
	Within groups	28.64	117	.245			
	Total	36.94	119				

in a shared livelihood. ... If you have prepared food, it should serve at least about three household members around you. This shows the common and shared life around here, which is the quality of a good neighbourhood.'

Both the quantitative and qualitative findings show strong social ties and relationships among the immediate neighbours in the inner-city slum (Enkoye Mesk) and the outskirt squatter settlement (Gefo Kuch). In contrast, the data generated from the Aba Samuel condominium indicates limited social ties and relationships among the immediate neighbours. The Aba Samuel condominium residents identified the unique factors that determine the relationship among the residents. According to the participants, the vertical physical nature of the buildings hinders the residents' movement and thereby affects their social relationships. One of the participants, a 70-year-old widow, reported her challenge to build social relationships with her neighbours as:

'I am interacting only with those who come and visit me since I can't lift to the upper floors of the buildings. Sometimes, some of the residents have invited me to participate in a social gathering. In many instances, I was forced to cancel the invitations since I find it difficult to do the stairs to the upper floors.'

Participants in the condominium also uniquely revealed that many of the residents are involved in disputes resulting from the removal of wasteful disposal, particularly from the upper floor of the buildings. According to the participant, residents of the upper floors throw garbage onto the lower and ground floors. Congruently, Abebe et al. (2011) and Ingwani, Gondo and Mazhindu (2010) also claim that condominium housing design, particularly its vertical nature and densely populated setting, affects social interaction among neighbours in comparison with other neighbourhoods.

Conclusion

Though there is no agreement on the possible impact of neighbourhood design on social relationships, the impact of neighbourhood on social relationships has always been an area of focus for social scientists. Previous studies have indicated that factors such as housing tenure (owner, renter), housing physical factors, duration of stay, sociodemographic factors and socioeconomic status influence the social capital among neighbourhoods. Neighbourhood social capital has four dimensions: trust and reciprocity, neighbour attachment, social network, and neighbourhood behaviour. Diverse literature, such as Alaimo, Reischl and Allen (2010), has also indicated that the bonding of neighbourhood social capital has four dimensions that might include trust and reciprocity, neighbour attachment, social network, and neighbourhood behaviour.

This study aimed to compare the social capital of residents in selected neighbourhoods of Gondar. Specifically, the study explored the residents' perspectives about social capital, compared four dimensions of social capital, and identified the factors that affect the social capital of residents in the selected neighbourhoods of Gondar, Ethiopia. The study employed a concurrent qualitative dominant mixed-methods research design in which the data was collected simultaneously using questionnaires and in-depth interviews.

The study's findings show that there is no difference in perspectives and views about a good neighbourhood across the three different study sites based on the definitions and qualities of good neighbourhoods identified by the study participants. Though the settlements were diverse in nature and type, the residents' views about good neighbourhoods across the three sites were similar. This shows us that the nature and type of settlement have little impact on the residents' view of a good neighbourhood. On the other hand, the study's findings highly imply the value of common life that Ethiopians share irrespective of the respective type of settlements, such as inner-city slum, outskirt settlement, and newly constructed condominium housing.

The social capital in the study sites was measured through its four dimensions, mainly via social networks, neighbourhood behaviour, trust, and neighbourhood attachment. The findings indicate that the condominium residents mainly participate in a single social network called *lkub*, a temporary, traditional saving association. Likewise, the mean comparison in the three dimensions of social capital, i.e., neighbourhood behaviour, trust and attachment, shows that the condominium residents have the lowest social bond among themselves compared to the inner-city slum and outskirt squatter settlement.

Generally, the residents of the condominium neighbourhood have the lowest social capital compared to the residents in the other neighbourhoods. In all four dimensions of social capital, the social capital of the condominium residents is found to be the lowest. Even though they participate in a single social network, *lkub*, it tends to be temporary and mainly conducted in the workplace. Since the membership is temporal, it cannot demonstrate the overall presence of social capital among the condominium residents. Perhaps this is because of the lack of interest in establishing such networks due to the uncertainty and threat of eviction. Hence, further research is suggested to confirm this with a larger dataset and controlling for all intervening factors (income level, age, and gender).

On the other hand, the unique features of condominium houses also contribute to the poor social bond among condominium residents. Some of the unique features of condominium houses that affect establishing a good neighbourhood include the vertical structure of the condominium houses, the divergent background of the residents, and job-related factors (e.g., being an employee that spends most of their time in the workplace). Thus, the nature of condominium houses and their residents hinders social capital, though the strategies and housing programmes of the Ethiopian government seek to promote it. Further large-scale research should also be considered to assess the effects of condominium houses on the social capital of its residences in Ethiopia's other major cities.



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Participatory Local Area Planning The Case of Bombay Hotel, Ahmedabad

Avni Rastogi

In the early 2000s, all major urban development schemes and programmes introduced by the Government of India required states to pass public participation laws and undertake extensive public consultation while preparing city plans. However, this was not seen in practice. In subsequent city planning schemes, citizens voicing their concerns on government websites was considered sufficient 'public participation'. Genuinely inclusive participatory planning processes have been notoriously difficult to implement.

What does it mean to 'do' participatory planning? What are the considerations when designing such a process? What lessons can one draw from such an exercise for policy advocacy? To answer these questions, we carried out a pilot study in participatory local area planning for solid waste management (SWM) in the Bombay Hotel area of Ahmedabad.

The pilot study, which spanned between 2016 and 2017, entailed engaging residents of the area in participatory data collection and mapping, presenting the collected data to the community, and conducting planning workshops for the locals to arrive at a community SWM plan. While the pilot achieved its objective of creating a plan, its lessons for a public policy on participatory planning lie in the processes followed and the challenges faced. The case study concludes that participatory planning can be institutionalised as long as, among other things, it allows for decentralised planning, involves local networks, hires locals, and provides for sensitisation and capacity building of those implementing the policy.

Partizipative Raumplanung: Der Fall Bombay Hotel, Ahmedabad

In den frühen 2000er Jahren verlangten alle wichtigen städtischen Entwicklungsprojekte und Programme der indischen Nationalregierung von den Bundesstaaten, Gesetze zur öffentlichen Beteiligung zu erlassen und umfangreiche öffentliche Konsultationen durchzuführen, wenn neue Stadtplanungen erstellt werden. In der Praxis wurde dies jedoch nicht umgesetzt: Bei Stadtplanungsprojekten wurde die Äußerung von Bedenken durch BürgerInnen auf Regierungswebsites als ausreichende "öffentliche Beteiligung" betrachtet. Tatsächlich inklusive partizipative Planungsprozesse waren dagegen schwer umzusetzen.

Was bedeutet es, partizipative Planung "zu tun"? Welche Überlegungen sind bei der Gestaltung eines solchen Prozesses zu berücksichtigen? Welche Lehren lassen sich aus einer solchen Übung für politische Advocacy ziehen? Um diese Fragen zu beantworten, führten wir eine Pilotstudie zur partizipativen Planung auf lokaler Ebene durch für das Management fester Abfälle (SWM) im Stadtgebiet "Bombay Hotel" von Ahmedabad im Bundesstaat Gujarat.

Diese Pilotstudie, die von 2016 bis 2017 lief, umfasste die Einbindung der BewohnerInnen des Gebiets in die partizipative Datensammlung und Kartierung, die Präsentation der gesammelten Daten in der Gemeinschaft und die Durchführung von Planungsworkshops, um gemeinsam einen SWM-Plan für die Nachbarschaft zu erarbeiten. Obwohl die Pilotstudie ihr Ziel erreicht hat, einen Plan zu erstellen, liegen die Lehren für eine öffentliche Politik zur partizipativen Planung vor allem in den durchgeführten Prozessen und den Herausforderungen. Die Fallstudie kommt zu dem Schluss, dass partizipative Planung institutionalisiert werden kann, solange sie dezentralisierte Planung ermöglicht, lokale Netzwerke einbindet, Einheimische beschäftigt und Sensibilisierung und Kapazitätsaufbau für diejenigen vorsieht, die die Politik umsetzen.

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Introduction

With an estimated population of over 7.79 million (World Population Review 2017), Ahmedabad, the capital of the state of Gujarat, is the seventh-largest city in India. As in other cities, the process of urbanisation and the state's inability to keep pace with it have led to the proliferation of different kinds of informal settlements with vulnerable tenure security and poor access to basic services. Desai (2016) attributes this to: the closure of the textile mills in the 1980s and 1990s, which led to the increasing informalisation of labour and the subsequent failure of the state to provide alternative, affordable housing; the informal subdivision of land in response to the Urban Land Ceiling Act; and, the sale of peripheral farmlands for other purposes without any change of land use. The purchasers were the urban poor who were willing to take this risk, despite the informality of the transactions, because of the affordability of the land (Desai 2016).

