

A Liveable Life Index

A study about the potentials for participation in slum upgrading.

Case Study Bhubaneswar/India

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Preface

This thesis revolves around the question how locally-rooted liveable life perceptions can be identified using digital participatory approaches at slum level to contribute to the sustainable design of slum upgrading projects in Smart Cities.

The research study brings together interviews from experts and inhabitants of slum-upgrading projects in Bhubaneswar. The results create new opportunities for digital approaches used within Smart Cities.

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III. Acronyms

ABD	Area Based Development
API	Application Programming Interface
APP	Application
BSUP	Basic Services for Urban poor
CSMC	Central Sanctioning and Monitoring Committee
EPI	E-Participation Index
EWS	Economically weaker sections
FGD	Focus Group Discussion
KPI	Key Performance Indicator
LIG	Low-income groups
LLI	Liveable Life Index
MIG	Middle-income groups
MoHUA	Ministry of Housing and Urban Affairs
OECD	Organisation for Economic Co-operation and Development
OLHM	Odisha's Liveable Habitat Mission
PMAY	Pradhan Mantri Awas Yojana (Housing for All Scheme)
RWA	Resident Welfare Association
SCM	Smart City Mission
SDA	Slum Dweller Association
SHG	Self Help Group

IV. Abstract

Current urbanism research unanimously recognises that eradication and displacement of informal neighbourhoods is often controlled by top-down policies of a mostly privileged social class. With the adoption of the New Urban Agenda and the Sustainable Development Goals (SDGs) and their follow-up agreements, a vision for future developments in which exclusion and paternalism are transformed into integrated exchange; top-down master plans into sustainable bottom-up empowerment; slums into integrated neighbourhoods; and misery into qualitative living conditions has been formed. From the shortcomings of previous approaches, a readiness has emerged for new, more inclusive action, whose key to sustainable urban transformation is participatory action. The focus of novel slum upgrading approaches is on improving the well-being of local slum residents, which is yet insufficiently realized by current methods. To accompany the change towards a liveable life for all levels of society, it is time to collect locally-rooted indicators for a sustainable and liveable future and make them usable. A guide and tool for such a development of informal urban areas is sought within in the context of smart city measures.

This study addresses actors working for a liveable life in urban slums. The overall aim is to contribute to research on urbanisation problems in developing and emerging countries by characterising local, digital participation and how these can be explored and systematically described for the creation of social, economic, and ecological added value. The focus is on bridging instrumental gaps in participatory planning and implementation. The hypothesis is that the perception of a liveable life is shaped by location-specific liveability factors, which are insufficiently reflected in current slum upgrading strategies. The methodology developed considers primary research in the form of expert interviews and focus group discussions (FGDs), followed by an evaluation of liveability indices, as well as e-participation in smart cities.

In this thesis, efforts to improve liveability are related to the context of slums in India. By examining living conditions from the perspective of slum residents, the term liveable life is concretised and contrastingly discussed with existing upgrading frameworks. Subsequently, a "liveable life index" is developed for the context of Indian slums in the process of conversion, based on slum-upgrading-specific relevant factors, aiming to capture, classify and structure locally-rooted components of a liveable life for prioritisation and strategic upgrading. To identify local values and perceptions of a liveable life, guided interviews were conducted with decision-makers and slum residents and contrasted with findings from the international research literature. The case study of Bhubaneswar, capital of the state Odisha and centre of pilot projects of Odisha's Liveable Habitat Mission, sources these findings using content from focus group discussions of residents and expert interviews.

The study shows that upgrading strategies rarely consider the importance of indicators for the realisation of a liveable life in slums. Thus, assumptions and realities about the

meaningfulness of measures diverge, resulting in misallocations. In general, the improvement of physical environmental conditions in slums (e.g. sanitation) is seen as a crucial factor for improving a liveable life. The research has shown that social and societal factors (e.g. social contacts) are of similar importance. To identify the optimal balance of different aspects in slum upgrading, the Liveable Life Index aims to rank locally-rooted indicators of liveable life based on categories and their importance to provide a guide for the implementation of locally prioritised interventions.

The systematic study of existing indices provides results on the opportunities and weaknesses of indicator-based monitoring tools and their use in documentation and communication. Based on the results, an index is developed, consisting of a fixed and a variable component. The fixed component consists of four main-elements determined to be decisive for slum upgrading, regardless of the case. They represent fields of action which are further specified by different sub-elements, defined in the variable component, orientating towards specific elements to be upgraded. The variable component consists of a given selection of 16 indicators (sub-elements) that can be case-specifically defined, measured and parametrised based on local data to customise the index. As every upgrading project has different specificities and areas of improvement to be addressed, additional indicators (e.g. street pavements) can be added or substituted with similar indicators. The design of a customised index can be achieved in a participatory manner and be aligned with jointly agreed goals.

Keywords: Informal Neighbourhoods, Slum Upgrading, Liveability, Liveable Life Index, India, Smart Cities, e-participation.

V. General Terminologies

Global Positioning System (GPS)

The term “GPS System” refers to the term “Navigational Satellite Timing and Ranging - Global Positioning System” (NAVSTAR-GPS) which was first used in 1995 for US military purposes and is a satellite-based navigation and positioning system.¹ GPS enables it to determine an exact location (latitude and longitude as well as the elevation) at a specific time, with an accuracy between 13 meters and 1 millimetre.² Today GPS receivers are installed in nearly every smartphone (ibid.).

Informal Settlement

An informal settlement is a planning classification. It displays development outside of legally defined building areas. Not directly marked by the characteristic features of a slum. There are also informal luxury settlements that are politically tolerated and of a high standard.³⁵²

Internet of Things

The Internet of Things (IoT) comprises “a large number of objects with intensive connections, which allow these smart objects to be sensed and controlled remotely across an efficient network”.³ The

objects are thus capable of interaction and data exchange and can be remotely controlled or programmed.⁴ Fundamentals of IoT include cloud services, artificial intelligence, big data analysis and the 5G trend.

Local Strategies

Strategies describe planned behaviour to achieve a predefined goal. While strategies deal with an extended time-period and serve basic programmatic orientation for decisions, local strategies, as opposed to the concept of global strategies, do not assume homogeneous markets and rationales, but try to realize competitive advantages within one specific market.^{5,6}

Participative Strategies/Citizen Engagement

Participative strategies imply the active involvement of key stakeholders in projects, enabling individuals to actively take part in decision making processes, be

¹ Tsui, J. B.-Y. (2005): Fundamentals of Global Positioning System Receivers: A Software Approach, 2nd edition, John Wiley & Sons, Inc., Publication, New Jersey, p. 7.

² MagicMaps GmbH (2019): Wie funktioniert Satellitennavigation?, retrieved from <https://www.magicmaps.de/produktinfo/gps-grundlagen/wie-funktioniert-gps.html> (16.09.2019).

³⁵² Dovey, K.; Shafique, T.; van Oostrum, M.; Chatterjee, I. (2020): Informal settlement is not a euphemism for ‘slum’: what’s at stake beyond the language?, in: International Development Planning Review, p. 1-12.

³ Al-Sabbagh, A.; Alsabab, R. (2016): Internet of Things and Big Data Analysis: Recent Trends and Challenges, United Scholars Publications, Melbourne, USA, Preface.

⁴ Gründerszene (2019): Internet of Things, retrieved from <https://www.gruenderszene.de/lexikon/begriffe/internet-of-things> (27.09.2019).

⁵ Daft, R. L.; Marcic, D. (2017): Understanding Management, 10th edition, Cengage Learning, Boston, p. 148.

⁶ Peng, M. W. (2021): Global Strategy, 5th edition, South-Western Cengage Learning, Mason, p. 3.

regularly informed, and respected for their personal contribution.⁷

Resilience

“Resilience is understood as a measure of a system's ability to withstand disruption or change without losing its fundamental qualities and functional properties. The term robustness is understood here as synonymous with the concept of resilience.”⁸

Rural Area

A rural area displays a natural settlement that is characterised by agriculture and forestry. In these areas exists a low degree of buildings and population density, as well as low economic power and centrality, in which tradition, culture and interpersonal relationships play a greater role than in the city.⁹

Slum

A slum is a geographic-structural term and implies an area of high settlement density with poor infrastructure development level, social periphery. It can also exist in planned areas. Based on the UN-Habitat definition, slum households are considered to lack at least one or a combination of the following:¹⁰

- Stable houses to protect against weather conditions

- Sufficient living space with maximum three people living in one room
- Easy access to clean water
- Access to sanitary facilities shared by a fair number of people
- Legal security of residents which forbids evictions

Regarding the location of the thesis Case Study, the “Odisha Land Rights to Slum Dwellers Act”¹¹ of 2017 defines a slum as “a compact settlement of at least 20 households with a collection of poorly built tenements, mostly of a temporary nature, crowded together usually with inadequate sanitary and drinking water facilities in unhygienic conditions” (ibid.). Within the thesis both definitions (UN-Habitat & Odisha Land Rights to Slum Dwellers Act) are accepted.

Slum Upgrading

Slum upgrading, also known as slum improvement, implies the combination of constructing basic services (e.g. clean drinking water infrastructure, sewage disposal systems, footpaths, drainage, streetlights for security and electricity – depending on the current demand) and providing tenure security.¹²

Smart City

⁷ Cleverism (2019): Six-parts to operation, retrieved from <https://www.cleverism.com/participative-leadership-guide/> (01.10.2019).

⁸ Greiving, S. (2018): Resilienz/Robustheit, ARL – Akademie für Raumforschung und Landesplanung, Hannover, p. 2063.

⁹ Lombord, H. (2018): What is considered a rural area?, retrieved from <http://statchatva.org/2018/05/30/what-is-considered-a-rural-area/> (18.09.2019).

¹⁰ UN-Habitat (2018): SDG Indicator 11.1.1 Training Module: Adequate Housing and Slum Upgrading, in: United Nations Human Settlement Programme (UN-Habitat), Nairobi, Kenya, p. 8.

¹¹ Authority Law Department (2017): The Odisha Land Rights to Slum Dwellers Act, The Odisha Gazette, Odisha, Cuttack, p. 5.

¹² Ganguly, N. (2015): Slums of India, MJP Publishers, Chennai, p. 33.