Urban planning in Ahmedabad is governed by the Gujarat Town Planning and Urban Development Act, 1976, (GTPU-DA) through town planning schemes (TPSs). The Act provides land pooling and readjustment tools for urban local bodies to organise and allocate land for infrastructure, utilities, and public housing for the socially and economically weaker sections (SEWS) of the population. In practice, SEWS lands remain unused, encroached upon by others, or are used to resettle families involuntarily displaced by development projects (Desai 2016). TPSs take a decade or more from survey to implementation, the vacuum caused by the delay being filled by informal subdivisions and builder-led development. Due to their informal tenure, residents of land earmarked for infrastructure development face the demolition of their homes without compensation and often contest the implementation of the TPS. While they avoid evictions temporarily, social infrastructure remains underdeveloped (Mahadevia et al. 2016^a). Thus, the state planning authority deals with informal settlements mainly by

ignoring them or demolishing them. Consequently, most informal, unplanned settlements lack basic infrastructures such as water and sewerage connections, roads, and streetlights. Only sporadically is an informal settlement redeveloped to upgrade its infrastructure and services.

For more-equitable planning outcomes, there is a need to challenge this top-down practice of urban planning. Some groups and concerns, such as those of the working classes, are either invisible in the mainstream planning approach or are visible in very limited ways that do not capture the dynamics of ground realities and the implications on people's lives.

The main objective of this study is to design an alternative, equitable planning practice built bottom-up through participatory practices. Therefore, this case study seeks to answer the following questions: *What does it mean to 'do' participatory planning? What are the considerations while designing such a process? What lessons can one draw from such an exercise for policy advocacy?* To this end, we carried out a pilot in participatory local area planning for solid waste management in Bombay Hotel between 2016 and 2017.

The following section discusses public participation and the participatory planning landscape in India, and the author's views on ideal public participation. Section 3 is an introduction to the case study area. Section 4 describes the design and implementation of the pilot in Bombay Hotel. Section 5 is an assessment of participation in the process. Section 6 distils the lessons from the process into recommendations for a successful public participation policy.

Participatory planning and empowered participation

Sherry Arnstein (1969) defines (citizen) participation as (citizen) power: participation is 'the redistribution of power that enables the have-not citizens, presently excluded from the political and economic processes, to be deliberately included in the future'. Citizens are *empowered* to impact planning outcomes. Her 'ladder of participation' provides a working hierarchy of different levels of participation, from manipulation and therapy at the bottom of the ladder amounting to 'non-participation', moving up to the 'tokenism' of informing, consultation, and placation, and the top of the ladder constituting 'citizen power' through partnership, delegated power, and citizen control (Arnstein 1969).

Democracy has become limited to 'territorially based competitive elections of political leadership for legislative and executive offices' (Fung & Wright 2001). Beyond casting their vote, the average citizen has little role or influence in political decision-making. One of the effects of this is seen in the manner in which cities are governed and planned. For example, Ahmedabad's planning processes exclude most city inhabitants from decision-making by only recognising landowners as stakeholders. Contrary to this, participation seeks to deepen democracy and achieve its central ideals of 'facilitating active political involvement of the citizenry' (Fung & Wright 2001). Participation centres the policy (in this case, the city planning) on the citizen by making them active agents in planning. Power is resituated in the citizen so that they may impact planning outcomes through effective participation and, consequently, this results in more-inclusive outcomes.

We identified six policy elements of a good and effective citizen participation policy that would result in empowered participation.

- 1. The policy must be *inclusive*. Its design must include all categories of affected residents, not just property owners.
- 2. The policy should specify and empower a *single implementing government department* and office, along with its roles and responsibilities, to ensure effective participation.
- The policy must have an element of, and a required budgetary allocation for, *capacity building for officials* responsible for actuating the citizen participation requirements. In the past, the lack of capacity of such officials has resulted in the poor and counterproductive implementation of public consultations (Raman 2013).
- 4. Build awareness and capacity amongst stakeholders to enable effective participation. There needs to be a continuous sharing of accurate, relevant, and up-todate information so that stakeholders can make informed choices.
- 5. The policy must ensure that the design of the process gives actual (and equal) power to all these stakeholders, i.e., *their inputs must be reflected in the outcome*. This means that the process must not be simply for 'consultation' or 'information', with final discretion resting with the officials on accepting such inputs (Arnstein 1969). There should be an obligation to accept the inputs in letter and spirit.
- 6. Finally, it should specify a method by which residents can hold the government *accountable* for the outcome of the process to ensure that their inputs are reflected in it.

Participatory planning landscape in India

India's urban planning policy and regulatory framework do not fare well by these good and effective citizen participation standards. The current urban planning government schemes are the Smart Cities Mission (SCM), the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), and the Pradhan Mantri Awas Yojana (PMAY).

The SCM aims 'to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment, and application of "smart" solutions'. Funding for cities is competitive. Citizen participation is one of the criteria for assessment. An office memorandum from the Ministry of Urban Development, dated 23 September 2015 (Subject: Citizen consultations to prepare Smart Cities Proposals), provided specific guidance to city governments on the extent of citizen involvement and suggested, inter alia, that internet hotspots be set up in slums to enable such 'participation'. The homepage of the Mission's official website (http://smartcities.gov. in/) had a slide show that emphasised the importance of citizen engagement, providing statistics of how many winning cities created their own mobile app and used SMS, WhatsApp, etc. for citizen engagement.

AMRUT aims at providing water, sanitation infrastructure, and storm-water drains, and developing open spaces and public transport infrastructure in cities. Its guidelines document suggests that the service-level improvement plans (SLIPs) and the city development plans formulated by the ULBs should be made with citizen participation. This is one of the criteria on which the SLIPs are to be assessed. However, later in the document, the first-stage consultation is suggested to be held at the draft detailed project report stage for course correction, making participation in planning quite an afterthought. AMRUT, too, emphasises the use of information and communications technologies for citizen participation.

PMAY aims at providing 'Housing for All by 2022' through slum rehabilitation, credit-linked subsidy, etc. (MHUPA 2015). Public participation did not feature in the guidelines document of PMAY, except for a singular mention of consulting slum dwellers while designing slum rehabilitation projects.

These schemes have a rhetorical emphasis on public participation in a way that is bound to be limiting and exclusionary. The emphasis on technology and 'smart' means of 'citizen consultation' limits participation to those who can access the internet and use government websites and apps to provide inputs on plans for their cities. Research in Kalyan-Dombivli in Mumbai on the e-grievance systems showed a bias towards the middle class and those already empowered (Martinez et al. 2011). There is usually no accompanying awareness-building or information broadcast, so very often residents are not even aware of the opportunity to participate in planning processes. Thus, an illusion of participation is generated through rather superficial means, and there is no true transfer of power to the citizens to decide how the government uses its funds for development.

In Ahmedabad, the GTPUDA lays down a largely nonparticipatory procedure for preparing and implementing development plans and TPSs by the area or urban development authority, requiring only that these plans be published for suggestions and objections from the public. The GTPUD rules also require that a meeting of landowners be held to explain the tentative proposal and elicit suggestions and objections that may be taken into consideration by the authority. These rules exclude most residents, who do not own land but live and work on it, as well as those with informal tenure or no tenure security. Thus, participation is exclusionary and limited to tokenism.

This pilot study was conceived as an attempt to engage in a truly participatory manner of planning, designed to achieve informed deliberation and empowerment of residents.

Case study area – Bombay Hotel in Ahmedabad

Bombay Hotel is an informal settlement located on the southern periphery of Ahmedabad, adjacent to the city's garbage dump. It was selected as the focus area for this

pilot based on an exploration facilitated by NGOs working in the area: the Centre for Development (CfD), which works on the issues of child rights and education, and Janvikas (JV), which works towards social development. Economically and socially marginalised groups routinely approach them with concerns related to access to basic services and evictions. The issue of solid waste was of interest to both organisations because of the immensity of the problem in the area, compounded by the proximity of the city's landfill.

While residential development in the Bombay Hotel area began in the late 1990s, triggered by the closure of textile mills, it picked up after the communal riots of 2002 when the area emerged as one of Ahmedabad's new Muslim ghettos. The area originally consisted of agricultural lands that were sold illegally to builders. Some of the land was then further divided into smaller parcels upon which residential structures were built to provide low-income housing to Muslims (Mahadevia et al. 2016b).

Most residents who moved here in the aftermath of the 2002 riots were from refugee camps and victims of violence and displacement. Citizen Nagar, a neighbourhood in the Bombay Hotel area, right at the foot of the garbage dump, was the first rehabilitation colony that the victims moved into when the refugee camps closed. At the time of the intervention, the population of Bombay Hotel also consisted of migrant workers predominantly from Bihar, Uttar Pradesh, and West Bengal. The immigrant population primarily consisted of single male migrants who worked in garment workshops and textile or chemical factories in the area. Some women also engaged in home-based work like stitching, embroidery, kite-making, tobacco-rolling, and ironing. Several Bengali families worked as waste pickers and manual scavengers. Community leaders estimate that approximately 60% of the residents live in rented accommodation.

The increase in the area's population after the riots was not accompanied by access to basic services and social infrastructure. TPSs developed for the Bombay Hotel area were based on surveys done in 2003–2004, but their implementation only started in 2013. By then, the TPSs were at odds with the ground reality, with 2,200 houses needing to be demolished to implement them. Since 2010, services such as drainage connections, water supply through tankers, and streetlights had been introduced in the area in limited ways, facilitated by negotiations between community leaders, political representatives, and Ahmedabad Municipal Corporation (AMC) officials. These were piecemeal developments skewed towards those neighbourhoods in Bombay Hotel that had the political connections to enable them. However, concerns remained regarding the implementation of the TPSs and the further demolitions they may lead to.

Bombay Hotel was also fraught with social tensions. There was a degree of resentment and hostility directed towards migrants by the resident homeowners. There was a feeling that due to their itinerant status, the migrants were not invested in the long-term development of the area. According to a resident, 'Even if everyone agrees not to throw garbage outside, "they" will continue doing so. They don't see how this affects the entire community because they are gone the next day.' These were some of the complex

socio-economic and political dynamics that we had to contend with while working in the area.

Steps in the participatory local area planning process

Figure 1 shows the seven steps we carried out in the participatory planning process. We first conducted community outreach to inform residents, raise their interest, and mobilise volunteers (Step 1), so that they would be willing to participate in the data collection on the status of SWM infrastructure and services in the area (Steps 2-5). We then analysed the data and presented it to the community through easy-to-understand maps and visualisations (Steps 6-7). This was done through community meetings to triangulate the data and build a shared understanding of the gaps, problems, and impact of the limited provision of services from the AMC. These meetings were also used to record community inputs on the infrastructure and services they wanted in their neighbourhoods, which informed the draft SWM plan. The draft plan was shared with the community through large meetings held in the area for modifications and approval. Finally, a strategy was drawn up with the community's participation for pursuing the plan's implementation.

Step 1: Initial outreach

The first step was to introduce the idea of the participatory SWM planning exercise to the community. This was to be done by JV and CfD in August 2016 through informal conversations with residents and local leaders, simultaneously recruiting volunteers from within the community for mapping.

We later realised that very limited outreach had been done, if at all, for reasons elaborated below. This affected participation in the process adversely. Our response was the participatory planning workshop. Our learning was that organising this at the commencement would have resulted in a more-participatory process.

Step 2: Preparing the data collection methodology

We prepared both a paper-based mapping survey and a mobile data collection app using KoBoToolbox. However, we found during the pilot that almost no one possessed smartphones capable of running a KoBoToolbox survey; therefore, only the paper methodology was used. We mapped the roads and landmarks within an area of 1 sq. km using Google Earth's satellite imagery, through sessions with the NGOs field staff who were familiar with the area, and through transect walks accompanied by field staff using mobile GPS tracking applications. The area was divided into 68 rectangular tiles. Tiles were then grouped to form 11 sets, with a master map for each set.

The methodology used a printed tile set with a SWM service survey. These were prepared in English and then translated into Gujarati. Surveyors were to mark garbage, construction debris, sewage, chemical waste, and dumpsters on the map. The survey included basic questions to residents about garbage collection and street sweeping done by the AMC-employed staff, the frequency of dumpster emptying, and the method of garbage disposal. Two



respondents were interviewed from different parts of the same tile. The location of the surveyed household/shop was to be marked on the map to allow for geographical analysis later.

We piloted the surveys with volunteers and the NGOs' staff and made revisions based on their inputs.

Step 3: Training volunteers

The finalised data collection methodology was communicated to the NGOs' staff and local volunteers through training held in September 2016. We emphasised the participatory nature of the process to empower residents to bring about change. Several volunteers, young school and college students, left early for their classes and did not attend the field trial. This limited the effectiveness of the training. Many other factors further reduced the training effectiveness, such as volunteers arriving late and a noisy training venue (school).

Step 4: Conducting mapping and surveys

The NGOs' staffs were to co-ordinate with the volunteers to complete the data collection. We observed many problems during the data collection. There was scepticism amongst the residents towards the surveys; many had inhibitions about providing their names and other details, despite the surveyors informing them of their identity, the survey's purpose, and asking them to participate in the survey to help improve their surroundings. Certain

Figure 1: Outline of the process of the pilot.

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members of the community were actively hostile to our presence in the area. The volunteers too were cynical about participatory practices and believed that 'nothing can be done in this community'. There was condescension in the attitude of the staff and volunteers, as they were steeped in the tradition of service-providing NGOs that viewed residents as passive beneficiaries. This attitude was contrary to the underlying philosophy of the pilot, which intended to imbue residents with agency and power. The problems observed during the data collection underscored the lack of outreach and awareness-building and, to some extent, the lack of buy-in that the NGOs had in the area. However, the data outcomes from this exercise were still very positive.

Step 5: Participatory planning workshop

The primary objectives of the workshop carried out on 6 December 2016 were to reorient the NGOs' staffs to, and reiterate the importance of, public participation in this project; to clarify subsequent activities; and to build the team's morale by sharing digitised maps with the surveyors. For the workshop, we had requested CfD and JV to invite their staff members, all volunteers, and the community leaders engaged in the project.

We had discerned a feeling of cynicism during the mapping process, both within the community and amongst the volunteers. Many felt that the community would never unite to rally for change and, therefore, nothing would change. To counter this, we identified four 'positive stories' from within Bombay Hotel that showcased examples of leadership, participation, and collective action, which had, in turn, led to tangible results. We created a ten-minute film showcasing these stories and screened it during this workshop. These four stories showed that the community was willing to act collectively when given an opportunity. For example, Khushbu Park is a small neighbourhood where all residents themselves, out of concern for their children's health, ensure that the streets are kept clean and swept daily.

We asked participants to write a few sentences about their attitude towards Bombay Hotel and its residents. A few staff members and volunteers shared their experiences of the data collection exercise, and their perspectives and attitudes towards the locals. This was used to anchor the discussions and unpack the group's own biases towards Bombay Hotel. Once these biases were exposed, we showed the short film on positive stories from Bombay Hotel as a counter. Participants then created a timeline of the history of Bombay Hotel. The timeline exercise brought out a rather comprehensive popular history of the area and showcased the development of Bombay Hotel over the years since 1996. Participants agreed that although a lot was still needed to be done, much improvement had been accomplished over the years. Thereafter, we carried out a participatory stakeholder mapping for Bombay Hotel, where the participants could identify different groups and individuals who could impact the project and who would be impacted by it. Maps and graphics from the data collection exercise were presented to show the progress that had been made. Examples from other participatory exercises were shared through presentations to give participants an idea about what could be achieved through participatory approaches.

To a large extent, the workshop effectively addressed the cynicism of the participants and energised them for the project. However, more needed to be done to emphasise the role and importance of participation in the exercise.

Step 6: Data digitisation, analysis, and visualisations

The data collected by CfD and JV was handed over to [Blinded for review] in the last week of October 2016. On 25 October 2016, we held an internal training on digitising the tiles created during the paper mapping process, using QGIS, an open-source mapping software. The digitised data was used to create several maps and charts representing the waste management problem in Bombay Hotel.

Step 7: Community meetings to present the data and seek inputs for an effective SWM plan

We first trained the NGOs' field staff on the material created for the community meetings, so that they understood them and were, in turn, able to explain the same to the community residents when seeking their inputs and to discuss possible solutions for SWM. For this training we prepared a note on the agenda for the community meetings, a presentation with the maps and pie charts, a note on the health impacts of poor garbage disposal methods, and templates for documenting the meetings.

The blank map of Bombay Hotel (showing only the roads, boundary, and landmarks) was used by the field staff to mark the radius of each meeting and number the meeting. Any location-specific inputs such as where a dumpster should be placed or where the AMC vehicle should stop were also to be represented on this map.

Between February 15 and 28, 2017, JV held 27 community meetings. The average number of participants per meeting was about 16, with a majority of them being women. After the first few, the meetings developed a format: the field staff would select an ideal space to hold a public meeting in a specific locality, usually covering about 4–8 lanes. A resident would be requested for use of their charpoy (a lightweight bed usually found leaning against their walls). The maps would be spread on the charpoy – first would be the landmarks map of Bombay Hotel. As a field staff member set this up, the others would walk through the nearby lanes, knock on the doors of homes, and corral residents to the meeting venue. At the sight of the maps, residents usually asked if we were from the government and had come to the Bombay Hotel area for 'cutting' (the colloquial term for demolition). In response, the staff would tell them about the SWM survey. Within 10 minutes, a crowd of about 10 to 25 people would have gathered. The staff would then begin by introducing themselves, their organisation, and their work in Bombay Hotel. They would then refer to the survey, and, often, someone remembered the survey and mapping exercise from several months ago. The landmarks map was then introduced. They would point to the main roads traversing the area, the major landmarks, and eventually lead to the location of the meeting. After explaining the context, the team would display the garbage map to emphasise the magnitude of the problem, followed by the maps showing the



concentration of garbage with the garbage disposal survey results. At every point, they would ask if the maps were representative of the residents' lived experiences. Very rarely were there disagreements.

Using the maps, the staff would ask why the situation was so bad, who was responsible for it, and then discuss the impact of garbage and burning plastic on residents' health, especially their children's health. They would sometimes point out the cleaner areas of Bombay Hotel, highlighting how the residents in these localities had taken control of the situation and had monitored each other concerning throwing garbage on the streets. The residents at the meeting would be asked how they could improve the situation around them, and an attempt would be made to get a concrete commitment from them. This did not always work, though. They would be asked which service from the AMC would work best for them – whether they wanted a dumpster or the AMC vehicle to collect the garbage and, in the case of the latter suggestion, where this vehicle should stop for garbage pick-up. This location was recorded on the map. Finally, we would ask someone to take leadership in the area, and be the contact person as the project proceeded further.