There exists no general definition for the term Smart City, as each city has its own set of approaches to become smart. Still, the general consensus is that Smart Cities focus on a combination of location specific, industrial- and citizen-focused interests “[...] to improve urban life through more sustainable integrated solutions, including applied innovation, better planning, a more participatory approach, higher energy efficiency, better transport solutions [and the] intelligent use of Information and Communication Technologies (ICT)”.¹³

It can be summarised that a Smart City is about innovation in – social, economic, and technical aspects.^{14, 15, 16, 17} The social part deals with strategies that make a city more attractive and liveable for people, as well as environmentally friendly (green city) and sustainable. The economical part considers the strategies that are concerned with a city’s international competitiveness, expanding economic growth, and ensuring economic future viability. The technical part displays the digital changes enhancing a city’s procedures and processes, e.g. sensors that support the search for parking spaces or cameras that control and

manage the traffic.¹⁸ Examples of smart components in cities are advanced healthcare systems to streamline medical treatment of patients, smart buildings to control the use of energy and electronic government systems to facilitate citizen access to information and involve citizens in urban decision-making processes (ibid.).

In 2015, India launched the Smart City Mission (SCM) to create 100 Smart Cities. The selected cities aim at an easy-to-access infrastructure and become technologically advanced in government-citizen interactions.¹⁹

Stakeholder

A stakeholder is a “person such as an employee, customer, or citizen who is involved with an organisation, society, etc. and therefore has responsibilities towards it and an interest in its success”.²⁰ Within the thesis, stakeholders in the context of slums, are defined as community groups within and external to slum neighbourhoods that have a functional interest in and impact on the progress of slum upgrading. Through optimal integration in development work, especially external stakeholders have an impact on

¹³ IRIS Smart City (2020): Objectives & Ambition, retrieved from <https://irissmartcities.eu/content/objectives-ambition> (18.05.2020).

¹⁴ Hadzik, T. (2016): Smart cities: An inventory of Smart City concepts in practice, Epubli, Berlin, p. 4.

¹⁵ Cardullo, P.; Di Felicianantonio, C.; Kitchin, R. (2019): The Right to the Smart City, Emerald Publishing Limited, Bingley, p. 1.

¹⁶ Konieczek-Woger, M.; Naeth, A. (2020): Achtung: Smart! – Möglichkeiten und Grenzen der Idee der "Smart City" für deutsche Kommunen, Universitätsverlag der TU Berlin, Berlin, p. 42.

¹⁷ Gassmann, O.; Böhm, J.; Palmié, M. (2018): Smart City: Innovationen für die vernetzte Stadt – Geschäftsmodelle und Management, Carl Hanser Publisher, Munich, p.17.

¹⁸ Parsons, A. W. (2010): The Seven Myths of ‘Slums’ Challenging popular prejudices about the world’s urban poor, in: Share The World’s Resources, p. 58.

¹⁹ Kumari, T. (2020): Smart Cities and eGovernance Trends in India, retrieved from <https://www.analyticsinsight.net/smart-cities-and-egovernance-trends-in-india/> (01.06.2020).

²⁰ Cambridge Dictionary (2014): Stakeholder, <https://dictionary.cambridge.org/de/worterbuch/englisch/stakeholder> (04.10.2021).

development goals, which residents cannot realise unassisted to reach their perception of a liveable life.

Sustainability

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”²¹

Urbanisation

In this work urbanisation is referred to as the uneven expansion of human life and activity that takes place in a liveable environment.²² It is the outcome of individual decisions that are done in a sociocultural, economic, political, and environmental context and results in a change of fertility, mortality and migration patterns. Theoretical definitions emphasised the following three characteristics that contribute to the term urbanisation (ibid.):

- Demographic characteristic: refers to the population size, spatial dimension, and density
- Economic characteristic: refers to the type of labour force (e.g. mostly non-agricultural)
- Social-psychological characteristic refers to the different values and behaviours of urban citizens in comparison to rural citizens.

Urban Systems

Urban systems describe the structure of relationships that build up an urban area: essential linkages, specializations and

the response to growth and change. The dynamics of the system incorporate relationships in interdependence. Hence, linkages within the urban system are correlated to each other.²³

²¹ UCLA (2022): Sustainability, retrieved from <https://www.sustain.ucla.edu/what-is-sustainability/> (23.01.2022).

²² OECD/European Commission (2020): Cities in the World: A New Perspective on Urbanisation, OECD Urban Studies, OECD Publishing, Paris, p. 26.

²³ Walloth, C.; Gebetsroither-Geringer, E.; Atun, F.; Werne, L. C. (2016): Understanding Complex Urban Systems: Integrating Multidisciplinary Data in Urban Models, Springer International Publishing Switzerland, Basel, p. 4.

1 Introduction

“Our future is set to be urban.”²⁴ The global trend of rapid urbanization results in a growth of slums.²⁵ More than one billion people live in slums worldwide, of which 80% are located in African and Asian regions.^{26, 24, 27} With a rise in urbanisation, it is expected that the number of slum residents will triple by 2030.²⁸ By 2050, the UN projects that 68% of the world population will live in urban areas.²⁹ Within this time period India’s urban population is expected to increase by 700 million and 29% of the urban population will live in slums.³⁰

Urban environments are attractive, as they provide a series of benefits to residents, such as job opportunities, expected improved living standards and economic possibilities. Preserving the quality and quantity of those benefits and ensuring fair access can be fundamental for poverty eradication.³¹ Yet, rapid urbanisation places stringent requirements on critical infrastructure, offered services, climate conditions and the general environment.³² ³³ With increasing populations, unsustainable consumption patterns and the rise in demand for natural resources to sustain urban needs, sustainable lifestyles are limited.^{34, 35} In the dilemma between urban development and liveable environments it is essential to support sustainable and inclusive urban growth and figure out a way that harmonizes resulting opportunities and challenges.³⁶

²⁴ PWC (2022): A New Urban Agenda: Accommodating 2 billion new urban citizens, retrieved from <https://www.pwc.co.uk/issues/megatrends/rapid-urbanisation.html> (04.03.2022).

²⁵ Chant, S.; McIlwaine, C. (2016): *Cities, Slums and Gender in the Global South*, Routledge, New York, p. 31.

²⁶ United Nations, Department of Economic and Social Affairs, Population Division (2019): *World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420)*, United Nations, New York, p. xix.

²⁷ United Nations (2016): 11 Make cities and human settlements inclusive, safe, resilient and sustainable, retrieved from <https://sdgs.un.org/goals/goal11> (10.01.2020).

²⁸ UN-Habitat (2016): *Slum Almanac 2015/2016: Tracking Improvement in the Lives of Slum Dwellers*, UNON Publishing Services Section, Nairobi, p. 2.

²⁹ United Nations (2018): 68% of the world population projected to live in urban areas by 2050, says UN, retrieved from <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html> (24.05.2020).

³⁰ Urban Hub (2018): Challenges and opportunities for urban development in India, retrieved from <http://www.urban-hub.com/de/urbanization/challenges-mean-opportunities-for-urban-development-in-india/> (13.12.2018).

³¹ Gulati, M.; Becqué, R.; Godfrey, N.; Akhmouch, A.; Cartwright, A.; Eis, J.; Huq, S.; Jacobs, M.; King, R.; Rode, P. (2020): *The Economic Case for Greening the Global Recovery through Cities: Seven priorities for national governments*, Coalition for Urban Transitions, London and Washington, p. 6.

³² Ritchie, H.; Roser, M. (2018): *Urbanisation*, retrieved from <https://ourworldindata.org/urbanization> (17.02.2020).

³³ Kuddus, M. A.; Tynan, E.; McBryde, E. (2020): Urbanization: a problem for the rich and the poor?, in: *Public Health Reviews*, Vol. 41, No. 1, p. 1-2.

³⁴ UNEP-IRP (2018): The weight of cities. Resource requirements of future urbanization, in: *United Nations Environment Programme, International Resource Panel*, p. 21.

³⁵ Ahlström, R.; Gärling, T.; Thøgersen, J. (2020): Affluence and unsustainable consumption levels: The role of consumer credit, in: *Cleaner and Responsible Consumption*, Vol. 1, p. 1.

³⁶ The World Bank (2020): *Urban Development*, retrieved from <https://www.worldbank.org/en/topic/urbandevelopment/overview> (20.05.2020).

Liveability and Informality

There are many names for slums - favelas, bastis, ghettos, barrios populares, shanty towns, informal settlements or simply slums. With global poverty moving to cities, the developing world has to be prepared for sustainable integration.³⁷ Inclusive strategies and practices, which prioritize local concerns, local environments and environmental values are rarely found in the Indian slum context.³⁸ As numbers reveal, for the urban majority, urban life is often associated with poverty, congestion, health concerns and feelings of isolation.^{39, 14} Governments are aware of the consequences related to urban expansion, but have not yet implemented slum upgrading approaches that deal with the situation in a sustainable manner.⁴⁰

With the introduction of the Sustainable Development Goals (SDGs) in 2015, followed by the New Urban Agenda (NUA) in 2016, attention has shifted to aspects of participation and equal achievement of liveable environments.⁴¹ The need for a stronger focus on and understanding of liveability in underserved communities is formalised in SDG Goal 11.⁴² The New Urban Agenda, seen as the delivery vehicle for the SDGs, goes one step further and even mentions “enhancing liveability [...] for all”⁴³ as an interlinked principle of SDG Goal 11. Still, increasing urban inequality shapes cities, their citizens, and the environment, which requires the development of further instruments for locally adapted measures.⁴⁴ The implications associated with slums are greatest to those living there, as urban poverty is deeply intertwined with social justice, qualitative living conditions and ecological limits.^{39, 40, 45}

Creating consensus for change and extending social values, implies a shift in urban resilience and the need for networked communities that participate in a common work. This

³⁷ Mitlin, D.; Colenbrander, S.; Satterthwaite, D. (2018): Editorial: Finance for community-led local, city and national development, in: *Environment and Urbanization*, Vol. 30, No. 1, p. 3–14, retrieved from <https://doi.org/10.1177/0956247818758251> (17.01.2021).

³⁸ Cities Alliance Cities Without Slums (2021): Slums and Slum Upgrading, retrieved from <https://www.citiesalliance.org/themes/slums-and-slum-upgrading> (10.02.2021).

³⁹ Satterthwaite, D.; Archer, D.; Colenbrander, S.; Dodman, D.; Hardoy, J.; Mitlin, D.; Patel, S. (2020): Building resilience to climate change in informal settlements, in: *One Earth*, Vol. 2, No. 2, p. 143-156.