The community meetings were sites for a lot of counselling and awareness-building on more sustainable SWM practices. The field staff would tell residents that they should not make their children throw the garbage because it was not good for their health; also, if they did so, they would be fined! The areas around the dumpsters were usually filthy, acting as breeding grounds for rats, flies, and mosquitoes. Moreover, the children were forced to throw the garbage bags from a distance, usually adding to the filth. They were counselled to throw garbage inside the dumpsters and not on the streets or around their homes. The staff also explained that requesting the AMC for individual dustbins in each house would not solve the problem because those dustbins would have to be emptied somewhere. When residents requested that a dumpster be given for their neighbourhood, the staff would ask where they would be placed. This would cause some discussion,

with some objecting to the idea of it being close to the houses. Finally, residents requested that a dumpster be placed only in areas where open space was available and where the residents could have control over who used the dumpster.

CfD held four community meetings in February 2017 and was unable to commit human resources to anchor the meetings after that. Meetings in the remaining neighbourhoods were completed in May 2017. The data from these meetings was digitised the same way as the survey data and used to prepare an SWM plan for the area. The SWM plan was presented at a meeting of community leaders from Bombay Hotel in November 2017. Their suggestions were incorporated, and the final SWM plan was prepared and handed over to JV and CfD for it to be taken further with the community and the authorities in March 2018.

How participatory was the process?

The mapping and survey exercises were not as participatory as we had planned them to be. This was a failure of the initial outreach and, subsequently, of the training on mapping and surveys held before the mapping exercise. This was acknowledged by JV: 'The mapping could have been more participatory. The willingness is there in the community. If we are unable to bring together community volunteers, we should wait and ready the community for this first.'

CfD managed to involve two volunteers from the area. All the other volunteers were from surrounding areas. Almost throughout, the volunteers were unsure of the mapping and surveys' objective, despite repeated training and refreshers. This lack of clarity, in turn, was reflected in their demeanour. They would easily get frustrated with people who were not forthcoming with the survey questions and resort to sweeping generalisations about the area and the community.

This spurred us to organise the Participatory Planning Workshop in December 2016 (Step 5). Locating positive stories within the community helped in providing a **Figure 2:** Bombay Hotel residents during community meetings.

socio-historical background from the people's perspective. This, in turn, informed the approach to participation. The mapping, surveys, and positive stories, along with the Participatory Planning Workshop, made it evident that people are acutely aware of the various problems in the area, whether it is the general lack of access to basic services or the specific problem of SWM. However, awareness was needed to delineate a coherent cause-effect understanding of the problem of waste management.

We observed that the presence of political representatives at workshops and trainings prevented these from being genuinely participatory. While it was important to seek their insights and assurances in terms of further action, their presence impeded our objectives of building community interest and the confidence that people have the power to change things for the better. Political workers who were present at the meeting usually took on a paternalistic attitude while hearing complaints, which possibly suggested 'We are here for you!' but dismissively and without accountability.

A large part of the community meetings was about sharing the data that the NGOs had collected in the maps. In our assessment, this was interesting to the community because it demystified maps. For the community, till now, maps had only been associated with 'cutting'; the meetings now presented the area to them through these maps in a friendlier manner. In some meetings, there was also an appreciation that the collected data was being brought back to the community. In their prior experiences, they had not seen the outcomes of surveys done in the area.

However, all stakeholders were not engaged in these meetings. For example, tailoring workshops in the area threw out all their waste cloth onto the streets and dumped it on vacant plots: the people who ran these were not approached. In some meetings, the efforts to ensure that the area was well represented were minimal. In some, there was a high dependence on political party workers, which almost certainly resulted in exclusion: only those residents with whom the party workers were familiar would be called to attend the meeting.



Avni Rastogi

This article was authored by Avni Rastogi, BA LLB (Hons), during her time leading this project as a Research Fellow with Centre for Urban Equity (CUE), CEPT University, Ahmedabad (India) in 2017. Avni now runs a home bakery from a small homestead with her husband in a small village in the Himalayas of India. You can reach her at <avni.rastogi@gmail.com> In all, the meetings were positive because they provided a space for the residents to engage on the issue of SWM, not just with our teams but even with each other. This was the first time that the people of the Bombay Hotel area had been given a forum to talk about what they expected from the AMC for waste management. This was also the most comfortable they have been with maps, which, until then, had been associated in their minds with evictions and demolitions, seeing them instead as tools in their hands for advocacy.

Conclusion

This section summarises and concludes the main findings of this study by examining the question: 'Was the process participatory?' The answer is mixed as evident from the discussion above. There were many challenges in terms of the ability of the NGOs to commit time and resources, in managing the attitudes of the field staff, negotiating the political dynamics, and including all stakeholders. However, it was possible to navigate most of these challenges with some success. Based on our experience in this project, the following five design features should be included for a successful public participation policy:

Orientation and continuous training for all the staff. The Participatory Planning Workshop was quite impactful in changing attitudes. Continuous training would have helped in deeply embedding open, inclusive, and participatory attitudes.

Continuous information dissemination. Ideally, we would have liked to create permanent spaces within the community for residents to approach us to allow for two-way communication at all times, instead of being limited to several community meetings.

Inclusive of all stakeholders. The word 'inclusive' here refers to not only the poor and disempowered but to all stakeholders equally – for example, people working in the tailoring industry.

Accountability. Just as the government should be accountable to citizens, NGOs and actors such as [Blinded for review] should also be accountable. While no system for accountability had been conceived, all three organisations involved held each other accountable, at least on the question of whether and how we should proceed, given the difficulties of limited resources.

Community inputs. The proposal from the community meetings where residents requested individual house-hold dustbins tempered our idealism regarding the acceptance of community inputs. The process should allow for some level of counselling (such as sustainable waste management practices to explain to residents why their request for individual dustbins would not solve their problem). Experts in the field should determine the content of such counselling.

We had to work with several limitations when designing the process for the participatory planning exercise. An overarching problem was that our partner NGOs had neither dedicated funds nor other resources to carry this project through. The staff working on this pilot also worked on other projects, thus being available only when the demands of other funded projects had been satisfied. Activities could not involve any expense since no specific budgetary allocations had been made for this project. Second, we were designing and implementing a participatory planning process without the backing or involvement of government authorities, who should have ideally been anchoring it. This reduced the credibility of the project and diminished its potentiality. Community involvement was sought with these caveats. This was compounded by a sense of frustration amongst the Bombay Hotel residents who felt that they have continuously been subjects of different research studies without having witnessed any consequent improvement in the provision of services. Last but not least, in designing the process, it was important to consider the specific interests of the partnering NGOs so that their buy-in remained high. The effectiveness of the pilot must therefore be judged in this light.

Countering the Narrative of an 'Informal Settlement Free' City How Urban Housing Demand Induces Changes of Livelihood in Peri-urban Areas of Mekelle, Ethiopia¹

Daniel Semunugus, Ephrem Nigusie, and Tania Berger

Peri-urban areas are where the activities of the countryside and city overlap. As the economic structure of Africa's agricultural sector changes, the surplus labour in rural areas is bound to migrate to cities and exert pressure on land and housing there. Consequently, municipalities struggle to cope with the rising demand for housing. This rising demand for cheap housing in the city incentivises peri-urban landholders to create new housing for rental accommodation on their plots.

Facing fast growth, Mekelle, the capital of Ethiopia's northernmost province of Tigray, is expanding towards its surrounding peri-rural areas, which face rising informality in housing. However, unlike most cities in Ethiopia, Mekelle regards itself as 'informal settlement free' and, eager to foster this image, the city administration has in the past exhibited low tolerance to any informal settlements.

Against this background, this study investigates how urban housing demand in Mekelle induces growing informality and livelihood changes in the city's peri-urban areas. The development of informality is analysed using, above all, interviews with residents and observations on the ground. Our findings demonstrate that these peripheral areas are susceptible to land price speculation and illegal construction. Thus, the study counters the official narrative of an 'informal settlement free' city.

Wider das Narrativ einer "Stadt ohne informelle Siedlungen": Wie die Nachfrage nach städtischem Wohnraum Veränderungen der Lebensgrundlagen in Peri urbane Gebieten von Mekelle, Äthiopien, hervorruft

Peri urbane Gebiete sind Bereiche, in denen die Aktivitäten des ländlichen Raums und der Stadt überlappen. Mit der Veränderung der wirtschaftlichen Struktur des landwirtschaftlichen Sektors in Afrika ist zu erwarten, dass überschüssige Arbeitskräfte aus ländlichen Gebieten weiterhin und verstärkt in Städte migrieren und dort Druck auf Land und Wohnraum ausüben werden. In der Folge haben Gemeinden Schwierigkeiten, mit der steigenden Nachfrage nach Wohnraum umzugehen. Diese steigende Nachfrage nach günstigem Wohnraum in der Stadt motiviert GrundstückseigentümerInnen in Peri urbanen Gebieten, neue Wohnungen zur Vermietung auf ihren Parzellen zu schaffen. Mekelle, die Hauptstadt der nördlichsten äthiopischen Provinz Tigray, expandiert aufgrund des schnellen Bevölkerungswachstums in Richtung ihrer umliegenden ländlichen Gebiete, in denen die Informalität im Wohnungsbau zunimmt. Im Gegensatz zu den meisten Städten in Äthiopien betrachtet sich Mekelle jedoch als "Stadt ohne informelle Siedlungen" und die Stadtverwaltung zeigte, um dieses Image zu fördern, in der Vergangenheit geringe Toleranz gegenüber informellen Siedlungen.