⁴⁰ Vale, R. (2016): Effects of Urbanization On Poverty, retrieved from <https://richmondvale.org/en/blog/effects-of-urbanization-on-poverty> (20.05.2020).

⁴¹ Dahiya, B.; Das, A. (2020): *New Urban Agenda in Asia-Pacific: Governance for Sustainable and Inclusive Cities*, Springer Nature. Singapore Pte. Ltd., Singapore, p. 74.

⁴² Sustainable Development Goals (2020): Sustainable Development Goals, retrieved from <https://sustainabledevelopment.un.org/?menu=1300> (25.05.2020).

⁴³ United Nations (2017): NEW URBAN AGENDA, retrieved from <https://uploads.habitat3.org/hb3/NUA-English.pdf> (09.10.2021).

⁴⁴ Higgs, C.; Badland, H.; Simons, K.; Knibbs, L. D.; Giles-Corti, B. (2019): The Urban Liveability Index: Developing a policy-relevant urban liveability composite measure and evaluating associations with transport mode choice. *International Journal of Health Geographics*, Vol. 18, No. 1, p. 1–25.

⁴⁵ Davis, M. (2006): *Planet of Slums*, Verso, London, p. 26.

includes the transformation of often top-down controlled decision-making in planning towards raised relevance of a participative exchange with the local community. Higher qualitative living standards in slums are rarely achieved under top-down planning. There is a need for advanced communications structures and upgrading allowing the connection between key stakeholders. Transformation to reach desired futures, implies the adaptation to local values. Navigating transformative changes sustainably should be based on an approach, in which local demands are respected and established in a way that contributes to a rise in slum residents' quality of life.⁴⁶

The Role of Smart Cities in India

To improve the quality of life and create a more sustainable environment, various Indian cities started to focus on Smart City approaches. There exists no general definition for the term Smart City, as each city has its own set of approaches to become smart. Still, the general consensus is that Smart Cities focus on a combination of location specific, sustainable and citizen-focused interests "[...] to improve urban life through more [...] integrated solutions, including applied innovation, better planning, a more participatory approach, higher energy efficiency, better transport solutions [and the] intelligent use of Information and Communication Technologies (ICT)".¹³

With the potential of emerging ICT adapted to local conditions, the administration can apply powerful and inclusive development tools, by addressing environmental, economic and social sustainability, physical and community resilience and inclusionary governance programmes.⁴⁷ Cities incorporating ICT "to improve operational efficiency, share information with the public and provide a better quality of government service and citizen welfare"⁴⁸ are referred to as Smart Cities. How can Smart Cities, but also inclusive cities, extend established ICT service to enhance a liveable life in slum neighbourhoods and optimise local upgrading? (ibid.)

The concept of Smart Cities in a slum context brings both: risks and opportunities. Technical innovations are argued to make slums more resilient and contribute to liveable life conditions.⁴⁹ The degree of impacts is based on slum residents' potential of inclusion (ibid.). Promoting data collection in slums and allowing residents to participate in surveys on liveable life perceptions using digital devices can support the sustainable development of slum upgrading. A rise in location specific priorities and the comprehension of liveable life indicators valued in slums, display the basic principles to facilitate the sustainable

⁴⁶ Vardoulakis, S.; Kinney, P. (2019): Grand Challenges in Sustainable Cities and Health, in: *Frontiers in Sustainable Cities - Health and Cities*, Vol. 1, No. 7, p. 1.

⁴⁷ O'Neill, D.W.; Fanning, A.L.; Lamb, W.F.; Steinberger, J.K. (2018): A good life for all within planetary boundaries, in: *Nature Sustainability*, Vol. 1, p. 88–95.

⁴⁸ TWI (2022): What is a Smart City? – Definition and Examples, retrieved from <https://www.twi-global.com/technical-knowledge/faqs/what-is-a-smart-city> (04.05.2022).

⁴⁹ Emmanuelle Laurinda Godjo, S. (2019): Smart Cities and Slum Resilience, retrieved from <https://www.urbanet.info/smart-cities-and-slum-resilience/> (04.04.2022).

design of slum upgrading projects.⁵⁰ Key is to raise local inclusiveness and the role of Smart Cities in informal settlement development.

1.1 Problem Statement (Challenges of Slum Upgrading in India)

The greatest international commitment to upgrade slums in India started in 1990.¹⁸ This has increased the focus of national and international NGO's, aid agencies and consultants on slum regions. Never in the history of city development, have as many agencies been involved to create a better environment for the urban poor – but the poor continue to get poorer and the rich richer (ibid.). Despite various experiments conducted to achieve sustainable slum upgrading, none of them proved to display a sustainable model in a social, environmental, economic, or cultural context.⁵¹ One of the biggest problems is that concerns, demands and daily struggles residents face, are often invisible, due to a lack of participation in development measures.^{52, 53, 54, 55, 56} It is common that upgrading projects are supported and funded individually without building on each other, seeking for co-operation's with local stakeholders or focusing on already established local systems.^{57, 58} There are many known cases where supporting institutions failed because they have benevolently, but without any preparatory work, established solutions that communities either partially or completely rejected.^{59, 54, 60} Such approaches can be categorised as top-down methods.

In general, there are two ways of slum upgrading (Figure 1)⁵¹: Top-down (led and initiated by the government/funding source) and bottom-up (led and initiated by the participation

⁵⁰ Ezech, A.; Oyeboode, O.; Satterthwaite, D.; Chen, Y.; Ndugwa, R.; Sartori, J.; Mberu, B.; Melendez-Torres, G. J.; Haregu, T.; Watson, S. I.; Caiaffa, W.; Capon, A.; Lilford, R. J. (2017): The health of people who live in slums: The history, geography, and sociology of slums and the health problems of people who live in slums, in: *The Lancet*, Vol. 389, No. 10068, p. 547–558.

⁵¹ Khan, K. A. (2021): Previous to Present Policies and Approaches for Slum and their Limitations: In Search of Sustainable Slum Upgrading Process in Developing Countries, in: *International Journal of Research and Innovation in Social Science (IJRISS)*, Vol. 5, No. 8, p. 356.

⁵² Wagner, F. (2018): *Livable Cities from a Global Perspective*, Taylor & Francis, London, p. 69.

⁵³ Wagner, F.; Caves, R. W. (2019): *Community Livability: Issues and Approaches to Sustaining the Well-Being of People and Communities*, 2nd edition, Taylor & Francis, London, p. 45.

⁵⁴ Heller, P. (2016): Making Slums Liveable, in: *Sociological Insights for Development Policy*, Vol. 1, No. 5, p. 2.

⁵⁵ Patki, S. Y.; Shah, M. G.; Kale, C. M. (2020): *Building Drawing with an integrated approach to Built Environment*, 6th edition, McGraw-Hill Education, New York, p. 110.

⁵⁶ Magalhães, F. (2016): *Slum Upgrading and Housing in Latin America*, Inter-American Development Bank, New York, p. 13.

⁵⁷ Waseem, S. (2017): Health Solutions That Work for Indian Slums, retrieved from <https://blogs.adb.org/blog/health-solutions-work-indian-slums> (01.03.2020).

⁵⁸ Chakrabarty, A.; Urban Planner and Former Lead in the State Equity Cell in the government of Odisha's Department of Housing & Urban Development (11.10.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.

⁵⁹ Live Mint (2018): Opinion | India's failure to address its urban slum problem, retrieved from <https://www.live-mint.com/Opinion/AhwjNLTtMS8GK7i1RBqnSI/Opinion--Indias-failure-to-address-its-urban-slum-problem.html> (12.02.2020).

⁶⁰ Singh, K. (2016): Strengthening community-based organizations for Slum Development, in: *International Journal for Research Publication & Seminar*, Vol. 7, No. 1.

of slum residents).⁶¹ Top-down projects address slum upgrading based on a pre-planned physical design by the government and are usually longer in duration, as projects involve many bureaucratic procedures before developments reach residents. They are most often also accompanied with larger scopes, higher budgets, as well as corruption so that local aid becomes secondary.⁵¹ Bottom-up projects are led by slum residents/aid agencies/NGOs/CSOs/etc. and involve a certain degree of community finance. This gives the residents a sense of belonging and leads to more responsible, organised, and conscious investments when establishing and maintaining developments.⁵¹ Participation is required to identify local weaknesses, assure sustainability of approaches, ensure local community engagement and the development of networks among different stakeholders. Expert knowledge combined with local networks can thus lead to more sophisticated solutions. The importance of sustainable actions is that upgraded areas do not easily revert to old patterns. There is a need for policy interventions targeted at local inclusion if urbanization is to provide a pathway to a liveable life in urban slums.

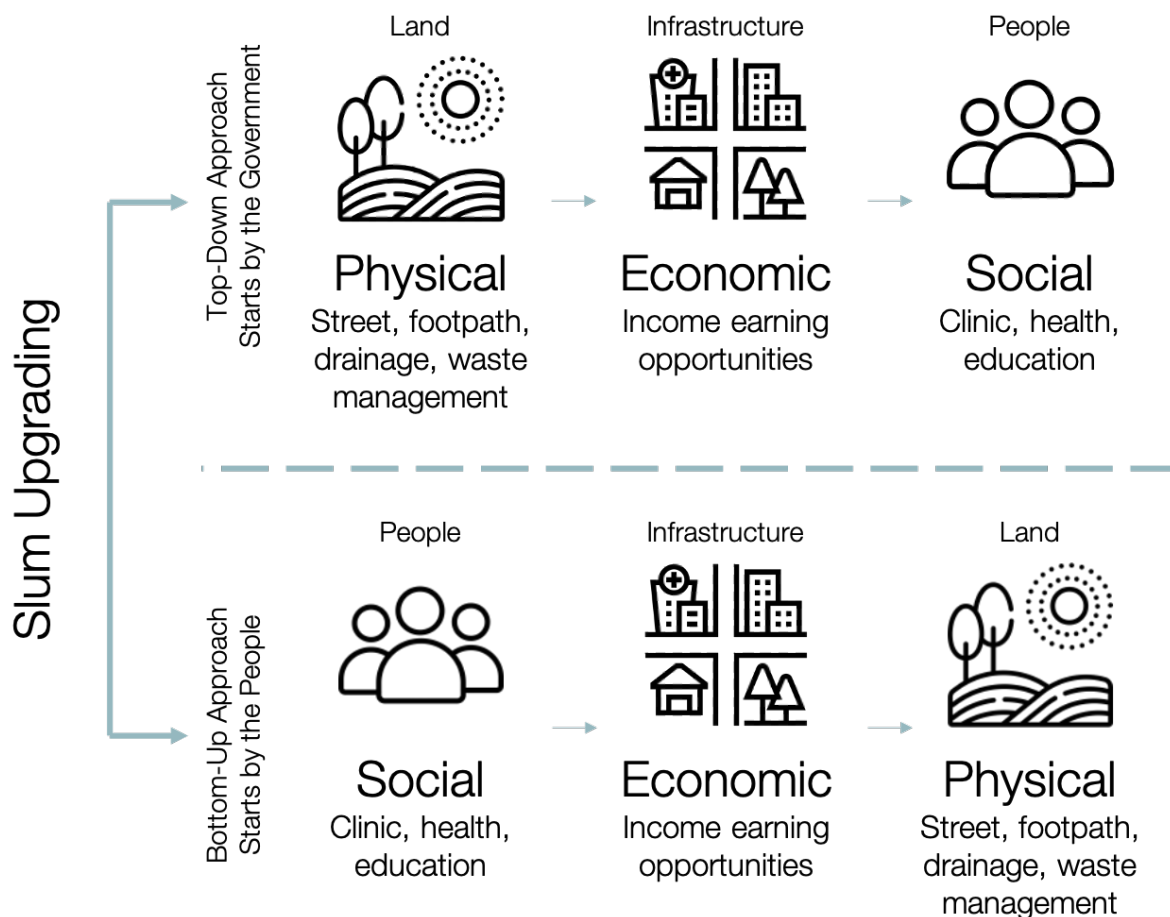


Figure 1: The Difference between top-down and bottom-up projects (own representation based on Khan, K. A.).⁵¹

⁶¹ Birch, E. L. (2014): UN-Habitat Global Urban Lectures: Slums and Cities: Past, Present and Future, retrieved from https://www.youtube.com/watch?v=pFD7hPJ37lw&list=PLTQZbEc6Bv5-Hja_AppdM6gkXp98C01Ca (21.10.2021).

Governmental institutions are aware of the needs for adequate living conditions, housing, technological advances, policies, infrastructure, differences in social classes and cultural disparities. Problems are well known and researched but solutions are not established yet. Regarding the Indian Ministry of Housing and Urban Affairs (MoHUA) a more realistic demand assessment is needed to address the challenges of informal areas.⁶² As already mentioned, projects in the past rarely considered individual relevance, location specific demands and limitations.⁶³ An explanation for this are in part development projects, which are primarily based on subjective upgrading estimations of governments/funding sources (top-down), rather than the realistic needs of those for whom a solution is being sought (bottom-up).⁶² A method is needed in which residents are actively involved in sharing information so their needs can be summarised and categorised by location for development purposes. To deal with inner city slums various practices such as eviction, resettlement or general slum upgrading have been applied. Presently, slum upgrading is very popular with urban planners dealing with urban slums.⁵¹ This is associated with a new perception of development towards more sustainable futures articulated in recent international agreements and agenda settings.

The 2030 Agenda for Sustainable Development

The UN stated in 2003 that the main challenges to slum development and urban poverty are rapid demographic change and the “result of a failure of housing policies, laws and delivery systems, as well as of national and urban policies”.⁶⁴ The need for a stronger focus on and understanding of liveability in socially deprived communities has thus become a priority in numerous agendas such as in the SDGs and New Urban Agenda.

An Introduction to the Concepts of Liveability

In many countries worldwide, especially the Global South, the majority of the urban population resides in slums and most of the workforce operates in informal economies.³⁷ Still, liveability remains a complex concept that includes a variety of elements. It can be operationalised through a set of sub-dimensions which encompass objective indicators, as well as subjective indicators.⁶⁵ Problematic is the fact that in most cases liveability indica-

⁶² Centre for Science and Environment (2020): Policy Brief On Pradhan Mantri Awas Yojana, Beyond The Four Walls Of PMAY: Resource efficiency, thermal comfort and liveability in the affordable housing sector, Centre for Science and Environment, New Delhi, p. 10.

⁶³ Annamalai, T. R.; Devkar, G.; Mahalingam, A.; Benjamin, S.; Rajan, S.C.; Deep, A. (2016) What is the evidence on top-down and bottom-up approaches in improving access to water, sanitation and electricity services in low-income or informal settlements? London: EPPI-Centre, Social Science Research Unit, UCL Institute of Education, University College London, p. 122.

⁶⁴ UN-Habitat (2003): The Challenge of Slums: Global Report on Human Settlements, in: United Nations Human Settlements Programme, Earthscan Publications Ltd., London and Sterling, p. 5.

⁶⁵ Okulicz-Kozaryn, A. (2013): City Life: Rankings (Livability) Versus Perceptions (Satisfaction), in: Social Indicators Research, Springer Verlag, Cham, Vol. 110, No. 2, p. 433–451.

tors 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 [...]”⁶⁶. In existing studies, such disparities in the perceptions of a liveable life mostly refer to differences between the various types of formal neighbourhoods.⁵³ But in countries of the Global South, such as India, a large proportion of the population live in slums.

There exist many studies about slums, which lead to the conclusion that upgrading actions, such as improved construction, social service provision, or access to water automatically lead to improved local living conditions.⁴⁴ Yet a lack of understanding of the local people and informal structures, as well as incomplete concepts about optimal upgrading measures rather lead only to insufficient upgrading effects.

Monitoring the Development of Liveability

Indicators are a powerful tool to monitor and evaluate development and improve communication. There exists a broad range of general liveability indices (Chapter 5.2) addressing different aspects of liveability. However, the majority of approaches calculates liveability on the basis of fixed quantitative indicators, and rarely differentiates between social classes or takes into account individual perceptions.⁴⁷ A holistic approach to identify and prioritise liveable life indicators for the design of sustainable slum upgrading at local scale has yet to be achieved. Still, primary research in slums revealed that community perceptions of a liveable life are the most influential indicators, and they perform weakest in slum upgrading programs. Identifying liveable life indicators could act as a lever within participative slum upgrading approaches.

Concerns and priorities of different communities have to be adequately researched and evaluated for discussions in urban planning. Inclusive decision-making processes are crucial to break structural societal factors that have resulted so far in rather unsustainable urban places for informal communities. In particular, urban areas in developing countries are strategically poorly positioned to deal with sustainable slum upgrading, even though they are most affected, as growing slum landscapes verify.²⁸ Contributing to and establishing social sustainability should optimally follow locally-oriented courses, albeit with different impacts, but at least impacts that incorporate inhabitants of informal areas.⁶⁷

⁶⁶ Katil, S. (2020): Measuring Expatriate Quality of Living, retrieved from <https://mobilityexchange.mercer.com/Insights/article/Measuring-Expatriate-Quality-of-Living> (19.11.2020).

⁶⁷ Das, A.; Saha, T.; Mazumder, A.; Sawla, J. (2019): Political Economy Perspectives in City-Making, International Symposium, in: Plan OK Please, New Delhi, India, p. 4.

The Impact of Smart City Approaches

Smart Cities seem to be all-rounders that exploit local opportunities.⁶⁸ But what is the participatory potential in a Smart City scope to support slum upgrading? Primary research in slums revealed that a lack of scientific contribution exists on the participatory potential in a Smart City scope to support slum upgrading, such as leveraging the potentials of ICT in the context of e-participation (bottom-up). The perspective and inclusion of socially underrepresented citizens is therefore a vital component for the sustainability of a Smart City and associated development procedures.¹⁵ Despite a rise in Indian Smart Cities, slum development has been ineffectively addressed, as laid out below.

In 2015, India launched the Smart City Mission (SCM) to create 100 Smart Cities. The selected cities aim to develop an easy-to-access infrastructure and become technologically advanced in government-citizen interactions.¹⁹ In accordance with the start of the SCM a Smart City Expo takes place annually. The Expo showcases the latest SCM technologies and key pillars of urban development.⁶⁹ Key pillars of urban development within India's SCM are green buildings, energy, transport, clean environment and water, for optimizing resources and making cities smart and sustainable. Within the latest Smart City Expo agenda only one (the 'Housing for All' scheme) of the many SCM projects addresses the inclusion of informal communities in land management, planning and design of Smart Cities. The 'Housing for All' scheme aims to provide affordable housing for the urban poor in India. Also, the "Open Research Foundation" recognised the shortfall of effective integration and missing favourable approaches towards strategies for informal communities within Smart City concepts.⁷⁰ It is stated that the SCM has "neither been sensitive to the 'informal' poor populations nor the ecological commons" (ibid.). India's SCM comprises a multitude of measures but lags behind on holistic approaches directed towards socially deprived areas. Keeping in mind that Smart City concepts are multifaceted and cities in general are not homogenous, planners and managers of urban areas are meant to adapt changes to local frameworks and focus on a base rise in living standards.⁷¹

Apart from the rather superficial focus on informal areas, the digital citizen engagement approach faces similar deficiencies in the majority of cities belonging to the SCM. For example, India's digital citizen engagement platform "MyGov" mainly reaches information

⁶⁸ Cities Alliance Cities Without Slums (2021): A Policy Framework for a Slum Upgrading Programme, retrieved from <https://www.citiesalliance.org/policy-framework-slum-upgrading-programme> (10.02.2021).

⁶⁹ 6th Smart Cities India 2020 Expo (2020): Developing Smart Cities for our Citizens, retrieved from <https://www.smartcitiesindia.com/pdf/6th-Smart-Cities-India-2020-Brochure.pdf> (26.03.2020).

⁷⁰ Mukherjee, J.; Sen, A. (2020): From SMART to sustainable cities: Is COVID19 an opportunity?, retrieved from <https://www.orfonline.org/expert-speak/from-smart-to-sustainable-cities-is-covid19-an-opportunity-66363/> (14.04.2020).