Vor diesem Hintergrund untersucht diese Studie, wie die Nachfrage nach städtischem Wohnraum in Mekelle wachsende Informalität und Veränderungen der Lebensgrundlagen in den Peri urbanen Gebieten der Stadt hervorruft. Die Entwicklung der Informalität wird vor allem anhand von Interviews mit BewohnernInnen und Beobachtungen vor Ort analysiert. Unsere Ergebnisse zeigen, dass diese Randgebiete anfällig für Spekulationen mit Landpreisen und illegale Bauaktivitäten sind. Die Studie widerspricht somit der offiziellen Darstellung einer "Stadt ohne informelle Siedlungen".

Introduction

Peri-urban areas are where the activities of the countryside and the city overlap (Wubneh 2018). They are directly impacted by urban growth while, at the same time, rural patterns remain present in the process of incremental transition. It is often difficult to precisely define peri-urban areas because of the mix of rural and urban land-use characteristics – which is also why there is no globally accepted spatial definition of 'peri-urban' (Mbiba & Huchzermeyer 2002).

Peri-urban areas are generally marked by competition for land between the agricultural and residential as well as formal and informal sectors, and changing local-level livelihoods. Many actors (customary land chiefs, farmers with customary rights, merchants, middlemen, and district and regional government bureaucrats) are involved in land transactions and sales in these areas. Mostly the wealthy, powerful and informed succeed in a race contested under such murky conditions. (Benjaminsen n.d.). The destruction of the local environment and loss of prime agricultural land can lead to landlessness among former farmers in the area (Wubneh 2018, Wehrmann 2008). A few winners might also be found among the farmers who held original rights to the land (Benjaminsen n.d.). Those authorising land sales at the local level are also often found to be the immediate beneficiaries of land transactions (Becker 2013).

As the economic and demographic structure of Ethiopia's agricultural sector changes, the surplus labour in rural areas is bound to migrate to cities and exert pressure on land there. The economies and labour markets of the cities

From 2020 to November 2022, when a truce was established, a civil war waged between the federal Ethiopian government and the Tigray People's Liberation Front (TPLF) in the Tigray province. This study was undertaken before these events. This text, therefore, does not account for impacts of the conflict. are, for the most part, unable to fully absorb the surplus labour force pouring in from rural areas. Simultaneously, the municipalities struggle to cope with the rising demand for housing due to the migrants' arrivals (Wubneh 2018).

Consequently, peri-urban agricultural land held by local farmers is in high demand for housing. Such peri-urban developments are often constructed illegally, resulting in low rental prices (when compared to inner-city accommodation). The rising demand for cheap housing incentivises peri-urban landholders to build houses for rental accommodation on their plots, especially as income from such investments remains tax-free (Baye et al. 2020).

This tendency is further exacerbated by the fact that landholders in peri-urban areas of growing cities anticipate that the authorities will expropriate their land at any time. Farmers are generally compensated at prices many times lower than in informal deals – informal land prices in peri-urban areas in some sub-Saharan African areas, including in Addis Ababa, reportedly are as high as eight times the regular compensation. Displaced farmers have been found to be much worse off after losing land because they face difficulties adjusting to urban life and finding jobs. Therefore, farmers prefer to sub-divide their plots to either sell them or build unauthorised rental houses than to risk expropriation (Baye et al. 2020, Wubneh 2018).

Modernisation theory views peri-urban change (e.g., commercialisation of agriculture, the commodification of land rights) as a positive process that leads to the transformation of the local economy. This World Bank/IMF-sponsored approach considers communal tenure as a backward obstacle to entrepreneurial endeavour and a 'structural' defect that must be overcome before growth can occur (Mbiba & Huchzermeyer 2002).

Realities on the ground, however, show that informal settlements in peri-urban areas are a response to the inefficient and inadequate formal housing delivery (FIG 2008: 10). Existing urban-planning standards and regulations are practically irrelevant in informal settlements and create a psychology of illegality (Fekade 2000).

Existing land-use control and regulations, imported from Europe over the last five to ten decades, are part of the problem rather than the solution: building codes, subdivision and infrastructure standards, and zoning laws tend to be way above current realities in African cities (Fekade 2000).

Rental-accommodation prices in the inner towns are unaffordable to the majority of the poor, pushing many of those in search of rental housing to peripheral areas – this encourages landholders at the periphery to build homes for rent. The rise in rental prices in the city thus causes the emergence of informal settlements in the peri-urban areas (Mbiba & Huchzermeyer 2002).

Mekelle

Mekelle, the capital city of the Tigray region, is located in the northern Ethiopian highlands, at a 784-km drive north of the national capital city, Addis Ababa. It has an average altitude of 2,200 metres above sea level, with a mean minimum, mean maximum and mean average monthly temperature of 8.7, 26.8 and 17.6° C, respectively. The amount of rainfall is variable in Mekelle; on average, about 600 mm, and more than 70% of it falls between July and August, followed by a long dry season.

The city was founded as a national capital during the era of Emperor Atse Yohannes IV in the nineteenth century. As a regional city of Tigray, it has developed as a political, economic and cultural centre characterised by spontaneous growth. Since the time of Italian occupation, there have been attempts to introduce city planning based on modern principles. In 1937, the Italians prepared the first-ever drawn city plan (grid organisation), which has guided the development of the inner settlements ever since.

In 2007, Mekelle had an estimated total population of 215,546 (CSA 2007). It is one of Ethiopia's fastest-growing cities, next to Addis Ababa, in terms of human settlement and industrial and institutional establishment. At present, the city has a built-up area of 3,500 hectares. As the prime city in northern Ethiopia and the regional capital of Tigray, the city has experienced rapid urbanisation and a substantial influx of rural-urban migration. This influx, coupled with the lack of timely, efficient and proper planning, exacerbates the gap between what the city can provide and the needs of its residents in aspects such as housing, infrastructure and services. Housing and municipal infrastructure are among the city's basic services, which are severely lacking.

Leaseholding of urban land in Mekelle

In Ethiopia, leasehold land can be transferred to a third party, without any value added to the land, if it is done through the responsible authority. In that case, the leaseholder is entitled to be reimbursed for any development on the land; the amount paid for the leasehold includes the calculated bank rate interest and 5% of the transferred lease value. Therefore, although the profit for urban land speculators is reduced, the urban land lease proclamation still offers an opportunity for the investors and/or land speculators to conduct urban land speculation, the profits of which they share with the local authorities.

Although land is the property of the state and the people, the urban land lease policy declares that urban land can be transferred to the users as leasehold via auction or public bid. Under this system, once the peri-urban areas are incorporated into the city's master plan, the municipality can initiate land acquisition. Then, after paying compensation, the land is expropriated from the farmers. This process converts the land from a rural land-use system with no time limit on tenure to land that can be transferred to individuals or corporations for a specified period through a lease arrangement. The third step is auctioning the land through a tendering system wherein the highest bidder gets the lease contract.

Following this system, the city administration offers vacant plots of urban land through advertisements on public media. The land providers set the lease benchmark price (or the land rent price base). Hence, the urban land authorities should determine the minimum threshold price by considering infrastructural development costs, demolition costs, and displacement costs in the case of built-up areas.

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Despite this fact, the current urban land leasehold market price in Mekelle is unaffordable for most inhabitants, preventing them from leasing land for the construction of private housing. The competition in the urban land market is very high, and the city administration generates most of its revenue through tendering urban land and collecting rents from leased land.

As the population of Mekelle increases, housing demand and land prices also rise. The need for urban land is too high compared to the supply, which is low, especially for the construction of single housing units. Lack of transparency in the municipal authorities and the land administration system has created a group of wealthy land speculators and brokers.

These speculators and brokers profit from the fact that farmers in peri-urban areas anticipate the incorporation of their land into the urban master plan and know that this would signify their expropriation at a low compensation rate. Rather than waiting for this to happen, farmers offer their land for informal purchase below formal market prices (which they cannot attain) but well above official compensation (which they would receive in the case of expropriation). Informal buyers, of course, take the risk that their purchase might not be acknowledged, but will still be expropriated by the authorities (in which case, their investment in the informal land purchase is lost). They therefore try to negotiate de facto recognition of their (informally acquired) tenure with the local administration. Their ultimate goal is to offer profitable rental accommodation on the informally purchased land.

The farmers who originally owned the land often had a formal connection to electricity and/or water supply. Thus, the informal buyers of that land step in, use these formal connections for basic services, pay the corresponding bills, and use this fact as means to document the legality of their tenure to the authorities. Ultimately, however, they are at the mercy of the authorities; hence, their informal land purchase is land speculation and, usually, only people with some amount of wealth can take such a risk.

Informal settlement in the eyes of the Mekelle city administration

Many local governments do not fully acknowledge the existence of slums and informal settlements, as the available data is often ad hoc and not connected to integrated, citywide monitoring and evaluation processes (UN-Habitat 2007).