⁷¹ Brelsford, C.; Lobo, J.; Hand, J.; Bettencourt, L. M. A. (2017): Heterogeneity and scale of sustainable development in cities, in Proceedings of the National Academy of Sciences, Vol. 114, No. 34, retrieved from <https://doi.org/10.1073/pnas.1606033114> (21.12.2020).

and consultation levels, rather than citizen engagement levels.⁷² “MyGov has been established as Government of India’s Citizen Engagement Platform which collaborates with multiple Government bodies/Ministries to engage with citizens for policy formulation and seeks the opinion of people on issues/topics of public interest and welfare.”⁷³

The City of Pune displays an exceptional case of successful e-participation.⁷⁴ From the beginning, the focus in Pune was on ground-level decentralisation of efforts and within the first step the SCM was planned and organized from start to finish based on active citizen involvement. The second step was used to inform and obtain citizen inputs. Responses to proposals were shared with citizens within just a matter of days. In the last step final decisions on proposals were likewise based on active citizen involvement. A major reason for citizens’ strong commitment is based on the fact that the government of Pune had already been engaged in various citizen participation measures and invested into a strong technological base to empower citizens, prior to the SCM. The SCM and Pune as a case illustrate that anticipating participation and realising it, requires mutual and sustained efforts among different elements within urban systems.

The Wake-Up Call of Covid-19

Next to the subset of identified barriers in sustainable slum upgrading, the Covid-19 pandemic, which peaked for the first time in early 2020, reinforced challenges in poor neighbourhoods.^{75, 76} Particularly in India, the rapid dissemination of Covid-19 is an example where misery and suffering are mainly based on inadequate networks, poor regulations, unhygienic conditions and a lack of basic services provided to underserved communities.⁷⁷ Expecting densely populated slums and working-class neighbourhoods to follow the strict rules of Covid-19 protective measures, such as physical distancing, staying at

⁷² Sarbeswar, P.; Hoon, H.; Scott, H. (2017): Innovative Civic Engagement and Digital Urban Infrastructure: Lessons from 100 Smart Cities Mission in India. In: *Procedia Engineering*. Vol. 180, p. 1423-1432.

⁷³ MyGov (2022): MyGov: An Overview, retrieved from <https://www.mygov.in/overview/> (10.06.2022).

⁷⁴ Pune Municipal Corporation (2015): Smart Pune Creation of a Vision Community, retrieved from <https://smart-net.niua.org/sites/default/files/resources/Smart%20Pune-Citizen%20Engagement%20Case%20Study.pdf> (18.06.2021).

⁷⁵ United Nations (2020): Policy Brief: The World of Work and COVID-19, retrieved from https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/genericdocument/wcms_748428.pdf (24.01.2022).

⁷⁶ Sumner, A.; Ortiz-Juarez, E.; Hoy, C. (2020): COVID-19 could drive global poverty back over one billion people as the world’s poorest face up to US\$500 million per day in lost income, United Nations University World Institute for Development Economics Research, Helsinki, retrieved from <https://www.wider.unu.edu/sites/default/files/Publications/Working-paper/PDF/wp2020-77.pdf> (23.01.2022).

⁷⁷ Gopinath, G. (2020): Reopening from the great lockdown: uneven and uncertain recovery, retrieved from <https://blogs.imf.org/2020/06/24/reopening-from-the-great-lockdown-uneven-and-uncertain-recovery/> (26.01.2022).

home and washing hands regularly, are impossible.^{78, 79} High population densities (London Density (population per km²): 5919⁸⁰, Mumbai Density (population per km²): 33850 (ibid.) in slum areas make it difficult to follow protective measures, but easy for the virus to infect large numbers. The combination of density, poverty and unhygienic conditions have made urban areas in India historically prone to diseases.⁸¹ In 1997 medical statisticians identified that “around one-third of the people in slum communities [living in Dhaka] are thought to be ill at any given time”⁸². This condition would display the equivalent of a pandemic in any other urban context.⁴⁵ Likewise, health researchers stated that “the urban poor are the interface between underdevelopment and industrialization and their disease patterns reflect the problems of both. From the first they carry a heavy burden of infectious diseases and malnutrition, while from the second they suffer the typical spectrum of chronic and social diseases.”⁸³

Particularly alarming in the Covid-19 context, is the fact that not just governments, but also aid agencies, NGO’s and other supporting institutions seem only now to realize the urgency of participative actions within informal settlement upgrading measures.⁸⁴ On 4th of May 2020, UN-Habitat organized an online Covid-19 ‘Urban Thinkers Campus’ conference, creating a space for supporting institutions, who aim to promote sustainable urbanization and “discuss the importance of local communities in addressing the current crisis in slums” (ibid.). Statements of eminent speakers and the session’s conclusion (Appendix A), confirmed the existence of uncertainty about structural approaches in development work. Discussions about lacking participatory approaches took place, as top-down measures still dominate in upgrading. It has already been mentioned that it is known from past approaches that development measures in slums are predominantly based on perceived best-practices, rather than realistic and locally feasible actions. As the UN-Habitat conference can tell, the benefits of participatory strategies in the context of sustainable slum upgrading have been underestimated so far. Reasons for underestimation

⁷⁸ Sur, P.; Mitra, E. (2020): Social distancing is a privilege of the middle class. For India’s slum dwellers, it will be impossible, retrieved from <https://edition.cnn.com/2020/03/30/india/india-coronavirus-social-distancing-intl-hnk/index.html> (10.12.2020).

⁷⁹ Global Platform for Sustainable Cities (2020): Global Responses to COVID-19 in slums and cities, retrieved from <https://www.thegpsc.org/knowledge-products/urban-poverty-and-housing/global-responses-covid-19-slums> (07.12.2021)

⁸⁰ World Population Review (2020): London Population 2020, retrieved from <https://worldpopulationreview.com/world-cities/london-population/> (12.05.2020).

⁸¹ Randolph, G. F.; Gandhi, S. (2020): Covid-19 is a wake-up call for India’s cities, where radical improvements in sanitation and planning are needed, retrieved from <https://www.washingtonpost.com/opinions/2020/04/20/covid-19-is-wake-up-call-indias-cities-where-radical-improvements-sanitation-planning-are-needed/> (11.05.2020).

⁸² Barkat, A.; Ur Rahman, M.; Bose, M. (1997): Family Planning Choice Behavior in Urban Slums of Bangladesh: An Econometric Approach, in: Asia-Pacific Population journal, Vol. 12, N. 1, p. 1.

⁸³ Werna, E.; Blue, I.; Harpham, T. (1996): The Changing Agenda for Urban Health, in: Cohen, Preparing for the Urban Future Global Pressures and Local Forces, Woodrow Wilson Center Press, Washington, D.C., p.201.

⁸⁴ UN-Habitat (2020): First COVID-19 Urban Thinkers Campus discusses putting communities at the centre of the crisis response, retrieved from <https://unhabitat.org/first-covid-19-urban-thinkers-campus-discusses-putting-communities-at-the-centre-of-the-crisis> (12.05.2020).

are unknown, but it could be traced back to a missing tool or concept for guidance in participatory strategies.

The dominance of top-down measures also became evident during ethnographic research in India, where slum upgrading experts disregarded the local focus within discussion and rather highlighted general upgrading measures in slums.

Conclusion

It can be concluded that two major issues prevail: (1) Lack of communication about holistic upgrading approaches that consider realistic needs of informal neighbourhoods, due to missing commitment between supporting institutions and slum residents (participation); (2) Lack of an appropriate instrument to empower local slum upgrading and monitor developments.

Despite the urgency, no method of implementation exists. The rate at which people move out of their rural villages into the city to access economic possibilities, emphasises the urgency of taking measures that manage demographic changes and make slums liveable and resistant to crises.¹⁴ Participatory strategies have been used in many projects as a vague concept, but no clear guidance has been given on the participatory potential in a Smart City scope to support slum upgrading (except for few initiatives⁸⁵).⁸⁶ Participation needs communication and today's communication is often based on digital networks.⁸⁷⁸⁸ Digital networks are defined as digital communication standards that transfer data via different types of media through the use of Internet.⁸⁹ Data transferred can be e.g. voice or text messages. In order to encourage participation, there is a need for participation forms that make participatory planning processes compatible with new urban settings.

In urban slum-upgrading projects, participatory data collection and community involvement are considered vital.⁹⁰ Many of the challenges described within this chapter are not

⁸⁵ Noennig, J.R.; Hick, D.; Doll, K.; Holmer, T.; Wiesenhuetter, S.; Sha, C.; Mahanot, P.; Arya, C. (2020): Upgrading the Megacity. Piloting a Co-design and Decision Support Environment for Urban Development in India. In: Czarnowski, I.; Howlett, R.J.; Jain, L.C. (eds.) Proceedings of the 12th KES International Conference on Intelligent Decision Technologies (KES-IDT 2020) pp.533-544.

⁸⁶ Mishra, S.; Mohapatra, M.; Padhi, A.; Paty, S.; Sahoo, M.; Tata Trusts Consultant (14.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

⁸⁷ Hachmann, S.; Jokar Arsanjani, J.; Vaz, E. (2018): Spatial Data for Slum Upgrading: Volunteered Geographic Information and the Role of Citizen Science, in: Habitat Int., Vol. 72, p. 18–26.

⁸⁸ Kuffer, M.; Pfeffer, K.; Sliuzas, R. (2016): Slums from Space—15 Years of Slum Mapping Using Remote Sensing. Remote Sens., Vol. 8, No. 6, p. 455.

⁸⁹ IGI Global (2022): What is Digital Networks, retrieved from <https://www.igi-global.com/dictionary/creating-analytical-lens-understanding-digital/7676> (15.08.2022).

⁹⁰ Aditya, T.; Sugianto, A.; Sanjaya, A.; Susilo, A.; Zawani, H.; Widyawati, Y. S.; Amin, S. (2020): Channelling participation into useful representation: combining digital survey app and collaborative mapping for national slum-upgrading programme, Applied Geomatics, Vol. 12, p. 133-148.

new, but they take on new dimensions and urgency, due to the negative impacts of increased urbanization in combination with intensified inequalities. An integrated approach has to be considered that focuses on the local inclusion of individuals to develop upgrading measures tailored to local needs. Establishing a locally-rooted and socially connected upgrading approach, enables residents to draw attention to realistic needs and for supporting institutions to implement project work accordingly.

The role of participation and digital tools in improving slum upgrading processes in urban areas is to enhance the selection of people involved, processes considered and technology used.⁹¹ Designing healthy and liveable urban neighbourhoods is a global priority.^{27, 44, 47} Current liveability indices are aggregated at the city-level, but do not reflect spatial and social diversity within cities and are often not aligned with policy execution.^{44, 92, 93} The problem statement identified that due to a gap between Smart City policies and areas of index applications, potentials for participation in an informal settlement upgrading context have yet to be leveraged.⁴⁴

1.2 Research Objectives

The main objective of the thesis is to analyse current slum upgrading in India and develop an instrument to support the design of sustainable slum upgrading measures for an improved liveability in slums based on advanced participation and communication.