In Mekelle, different government bodies likewise fail to acknowledge this phenomenon. Tigray's regional government and Mekelle's city administration have exhibited a low tolerance for any informal settlement in the past. The administration wants to maintain an image of an 'informal settlement-free city'. This intention has been seen recurrently, and multiple informal settlements around the peripheral districts of Mekelle have been evicted.

In 2011, 1338 housing units, deemed illegal by the regional government, were demolished in Gefih Gereb. In 2013, however, 1820 informal builders or settlers who purchased land through different mechanisms were legalised. A year later, the 2014 city administration report showed 827 units recorded as illegal; most of them were subsequently demolished. The report also pointed out a severe occurrence of 'illegal' settlement at the city periphery, for example, in the Gefih Gereb district on the outskirts of Mekelle, where city authorities demolished informal houses. Even though the city administration puts strong administrative controls on illegal or informal settlements in these outskirt areas, informality keeps emerging at a small scale.

Given this attitude of the local authorities and the fact that Mekelle regards itself as 'informal settlement free' – unlike most cities in Ethiopia – this study has pursued an investigation of how and to what extent informal settlements emerge in Mekelle city and its vicinity. It thereby focuses on how demand for low-cost urban housing induces changes in livelihood in peri-urban areas of the town: while farming and related agricultural occupations may still be prevalent in the area, the demand for cheap (rental) accommodation sees former farmers engaging in building construction and subletting, while their tenants are rarely farmers but entertain a range of other, non-agricultural occupations.

Methodology

The methodology of this study triangulates spatial data with structured interviews and focus group discussions with knowledgeable people, local-level administrators, municipality officials,² and members of the neighbourhood communities. As a first step in verifying the existence of informal settlements in the city and the understanding of city managers regarding the definition of informality, key informants, local-level administrators (departments of subcity offices) and municipality officials (from TBUD) were present during discussions and interviews with residents of neighbouring communities. Consequently, structured interviews and discussions with local administrators and experts of all the city's seven sub-cities were conducted. However, only results for the peri-urban district of Serawat are presented hereafter.

Overall, the following methodology was applied roughly between April 2018 and 2019:

- An initial focus group discussion was held with resident representatives and officials from all of Mekelle's seven sub-cities, thereby focusing especially on the peripheral areas.
- A first, rough visual assessment of satellite photos, following morphological analysis (Dovey, et al. 2020), was undertaken to identify potential areas of informality.
- 3. The identified areas were inspected on the ground.
- 4. Conversation was sought with randomly selected area residents to verify potential informality.
- 5. Conversation was also sought with local authorities to further verify potential informality.
- 6. If informality could be verified on the ground, the areas were demarcated on satellite photos. This approach enabled the research team to estimate the city's proportion of informally inhabited areas.

Employees of Tigray Bureau of Urban Development (TBUD)

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- 8. A focus group discussion was held with local authorities and representatives of the identified areas. However, to avoid exposing directly affected households to potential confrontation with the authorities, care was taken to involve only representatives who could speak on their behalf without being directly involved.
- 9. Expert interviews were conducted with individuals working for the local authorities on their stance on informality.

All these steps were conducted to verify all areas of potential informal housing within the municipal boundaries. Based on these thorough investigations, it could be established that roughly 15% of the city area can be deemed as occupied by informally residing households.

Table 1: Details on theinterviews, surveys and focusgroup discussions. Source:The authors.

Through this multi-layered approach, it was possible to discern that local officials were, in fact, aware that some informal structures existed in their areas. But they would

Method	Feature	Specification
"Focus Group Discussion	Number of FGDs conducted	1
(FGD)"	Who was involved	Community representatives (one female and one male representatives from each designated informal settlements) and experts (urban land management professionals) from each seven sub cities.
	Selection mode	In consultation with local administrative units (Sub city and Kebele) where the informal settlement are located.
	Number of respondents	In consultation with local administrative units (Sub city and Kebele) where the informal settlement are located.
Semi Structured Interviews	Who was involved	Experts on urban land Managment from each respective local offices (Sub cities, municipality and regional urban and regional development offices)
	Selection mode	All experts from each respective offices in all Sub cities, municipal and regional office.
	Number of respondents	10 experts
"Surveys	Who was involved	Residents
(individual household	Selection mode	Random selecetion
survey)"	Number of respondents	6 from each site total 12
	"main topics of survey questions"	"Housing condition Ownership status Family size Livelihood Infrastructure provision Age of the house"

rate them as either being of minor extent, in need of regularisation, or outright 'illegal' (and thus to be demolished).

Table 1 provides an overview of all relevant details on the interviews, surveys and focus group discussions.

Results

Serawat, the district investigated in detail here, is a somewhat agriculturally minted area on the periphery of Mekelle and in the Hawelti sub-city administration. Some years ago, it was still exclusively agricultural land. However, it was proposed as an expansion area and, through the merging of peripheral agricultural lands, it became part of the city administration by 2011. Yet, even today most of its residents are still predominantly farmers.

Mekelle's new industrial park is located behind this district. A new road to this park passes Serawat and is inducing land-use change. The new structural plan reserves the area for mixed development. Hence, agricultural activities are transforming into mixed activities, including service, small-scale commerce, and subletting of houses. Since the site is far from the city centre and rents are still very low, it is preferred by low-income renters. As a result, rental houses are being built by both original owners in the district and those who have bought land there.

Similar to other peripheral areas in Mekelle, Serawat has seen the emergence of informal settlements. From 2011 onwards, a few residents settled informally, but most were legalised later. The city administration conceived a local development plan (LDP) several years ago, but since it has not yet been implemented, it keeps creating loopholes for the emergence of informality in different ways.

Serawat district struggles with a critical shortage of water. Hardly any household has a direct water supply. The main water supply is supposed to be provided by communal water taps, which tend to be located within a certain distance from the homes. These communal taps, however, are not functional and residents are forced to travel some three to four kilometres to fetch water at least once a day. Once every week, a truck delivers water for the residents, but in insufficient quantity. That is why residents end up being forced to travel to fetch water.

The survey area for this study covers an estimated two hectares. This site is relatively less dense compared to the inner-city site because most of the land is still being used for agricultural activity. The houses are organised organically, following their farmland. Most of the homes do not have direct access to roads. In this site, 25 houses were surveyed with a questionnaire, and four house owners were interviewed in detail to gain insight into the housing conditions, ownership status and livelihoods of the residents. Of this sample, two expressive examples are portrayed hereafter.

In an exemplary manner, these two houses demonstrate how changes in livelihood slowly take hold in the affected area. While House 01 is still inhabited by the original farmers (who still work in agriculture but increasingly need to find new/additional sources of livelihood), House 02 has already been rented out by the farmers who own it. The renters of this house are not linked to agriculture anymore.

Figure 1: House 1. Photo: E.
 Nigusie.



House 01 (see Figure 1)

- Age of the owner of the house: 42
- Age of the main house: around 15 years
- Number of family members living in the house: five
- Compound size: approximately 500m2

In House 01, the female head of the household lives with her husband and three children. She inherited the house from her family when she got married. Her husband works as a farmer, and she is a housewife and works on the farm. Due to the lack of LDP implementation in the area, informal selling is happening all around. One consequence of this, the owner mentioned during the interview, is that her farmland is being used as an informal access road to neighbouring plots.

She and her family have noticed that the land is losing fertility over time. Therefore, they see themselves as forced to change their livelihood by providing rental housing. They get 600 birrs [11 USD] per month by renting two-room houses. Additionally, the interviewee's husband works temporarily on construction sites in the city.

The provision of water was indicated as this household's most-pressing need. It's the housewife's traditional duty to collect water, and she has to travel long distances to get it, which constitutes a significant burden to her. She also observes that the scarcity of water and the need to travel far to fetch it harms her children's studies. She, therefore, sees the city administration as having a duty to ensure adequate water supply in the Serawat district.

Furthermore, she requests the provision of adequately paved roads. The streets are dry, weathered and

improperly paved, making the neighbourhood very dusty, and the absence of sufficient water makes it challenging to keep the house clean. They fear that this constant exposure to fine dust in the air, and even within their home, will also impact their health.

House 02 (see Figure 2)

- Age of the main house: around ten years
- Number of family members living in the house: three
- Compound size: approximately 200m2

This house is located within proximity of the main road. The house is a two-room house with an approximate size of 25m2. According to the interviewee, the owner acquired the land through inheritance from his parents. Traditionally, when children get old enough to marry, they have the right to receive a portion of farmland from their family's property. That is how this owner got his land.

Today, its residents (the interviewees) are renters who engage in small-scale commerce by selling *injera* bread and local drinks. The interviewed household head indicated having chosen to rent this particular house because of its low cost, which is only 500 birrs [appr. 10 USD] per month for the entire compound.

There isn't any toilet, proper kitchen or water access on this property. The residents' primary problem is this lack of water and a decent toilet. The building is deplorable because it was erected initially only as a temporary structure with stone and mud. The house is also situated near the industrial park's main access road. This proximity causes difficulties in access and a high dust load, which renders it difficult to keep the house clean. During the rainy seasons, the road leading to the house becomes muddy and

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Figure 2: House 2. Photo: E. Nigusie.