The research objective can be divided into a general and specific research objective. The *general research objective* focuses on sustainable slum upgrading strategies in urban slum neighbourhoods with focus on liveable life indicators, utilizing the research of the thesis and recommendations drawn from it. Key is location specific relevance, participation in decision making from a multi-stakeholder perspective within slum upgrading approaches and the level of optimal involvement and active co-operation of the slum residents at all stages within upgrading projects. Focus of attention is the focus on participative upgrading measures that strengthen community inclusion and facilitate the conduction of realistic necessities.⁹⁴

The *specific research objective* focuses on the development of a Liveable Life Index (LLI). A fixed and variable component shape the LLI; from the identification of individual liveable life indicators to the establishment of a locally-rooted LLI, essential steps are required.

⁹¹ Fleming, E. (2020): What is Urban Upgrading?, retrieved from <https://www.sidmartinbio.org/what-is-urban-upgrading/> (09.12.2020).

⁹² Giap, T. K.; Thye, W. W.; Aw, G. (2014): A new approach to measuring the liveability of cities: the Global Liveable Cities Index, in: World Review of Science, Technology and Sustainable Development, Vol. 11, No. 2, p. 176-196.

⁹³ Kennedy, R. J.; Buys, L. (2010): Dimensions of liveability: a tool for sustainable cities, retrieved from <https://eprints.qut.edu.au/38526/1/38526.pdf> (10.06.2020).

⁹⁴ Horlings, L.G.; Lamker, C.; Puerari, E.; Rauws, W.; van der Vaart, G. (2021): Citizen Engagement in Spatial Planning, Shaping Places Together, in: Sustainability, Vol. 13, No. 19, p. 11006.

These steps are firstly specified within a non-digital approach (Chapter 5) and secondly the concept is extended to an e-participation framework within a digital approach (Chapter 5.3).

The main-objective of this thesis can be broken down into the following sub-objectives:

1. To identify and critically reflect on instruments of slum upgrading in India based on literature.
2. To define the components of a liveable life in slums based on interviews.
3. To reflect on Smart City potentials regarding participatory slum development based on the Bhubaneswar Case.

1.3 Research Questions

Based on the research objectives the following research question is formulated:

How can liveability in slum upgrading be sustainably optimised to address deficits in participation and communication considering Smart City potentials in their instrumentation?

The main question can be broken down into the following sub-questions:

1. Which instruments for slum upgrading exist in India?
 - a. How has upgrading changed over time?
 - b. Which developments exist in current upgrading approaches?
2. What constitutes a liveable life in slums?
 - a. What is a liveable life from a slum resident perspective?
 - b. What is a liveable life from a slum expert (developer) perspective?
3. Which potentials exist in Smart Cities to leverage participation and communication for the design of slum upgrading?
 - a. Considering Smart City potentials, which instruments for participation exist?
 - b. Considering Smart City potentials, which instruments can promote location-based upgrading?

1.4 Research Hypotheses

Based on the research questions, the research aims to verify the following hypotheses

1. Current slum upgrading instruments in India disregard the integration of locally-rooted liveable life perceptions in slums.
2. As liveable life perceptions differ among developers and residents communicative and locally-rooted instruments enhance sustainable slum upgrading.
3. Location-based upgrading in combination with digitalisation facilitates instruments which are responsive to societal trends and ease participation.

1.5 Research Scope

Keeping the demographic change in mind and looking into a sustainable future of urban areas in India, this dissertation has the objective to leverage the participatory potential in a Smart City context to support sustainable slum upgrading based on the concept of a liveable life. Area of investigation and primary case study is the Smart City Bhubaneswar, capital of the state Odisha and centre of pilot projects for the state specific slum upgrading scheme, Odisha's Liveable Habitat Mission (OLHM). The mission aims to develop slums into official neighbourhoods, by providing slums with basic facilities and granting land titles to slum residents living on unauthorised land. Odisha's pro-poor efforts are unique in India and enable the thesis specific 'liveable life approach' to learn from local schemes and adapt to established networks. A detailed overview of the research area will be provided in Chapter 3. Research results, based on the Bhubaneswar case study will serve as a reference value that can only be considered within this location, but provide a highly replicable example for similar cities with related objectives.

A central component is to identify a strategy that enables the identification and evaluation of relevant locally-rooted liveable life components, which are translated into a "Liveable Life Index" (LLI). This index will be designed to address the specific needs in slum upgrading. As such it will include liveable life perceptions of residents and experts. At policy level the LLI aims to highlight the spatial diversity among urban slum neighbourhoods to align location specific priorities with sustainable urban targets and guide slum upgrading strategies. To leverage the participatory potential of ICT solutions in Smart Cities, an additional focus is based on the extension of e-participation initiatives to facilitate communication processes involving slum residents within the LLI development process. The liveable life perspective is deeply intertwined with ICT solutions in Smart Cities. At policy level the LLI is envisioned to serve as a guideline and support the development of action plans for slum upgrading strategies in Smart Cities. Action plans can be realised within different project cycle frameworks to implement LLI outcomes. Consequently, this research addresses digital opportunities to contribute to the creation of a liveable life in slum neighbourhoods.

To display realistic needs using the LLI, requires detailed spatial profiling of slum neighbourhoods. The process of moving closer to individual locations can happen through image sharing, network connected devices or open source data to allow local inclusiveness.^{95, 87, 96, 97} But Smart City initiatives lack advanced methods on how to deploy digital

⁹⁵ Cutieru, A. (2020): Urban Acupuncture: Regenerating Public Space Through Hyper-Local Interventions, retrieved from <https://www.archdaily.com/948304/urban-acupuncture-regenerating-public-space-through-hyper-local-interventions> (17.03.2021).

⁹⁶ Tata Trusts (2019): Odisha: Land Rights to Slum Dwellers, Observations on detailed work flow process maps, p. 6-10, retrieved from <http://www.jagamission.org/pdf/Compendium%20Land%20Rights.pdf> (19.09.2020).

⁹⁷ Chakrabarty, A. (2020): COVID-19, JAGA Mission and the value of already existing solutions, retrieved from <https://www.iied.org/covid-19-jaga-mission-value-already-existing-solutions> (26.08.2020).

tools in sustainable slum upgrading programmes.³¹ Participation requires communication based on digital networks to ease and support democratic opinion making.^{94, 51, 98} Especially in slums, smart technologies such as mobile phones could play a major role in compensating underrepresentation of needs (Chapter 5.3).⁹⁹ To make the complex planning processes of new urban settings compatible with participation and responding to future challenges, ICT solutions in the growing Smart City sector have shown promising results.^{94, 100, 101, 53}

Conclusion

To improve habitat conditions and manage liveable life aspects in slums, previous projects relied on the provision of basic standardised services in slums (e.g. education systems, water access, sanitation facilities, drainage systems).¹⁰² Moving away from service indicators to liveable life indicators acknowledges the shift in thinking towards a multi-dimensional neighbourhood. Local communities, digital technologies and the accumulation of knowledge and networks offer the basis for local learning and co-operation.^{31, 50} The scale and complexity of a liveable life in slum landscapes is a development issue that requires coordinated community effort of strategies among a defined set of stakeholders.

The reason why participatory measures display a central component within this work, is that from a scientific point of view positive experiences have been made in projects following participatory structures.^{94, 103, 98, 101, 104} The reason why digital components display a central element within this work, is that in recent years the lack of high-quality data about slums has received renewed socio-political and academic interest.^{87, 88} Yet, scientific contribution lags behind on how Smart Cities can leverage their technologies to increase location specific relevance and the participatory potential of slums within urban slum upgrading. The development of an approach that connects participatory processes with location specific data to guide slum upgrading is the focus of this work.

⁹⁸ Datta, A. (2017): The digital turn in postcolonial urbanism: Smart citizenship in the making of India's 100 smart cities, in: *Trans Inst Br Geogr.*, Vol. 43, p. 405-419.

⁹⁹ Keelery, S. (2021): Digital population across India as of February 2021, retrieved from <https://www.statista.com/statistics/309866/india-digital-population/> (09.10.2021).

¹⁰⁰ International Institute for Environment and Development (2021): Citizen participation in planning: from the neighbourhood to the city, retrieved from <https://www.iied.org/qa-citizen-participation-planning-neighbourhood-city> (12.12.2021).

¹⁰¹ Li, W.; Feng, T.; Timmermans, H. J.P.; Zhang, M. (2020): The Public's Acceptance of and Intention to Use ICTs when Participating in Urban Planning Processes, in: *Journal of Urban Technology*, Vol. 27, No. 3, p. 55-73.

¹⁰² Deaton, A. (2008): Income, health and wellbeing around the world: Evidence from the Gallup World Poll, In: *Journal of Economic Perspectives*, Vol. 22, No. 2, p. 1-8.

¹⁰³ Hemmersam, P.; Martin, N.; Westvang, E.; Aspen, J.; Morrison, A. (2015): Exploring Urban Data Visualization and Public Participation in Planning, in: *Journal of Urban Technology*, Vol. 22, No. 4, p. 45-64.

¹⁰⁴ Daher, E.; Maktabifard, M.; Kubicki, S.; Decorme, R.; Pak, B.; Desmaris, R. (2021): Tools for Citizen Engagement in Urban Planning, in: Lazaroiu, G.C.; Roscia, M.; Dancu, V.S. (eds): *Holistic Approach for Decision Making Towards Designing Smart Cities*, Future City, Vol. 18, Springer, Chan, Switzerland, p. 115-145.

For urban designs to consider sustainable frameworks, liveability indices have to reflect spatial variation in cities, and be aligned with policy objectives.⁴⁴ Key is the development of a defined set of parameters, instructions and priorities, such as a locally-rooted index for upgrading guidance. The LLI, developed within this thesis aims to evaluate liveable life indicators in slums. Indicator evaluations serve as a guideline in slum upgrading for local analysis, upgrading orientation and the implementation of strategic targets.

Slum development is an unavoidable phenomenon.¹⁰⁵ Policy should not only develop upgrading programs, but also create a coalition of actors. To channel assistance, a more realistic and improved demand assessment of problem areas in slums is needed.⁴⁷ In respect to digital trends, the thesis aims to analyse the potential of e-participation via mobile phone application to facilitate the development of a Liveable Life Index for the guidance of sustainable slum upgrading. Focus is on the value of liveable life perceptions within slum upgrading projects, as well as on facilitated communication and integration among key stakeholders. The intention of this thesis is therefore not only to identify opportunities that enhance sustainable slum upgrading, but to support the development of environments that people value and feel more attracted to live in.⁵¹

1.6 Research Design

The Research Design defines the overall process of the research progress for the given thesis. Used data sources and data collection methods are clarified and the research framework is specified, from problem identification, formulation to verification. With an overview of the Methodology and Research Design, the first chapter is concluded.