3

Districts closer to the city centre are equipped with command posts that control regularly for illegal constructions, according to LDP. Owners are requested to make corrections if the informality happens on a legally owned property. If the informality or illegality happens without any legal right to own the land, the authorities will demolish the construction. The other control system is checking by professionals through random visits to the sites; however, the problem with this is that there is a critical shortage of staff, and it is very open for abuse.



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access, again, gets tricky. The entire neighbourhood lacks street lighting. Therefore, residents do not feel safe when coming home at night.

Discussions with the Hawelti sub-city administration

Serawat is under the Hawelti sub-city administration. A land management officer in this sub-city administration was interviewed about the status of informal housing in Serawat.

This expert indicated that only a few informal houses could be identified in the district. Previously, a largescale informal settlement had existed in Gefeh Gereb. But based on the city administration's decision, those informal constructions were demolished. Currently, a few informal houses exist but not on a big scale, so it is not considered a problem for the time being. Decisions will be taken on these few houses when the LDP is implemented.

The main informality observed in the sub-city includes the construction of residential homes on farmlands and farmers selling part of their farmland without the proper legal procedure. Likewise, buildings are constructed without building permits from the sub-city administration. The authorities have also observed the expansion of property lines beyond the original plot sizes. The appearance of this kind of informality is tied to changes in the residents' livelihoods: to be able to construct rental accommodation in their compound, residents include part of their farmland with their living compound and therefore move plot boundaries.

Questioned about measures taken by the city authorities regarding informal constructions, the expert pointed out that regularisation had previously been applied to some informal settlements. Such a decision for regularisation is made when preparing a LDP, and the informal settlements are legalised according to the LDP. However, currently, the decision being taken by the city administration is to demolish any illegal construction or settlement.

When it comes to identifying informal constructions, the first thing to be considered by local authorities is a lack of building permits. Even if a permit was issued, adding rooms or floors contradicting the permitted design is also informal. The expert interviewed by the research team acknowledged that, previously, regularisation had been applied to some informal settlements. This decision was made while preparing the LDP, and the informal settlers were legalised in this LDP.

Furthermore, the expert conceded that most LDPs for the city's peripheral areas had not yet been implemented. Due to this lack of implementation of the LDPs, informal and illegal settlements keep coming up, especially at the periphery of the Serawat district, where land-use control is not strictly implemented.³

For this study, residents deemed informal by the authorities were talked to and interviewed by the researchers. Through this, we were able to confirm that all the settlement areas delineated as informal settlements, according to the morphological analysis of aerial photographs, were indeed informal (see Steps 1 to 5, as described in 'Methodology'). The residents pointed out, however, that though the settlements are generally informal, they have different rights, ranging from entitlement to relocation on some properties, to the threat of outright, unavoidable eviction in other locations. Primarily, this is determined by how long the residents have been settling in the area – the later the settlers came to inhabit the site, the more susceptible they are to eviction (as witnessed in 2019's evictions on the city outskirts).
During discussions with the communities regarding the causes of informality and why they are informal, residents mentioned two main points:

- The delay of integrating annexed urban villages into any legal plans of the city (structural plan, LDP or cadastre): as the developed LDP has not yet been implemented, it keeps creating a gap for the emergence of informality.
- Lack of affordable housing schemes for the poor: in search of affordable housing, many urban poor move to the outskirt of the city and buy land or rent accommodation from farmers with the hope that this land will eventually get legalised over time.

The social composition of the Serawat site is characterised by a mixture of groups: some are owners of the land, others are renters. Some houses remain vacant as their owners only constructed the buildings to safeguard their ownership: unless there is a building on a plot, land cannot be legalised officially. It is only the house that the city administration can legalise as the property of the owner. Hence, people construct temporary buildings to indicate that they own the land and can sell or transfer it. Brokers or speculators also do this kind of construction. Houses constructed in this way are considered informal by the local utility companies, and that's why none of them are provided access to electricity.

Economically, the original residents are still mainly dependent on agriculture; however, those who moved to the area to rent make their income through small-scale commercial activities – mainly by selling local bread, drinks, or other items.

Since the site was previously under rural administration, there are hardly any waterlines. The entire neighbourhood of Serawat lacks a water connection. Even some formal residents have not been provided access by the city administration, as the area has low priority due to low residential density.

The situation is similar regarding access to proper roads and drainage systems. The primary reason is the land-use change from agricultural land to mixed development. The LDP designates Serawat as a mixed residential zone. However, since the LDP has not yet been implemented, residents are still running their farms. Apart from the main road passing to the industrial park, there is no proper road system. Access roads to the district are only roughly paved.

Conclusion

Contrary to the claim of the city administration, ⁴ informal settlements do exist in Mekelle regardless of the history of harsh evictions by the local authorities. The extent of informality is increasing as the city engulfs urban villages without proper preparation for integrating these peripheral settlements. In addition, the existing challenges of affordable housing coupled with the political and economic instability of East Africa are exacerbating the extent of informal settlements in Mekelle.

Peripheral rural villages and less-administrated areas of the city and its neighbouring villages, particularly, see the emergence of informal settlements. These settlements have developed without any recognition of existence by the local authorities. Based on visual analysis and data verification on the ground (as described in chapter 'Methodology'), this study found that informal settlements in Mekelle represent slightly less than 15% of the city area. The significant factors for people to settle there are the unmet housing needs coupled with the local availability and (albeit temporal) invisibility of the new structures to the authorities. Given the prevailing attitude and previous actions of the municipality towards informal settlers, it is likely that these settlers will face eviction in the future.

The developments portrayed here of the exemplary case of Mekelle document how cities grow in contemporary East Africa, especially in Ethiopia, where the state owns all land. It demonstrates how farmers living in peri-urban areas try to avoid being expropriated at low compensation rates once their lands get incorporated into the city's master plan by selling land informally to speculators and brokers.

These sales typically induce land-use changes, and residents not engaged in agriculture start to populate these peri-urban areas. These residents tend to be low-income earners unable to afford rental accommodation in more centrally located and, thus, more expensive urban areas.

The local authorities in different cities apply varying modes for dealing with such development at the fringes of expanding urban agglomerations. The low tolerance towards this kind of informality adopted by the authorities in Mekelle may represent an outlier in the context of Ethiopia, but it starkly highlights the power differentials and competing interests at play in this transitory phase of city growth.

However, how this phase is managed lays the crucial foundations of general future liveability in these new urban areas. This management decides who benefits from the urban expansion, and who loses out. At the moment, affected peri-urban farmers are often detrimentally affected as they tend to be expropriated without meaningful compensation. Additionally, they lose their livelihoods and are left to fend for themselves in search of new sources of income. To this background, it appears comprehensible if they seek alternatives by selling land informally. Yet, the authorities who cannot pay them meaningful compensation for expropriation try to suppress upcoming informality, sometimes going as far as bulldozing it.

This study, therefore, showcases the transition of peri-urban land into becoming part of the city. During this process, land use changes to entertain non-agrarian livelihoods. It could be demonstrated how urban housing demand fuels this transition. The evidence shows how complex interplays of different actors – such as farmers, local authorities, land speculators and low-income rentseekers – shape the process. More just modes of transition need to be conceived and tested to make sure that less-powerful sections of society, such as farmers and urban poor, are not nobbled and their weak socio-economic status does not get perpetuated. This transitional process of peri-urban areas being incorporated into cities thus warrants much more attention from researchers and policymakers.

E.g., in the (withdrawn and therefore unpublished) Mekelle Structural Plan of 2014 or in World Bank Group (2015: 44).



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TRIALOG

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Book reviews

Transport in Human Scale Cities. Edited by Miloš N. Mladenović, Tuuli Toivonen, Elias Willberg and Karst T. Geurs

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The book is an open access title available under the terms of a CC BY-NC-ND 4.0 License. It is free to read, download and share on www.elgaronline.com or https://doi.org/10.4337/9781800370517.

The book is part of the Nectar Series on Transportation and Communications Networks Research, an outcome of NECTAR, a Network on European Communications and Transport Activities Research whose primary objective is to foster research collaboration and exchange of information between experts in the field of transport, communication and mobility from all European countries and the rest of the world.

Very rich in context, this book claims to provide answers to two challenging questions of modern urban planning: What characterizes a human scale city, and how can urban transport contribute to achieve this quality?

Edited by four academics from universities in Finland and the Netherlands, the book compiles work conducted by fifty researchers in cities as diverse as Lisbon, Vancouver, Recife, Stockholm, Lima or Enschede. Despite the many authors, the book is perfectly well edited, including short biographies of all contributors and an index.

On the way to a human scale city the authors call for "transitions out of our unsustainable lifestyles which require changes not only in the built environment and technological systems, but also in our behaviors and societal values" (3). They question the conventional model of Homo economicus, for whom travelling is a burden and derived demand. Instead, they propose to imagine Homo mobilis to whom they attribute "an intrinsic desire to move in the everyday environment with travelling being an endemic fact of daily flow that can be a purposive activity in itself" (5).

The authors consider "future-making – and citymaking – not as a technocratic but rather a political process and a practice of knowing and acting" (7). For them "human scale can be a guiding principle in context-dependent situations for nurturing the wide range of cities around the world" (9).

The book is organized in five parts. Part II (6 chapters) "aims to further expand our understanding of the human scale in the urban transport systems", examining e.g., the relationship between transport and wellbeing or challenges and motivators for walking and public transport use among the elderly. Part III (4 chapters) adds further research findings on innovative practices to advance the human scale in mobility technologies, e.g., by using smartphone applications for cycling trips or examining neighborhood-level integration of mobility services in Germany. Part IV (7 chapters) puts a focus on the use of new data, methods and approaches, e.g. with a case study of a planning support system aimed at areas with potential for cycling in starter cycling cities in a Portuguese city, and a review of experiences from transport planning projects in six countries. Part V presents a comprehensive conclusion based on summaries of selected findings. It starts from the proposition that "we need to allow for multiple meanings of what human wellbeing is and how it can be achieved through built environment and policy interventions" (247). A first observation is a "significant discrepancy in an essential mode of human wellbeing: walking" (ibid.). Another insight concerns the Global South, where "income and poverty aspects are determinants of habit preservation in mode choice to a degree that low-income individuals depend on public transport regardless of their accessibility conditions, while high-income households do not use public transport for reasons that are not associated with accessibility (248).

Concerning the elderly, some findings support the need "to understand the classical integration of walking and public transport. [...] On the other hand, we should also design new mobility sharing devices such as car sharing" to enable an active lifestyle (248).

The mode of cycling, a constitutive mode in human scale cities, is covered in several chapters. One conclusion is that we need to develop more planning support systems for cycling-related decisions. In one chapter, a user-friendly method is explained to determine the gross potential for cycling based on census data using a so-called starter city in Portugal where the bicycle ride shares are still extremely low as a case. It is an outstanding merit of this book that it combines chapters on conceptual issues with others on practical applications.

The challenges of empirical studies on modal choice can be perceived in a study into the political economy of a metro project in Lima. The findings support the conclusion that a political barrier is the main obstacle to a more intensive use of the extremely costly only metro line, because it is not at all integrated into the overall urban transport system which is still based on a multitude of individual private transport operators.

Finally in the conclusion of this informative and well-organized book, the initially identified three key domains of change are being reflected in the light of the findings presented: "changes in actions and virtues of diverse actants involved in futuremaking; changes in governance and processes of these networked actants: and change in the core conceptualizations used in understanding urban mobility" (253).

Volker Kreibich

Editorial (Deutsch)

Die menschliche Wohnumgebung hat entscheidenden Einfluss auf unsere Gesundheit. Die Betrachtung des Wohnraum-Gesundheits-Nexus zeigt insbesondere im Fall von einkommensschwachen, städtischen BewohnerInnengruppen, dass gesundheitsbezogene Verbesserungen eine sektorübergreifende Herangehensweise an die Wohnbedingungen erfordern. Der Fachbegriff der Umweltbedingten Gesundheit (Environmental Health) bezieht sich auf jene Aspekte der menschlichen Gesundheit, die durch physische, soziale und psychosoziale Faktoren in der täglichen Lebensumgebung von Menschen bestimmt werden – wobei als Gesundheit gemäß der Definition der WHO nicht nur die bloße Abwesenheit von Krankheit verstanden wird (WHO 1946).

Die Verknüpfungen zwischen Defiziten der Umweltbedingten Gesundheit und anderen Dimensionen der Armut sind komplex und verstärken sich auf verschiedene Weise wechselseitig (Sunikka-Blank et al., 2019). Einkommensschwache Gruppen sind oft Gesundheitsrisken ausgesetzt, weil sie an "ungesunden" Orten ohne Basisinfrastruktur leben. Sie sind verletzlicher, weil ihnen weniger Ressourcen zur Verfügung stehen um ihr Verhalten anzupassen und ihre Exposition zu moderieren. Ihre Wohnsituation hat auch erhebliche wirtschaftliche Implikationen: der Wohnort beeinflusst stark welche Jobs zugänglich sind, und die Verfügbarkeit von Räumen bestimmt welchen Einkommen schaffenden Tätigkeiten nachgegangen werden kann (Ellena et al., 2020).

Wohnen, Gesundheit und Lebensgrundlagen sind somit intrinsisch miteinander verflochten. Sie werden selten in ihrer Gesamtheit betrachtet (Mukhija 2001). Diese Ausgabe von TRIALOG versucht vor diesem Hintergrund, Licht auf diese Zusammenhänge zu werfen. Die hier vorgestellten Fälle (überwiegend, wenn auch nicht ausschließlich aus Indien und Äthiopien) wurden empirisch fundiert und interdisziplinär bearbeitet um unser Verständnis des Nexus von Wohnen, Gesundheit und Lebensunterhalt zu erweitern.

01 Mamta Patwardhan untersucht die Vulnerabilität von BewohnerInnen der informellen Siedlung Adarsh Nagar, einem Viertel in Mumbai, Indien. Während eine Mülldeponie ihren Lebensunterhalt durch Müllsammeln sicher stellt, birgt sie gleichzeitig erhebliche Gesundheitsrisiken, insbesondere während extremerer Wetterbedingungen.

02 B.N. Eicker, J.R. Noennig und J.A. Schmidt

entwickeln einen Index für lebenswertes Leben, der darauf abzielt, relevante und lokal spezifische Komponenten des lebenswerten Lebens zu identifizieren und zu klassifizieren. Der Index wurde empirisch in Bhubaneswar, Indien, im Kontext von Slum-Aufwertungsgebieten getestet. Die Studie betont die Bedeutung kontextualisierter Indikatoren zur Unterstützung nachhaltiger Aufwertungsansätze.

03 António Manuel de Amurane, Dorival Victorino Fijamo, Cecília João Boaventura und Jaibo Rassul Mucufo stellen den Fall des Stadtteils Namutequeliua vor, einer informellen Nachbarschaft in der Stadt Nampula, Mosambik. Ihre Ergebnisse bestätigen den Einfluss von schlechten Wohnbedingungen und schlechten sozialen Beziehungen auf die Gesundheit der BewohnerInnen, insbesondere der Kinder.

04 Abnet Gezahegn und **Peter Gotsch** konzentrieren sich auf das Energiemanagement in informellen Siedlungen in Addis Abeba, Äthiopien. Sie versuchen, die Beziehung zwischen dem Energiemanagement von Haushalten und den sozialen, wirtschaftlichen und Umweltmerkmalen von Siedlungen zu verstehen. Dabei zeigen sie, dass der Zugang zum öffentlichen Stromnetzt, sei er formel oder informell, eine bedeutende Rolle für die Sicherheit der BewohnerInnen spielt.

05 Auch die Arbeit von **Faiz A. Chundeli** und **Tania Berger** trägt zum Wissen über die Beziehung zwischen städtischer Hitze und dem Zusammenhang zwischen Wohnen und Gesundheit bei. Sie behandelt die Frage, wie Hitze den Lebensunterhalt von einkommensschwachen BewohnernInnen in Vijayawada, Indien, beeinflussen. Die Autoren kommen zu dem Schluss, dass die Qualität der Behausung eine Verbindung zwischen Hitze und Gesundheit herstellt.

06 Sandeep B. Menon, Anirudh Somadas, Funda Atun und Javier Martinez untersuchen den Zusammenhang zwischen dem Wohlergehen von periurbanen Gemeinschaften und Ökosystemleistungen auf Panju Island, Mumbai, Indien.

07 Sara Amare und **Tania Berger's** Arbeit über Gebäudeform und den Übergang zu modernen Energieträgern präsentiert den Fall von mehrgeschossigen Wohnbauten in Mekelle, Äthiopien, die hauptsächlich mit Strom aus dem Netz versorgt werden. Diese Gebäude bieten jedoch nicht den Raum und die Einrichtungen, die für die Nutzung anderer Energiequellen erforderlich wären, und begrenzen damit die Möglichkeit für die BewohnerInnen, verschiedene Energiequellen zu nutzen.

08 Hone Mandefro und **Bekele Molla Ayele** untersuchen, ob Gebäudetypen das soziale Kapital von BewohnerInnen beeinflussen. Sie beobachten vergleichsweise geringes Sozialkapital bei BewohnerInnen mit sehr heterogenen, sozialen Hintergründen im mehrgeschossigen Wohnbau in Gondar, Äthiopien.

09 Avni Rastogi's Arbeit "Partizipative lokale Gebietsplanung: Der Fall von Bombay Hotel, Ahmedabad (Indien)" geht der Frage nach, was es bedeutet, in Indien eine partizipative Planung durchzuführen. Die Autorin zeigt, wie partizipative Kartierung und das mit der Gemeinschaft gesammelte Wissen für grundlegende Infrastrukturen unerlässlich sind, da dies direkt die Gesundheit und das Wohlergehen der BewohnerInnen beeinflusst.

10 Daniel Semunugus, Ephrem Nigusie und Tania Berger widersprechen der offiziellen Darstellung einer Stadt ohne informelle Siedlungen in Mekelle, Äthiopien, indem sie untersuchen, wie die Nachfrage nach städtischem Wohnraum Veränderungen des Lebensunterhalts in periurbanen Gebieten induziert. Diese Studie zeigt daher den weitgehend von Informalität gekennzeichneten Übergang von periurbaner zu städtischer Landnutzung auf.

Tania Berger, Javier Martinez und Peter Gotsch

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