The Research Design and Methodology of the scientific work is divided into three parts:

- Part I (Chapter 1 & 2) develops a theoretical framework with literature analysis, and carries out a case study, in order to determine requirements for the LLI.
- Part II (Chapter 3 & 4) focuses on the development of a liveable life index, which is based on general and case specific parameters. The most impactful scientific contributions and widely applied liveability indices serve as a reference point to line out key slum specific liveable life indicators and parameters. Indicators are critically reviewed by using the perspective of slum residents based on the information obtained within FGDs.
- Part III (Chapter 5 & 6) reconciles the results of the previous parts and introduces a model for a LLI to serve as an instrument for the design of sustainable slum upgrading projects at policy level.

¹⁰⁵ Jorgenson, A. (2015): Slum Prevalence and Health in Developing Countries: Sustainable Development Challenges in the Urban Context, In: Sustainable Development Forthcoming, Vol. 10, No. 1002, p. 1606.

The starting point is a literature review to summarise slum upgrading policies and participatory approaches in India, especially related to Smart City development. This follows a more specific focus on Bhubaneswar and local slum upgrading schemes. Using the case of Bhubaneswar, the local slum upgrading scheme, Odisha's Liveable Habitat Mission (OLHM), is analysed and described in detail. Local approaches are structured and typified to outline the hierarchical character and the use of digital tools in slum upgrading.

For the theoretical contribution of the thesis and since the LLI approach features Bhubaneswar as a case study, site specific research takes place in the form of interviews. The research is realised in collaboration with the "Gesellschaft für Internationale Zusammenarbeit (GIZ)"¹⁰⁶, "Tata Trusts"¹⁰⁷ and "Ekta Consultancy"¹⁰⁸. Two types of interviews are conducted: Expert interviews with slum experts and focus group discussions with slum residents living in slums located in Bhubaneswar. Expert interviews take place in two phases (2019 & 2021) and offer the opportunity to discuss slum related topics based on personal experiences. Focus group discussions offer the opportunity to discuss slum related topics from a realistic point of view based on a locally defined scale. Expert statements and slum residents' realistic location-based contributions support the LLI design.

Primary research in selected slums of the case is conducted to analyse the status quo in slums and suitability of OLHM measures. Expert interviews in the first research phase were conducted with slum upgrading experts to reveal insights about the history of slum development; identify actual measures and the status quo in slums; analyse the perception of a liveable life from a personal (expert) and resident perspective; establish key stakeholders within slum upgrading; and describe digital approaches to slum upgrading. Focus group discussions were conducted with local slum residents in Bhubaneswar to analyse the status quo; local problem areas; conventional countermeasures to problem areas in slums; identify indicators that contribute to a liveable life; and the use of digital services.

The *first research phase* aimed to contrast the different perspectives to identify similarities and differences in the respective aspects. In the second research phase, findings of the first research phase are deepened and consolidated with the support of expert interviews. Expert interviews in the *second research phase* were modified and carried out only with individuals of relevance to Odisha's Liveable Habitat Mission.¹⁰⁹ The focus of expert interviews was based on the analysis of already identified liveable life indicators (first research phase) in OLHM; the application areas of participative strategies; as well as the identification of and collaborations among various stakeholders. Focus group discussions were not conducted in the second research phase, as the focus was only on undeveloped

¹⁰⁶ GIZ (2020): About GIZ, retrieved from <https://www.giz.de/en/aboutgiz/profile.html> (12.01.2020).

¹⁰⁷ Tata Trusts (2019): About Tata Trusts, retrieved from <https://www.tatatrusts.org/about-tatatrusts> (27.03.2020).

¹⁰⁸ Ekta Consultant (2020): About us, retrieved from <http://ektaconsultant.in> (08.01.2020).

¹⁰⁹ Jaga Mission (2020): About Jaga Mission, retrieved from <http://www.jagamission.org/about-us.html> (08.01.2020).

slums. During the second research phase, OLHM was already far advanced. Focusing only on undeveloped slums ensures a comprehensive understanding of basic needs that have the potential to form liveable life indicators. It is anticipated that with an increase in upgrading, basic needs become a matter of course and are not worth mentioning for residents. With the aim to develop strategic steps that provides guidance for sustainable slum upgrading, it is important to identify and analyse liveable life indicators that are considered deep-rooted needs at local level and form the starting point for sustainable upgrading. Therefore, findings of the first research phase within focus group discussions are further investigated to link with findings of expert interviews in the second research phase.

Secondary research (literature review) revealed that current slum upgrading lacks participatory approaches, current liveability indices miss the focus on slum communities and Smart City concepts do not leverage the potential of digital instruments in slums. Primary research (FGDs & EIs) revealed that current slum upgrading lacks multi-stakeholder participation, bottom-up communication, and bypasses digital opportunities, which result in method insufficiencies. Layering the gaps of primary and secondary research, a communication tool to map needs for a liveable life and support digital multi-stakeholder participation seems to hold great potential in sustainable slum upgrading.

To conceptualise a tool, which maps the needs for a liveable life and supports sustainable slum upgrading, current liveability indices were reviewed based on the results of primary and secondary research. From the revision a new index was developed. This index follows the principle of current liveability indices but has been supplemented with KPIs research identified to be essential and reduced by KPIs research identified to be of less importance. In specific focus are KPIs which reflect basic needs in an informal settlement context. To allow quantifiable revisions of KPIs and for reasons of index comparability, an attempt was made to make identified KPIs calculable. In the context of this work, the developed index is termed a Liveable Life Index (LLI).

The *third research phase* aimed to validate the findings and evaluate the conceptualised, customised LLI through the eyes of local experts concerned with upgrading projects in OLHM. Thus, a linkage to the previous research phases can be guaranteed and the realistic integrability into the already implemented upgrading concept (OLHM) be evaluated. The results obtained in the previous were presented to the interviewees to receive feedback on the accuracy of challenges, functional patterns and selected criteria. The validation aims to critically verify whether the assumptions made and model developed are compatible with local observations in practice. Although no reference cases are considered, this step should provide a rough indication of the usability of the results.

1.7 Methodology

The Methodology displays the set of methods, techniques and procedures which are used in collecting and analysing measures of the different aspects that are specified in the research topic. Figure 2 displays the general research design, enabling an overview of the three main parts: “Part I Theoretical and Empirical Concept” (Chapter 1 & 2), “Part II Theoretical Development” (Chapter 3 & 4) and “Part III Result & Outlook” (Chapter 5 & 6). Each individual part within the Research Design will be subsequently described.

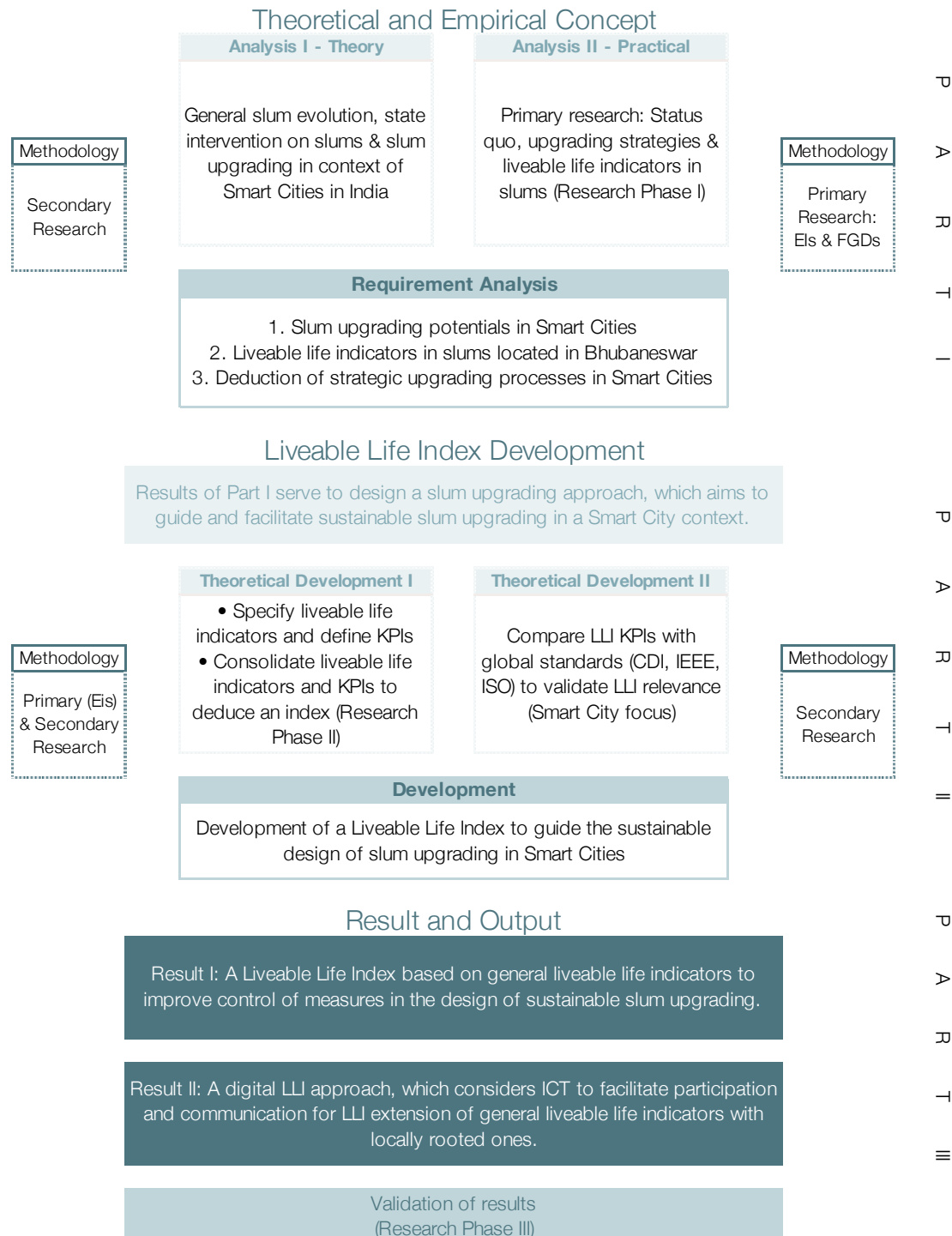


Figure 2: Research Design (own representation).

Part I – Theoretical and Empirical Concept

The “Theoretical and Empirical Concept” considers secondary research (literature review) to analyse India’s slum upgrading history and establish an overview on upgrading elements. Part I is subdivided into Analysis I and Analysis II. In “Analysis I – Theory”, the Indian slum landscape is analysed under consideration of an extended literature review and based on the following steps:

1. Evolution of Slums: This step focuses on the history of slums in India, how slum development evolved, which strategies proved successful, which ineffective and which conclusions can be made about different upgrading processes.
2. Participatory Approaches within Slum Upgrading: This step identifies participative approaches within slum upgrading among selected Indian states and in specific areas.
3. Community Engagement under Consideration of Digital Technology: This step focuses on the application areas of digital components within slum upgrading in Smart Cities.

“Analysis I – Theory” provides an understanding of the slum situation in India. The Problem Statement reflects inefficiencies in past slum upgrading measures and highlights reasons for upgrading processes compatible with new urban settings. Insights are generated to identify ineffective slum upgrading measures of the past and highlight the importance of participatory approaches. The focus of attention is on Smart City solutions. Lessons learnt from conducted upgrading approaches, as well as application areas of ICT serve to identify under-researched links, setting the frame for an adaptable upgrading concept that enables the sustainable development of urban slum neighbourhoods.

Additionally, the background knowledge generated about informal settlement development in India provides information to prepare site specific research based on topics which either lack profound secondary research evidence or need to be updated with location dependent information. Following this chapter, primary research will be conducted within the framework of the theoretical foundations.

“Analysis II – Practical” deals with the planning, conduction and analysis of expert interviews and focus group discussions with local slum residents in India. Expert interviews took place in 2019 and 2021 and focus group discussions were conducted in 2019. During the “Theoretical and Empirical Concept”, the data collection process of expert interviews and focus group discussions is based on a research procedure with mixed methods using feedback to interpretatively refine the view on the subject (linear & circular research process)¹¹⁰. The mixture of both processes is achieved by generating theoretical

¹¹⁰ Borchardt, A.; Göthlich, S.E. (2009): Erkenntnisgewinnung durch Fallstudien. In: Albers, S., Klapper, D., Konradt, U., Walter, A., Wolf, J. (eds) Methodik der empirischen Forschung, Gabler Verlag, Wiesbaden, p. 33-48.

aspects and hypotheses prior to the actual data collection process (linear research process), while still allowing each part within the research design to influence the subsequent, as well as the previous part and have no limited and consecutive research parts set (circular research process). In doing so there is a greater chance of obtaining new and location specific insights, as well as relating valuable information among experts and residents, which is difficult to obtain from secondary research in order to answer the research question.¹⁰⁹

All expert interviews and focus group discussions have been analysed using Mayring's Qualitative Content Analysis.¹¹¹ It is a common approach applied in empirical social research, as it considers a systematic and rule-based approach to process the material gained from research, which ensures the research process' high level of transparency. Within the method fixed communications are evaluated (e.g. texts, transcripts, pictures), using a set of deductively and inductively developed categories to be systematic, regular, theoretical and measure itself against quality criteria to draw conclusions that answer the research question. A category can be described as a significant header to which text passages are assigned. The category system reduces the complexity of the material through filtering, as only those aspects within the material that are determined to be relevant for the evaluation of the research question are used.

The method can be summarised as follows: (i) deductively analyse current slum upgrading, general liveability indices and application areas of digital instruments (ii) to inductively develop an index which considers informal patterns, allows better inclusion and a more efficient control of measures (iii) to guide sustainable slum upgrading at policy level. Central to the method is the identification of liveable life indicators considered relevant in slums. The approach selected is based on research that is subject to two research phases over a timespan of two years, to identify and further analyse liveable life indicators and their relations.

First Research Phase

The first research phase was conducted in 2019. In total, ten expert interviews were conducted. To ensure objectivity, validity and reliability of the information obtained in expert interviews, the selection of experts is explained in the following. Criterion for selecting slum experts was based on their age (25-50 years) to ensure that only senior professionals with relevant practical experience in their area of expertise are included; an equal gender distribution to identify gender specific opinions, concerns, interests; advanced knowledge in slum upgrading strategies (2-10 years) with a main focus on India in general to ensure that sufficient background knowledge exists; a variety in professional back-

¹¹¹ Mayring, P. (2015): Qualitative Inhaltsanalyse: Grundlagen und Techniken, 12th edition, Beltz Verlag, Weinheim und Basel, p. 11.

ground to ensure insights and perspectives from different professions; personal experiences with slum communities in a working relationship to provide a basis for a general understanding of informal communities and their local structures.

In total, interviewee age ranged between 25-45 years. This range displays the consideration of junior and senior experts (lower and higher ranks) with 5-25 years experiences in their professional background. Gender distribution among experts was 62.5% females and 37.5% males. Specific experiences in slum upgrading ranged from 3-10 years. The occupational status differed in terms of 30% consultants, 10% urbanists & researchers, 30% architects, 10% city planners and 20% technical experts. All interviewed experts made personal experiences with slum communities in a work relationship and contact was made through recommendations from the university, workplace, topic related events and personal networks.

Regarding interviews at slum locations, in total six focus group discussions with 15-20 participants in each neighbourhood were conducted. Focus group discussions were only conducted in Bhubaneswar, centralising the research to a defined geographic area for the purpose of better result comparability. The selected slums had not been part of upgrading schemes at that time. This aims to monitor the influence of upgrading from the first moment, as well as to allow comparisons of upgrading results upon upgrading conclusion against cases using classical strategies. A local analysis at the beginning of upgrading also ensures a comprehensive understanding of residents' basic needs, which can be translated into development requirements and describe aspects of a liveable life. It is considered that with an increase in upgrading, basic needs become a matter of course and are not worth mentioning for residents.^{112, 113, 114} Following this argumentation, FGDs are not conducted in the second research phase, as the focus of attention are only on undeveloped slums. In the second research phase the local upgrading mission was already largely advanced, resulting in a change of perceived requirements. This was verified by conducting pre-tests in the form of unstructured interviews.

To ensure objectivity, validity and reliability of the information obtained in focus group discussions, the selection of slum neighbourhoods and participating residents is explained in the following. Criterion for selecting slums to conduct FGDs was based on the location, with a focus on Bhubaneswar City, considering only slums in a defined zone; Tata Trusts or Ekta Consultancy's' (institutions supporting the local research) awareness of the slums to assure familiarity, announce visits in advance and ensure general safety

¹¹² Experten Report (2020): Der Wohlstand und seine Folgen, retrieved from <https://www.experten.de/2020/06/der-wohlstand-und-seine-folgen/> (17.07.2022).

¹¹³ Cipra (2015): Ziel: Lebensqualität, retrieved from <https://www.cipra.org/de/alpmonitor/ziel> (17.07.2022).

¹¹⁴ Lexikon der Nachhaltigkeit (2015): Gründe warum wir Wachstum „angeblich“ brauchen, retrieved from https://www.nachhaltigkeit.info/artikel/gruende_warum_wir_wachstum_angeblich_brauchen_1824.htm (17.07.2022).

of the visiting team; the slum neighbourhoods' existence for more than five years, to guarantee the presence of a rooted community culture.

In total, six slums in the City of Bhubaneswar were visited, which all were known to Tata Trusts and Ekta Consultancy and had already existed between 10-25 years at that time. Criterion for selecting slum residents participating in FGDs was based on their age (25-40 years) to ensure that only adults participated and statements in that specific age group can be clustered for comparisons among different slums visited; an equal gender distribution to identify gender specific opinions, concerns, interests; the personal interest to participate, in order to maximise statement validity and personal contribution. Slum residents age ranged between 25-35 years, gender distribution was equally split and their personal interest to participate was ensured through active personal commitment. This range displays the consideration of residents that where available to participate in and able to express themselves during FGDs. Children visited school during the time FGDs were conducted and elderly residents spoke dialects not understood by translators of the project team. Due to language barriers with selected participants, the team of Tata Trusts and Ekta Consultancy took over the role to conduct the interviews with participants that met participation criteria and to translate conversations within FGDs to the researcher.

The interview style in expert interviews and FGDs was based on a combination of an interview guideline and structured open-ended questions.^{115, 116} This approach ensured that respondents formulated their feedback themselves and the quality of answers increased. Appendix C offers an overview of both expert interview questionnaires and the FGD questionnaire. An evaluation phase of received information took place after each expert interview or FGD. During each evaluation phase, the expert interview or FGD was summarised and reduced to the essential in order to filter out material suitable for the thesis research. Relevant information was cited and incorporated into the main part of the thesis. Fieldwork results supported the verification of selected elements identified in secondary data, the understanding of participation techniques and the importance of various stakeholders external to slum neighbourhoods within upgrading, as well as the identification of liveable life indicators at slum level.

Second Research Phase

The second research phase was conducted in 2021. In total, ten expert interviews were conducted. Criterion for selecting experts varied to that of the first research phase, as only experts were selected that are or have been actively integrated within the local upgrading scheme "Odisha's Liveable Habitat Mission" to draw a comprehensive picture in

¹¹⁵ Meuser, M.; Nagel, U. (1991): ExpertInneninterviews - vielfach erprobt, wenig bedacht: ein Beitrag zur qualitativen Methodendiskussion, In: D. Garz, & K. Kraimer (Hrsg.), *Qualitativ-empirische Sozialforschung: Konzepte, Methoden, Analysen*, Westdeutscher Verlag, Opladen, p. 441-471.

¹¹⁶ Baur, N.; Blasius, J. (2019): *Handbuch Methoden der empirischen Sozialforschung*, 2nd edition, Springer VS, Wiesbaden, p. 669-675.

specific on slum upgrading under the local mission. There exist no overlaps among interviewees of research phase one and two, as the second research phase serves the description of location specific measures and experiences. It only deals with selected slum areas, which are also represented by the focus group discussions.

To ensure objectivity, validity and reliability of the information obtained in expert interviews, the selection of experts is explained in the following. An additional criterion for selecting slum experts was their age (25-40 years) to ensure that only adults participated that already had the chance to specialise and gain practical experiences in their area of expertise; an equal gender distribution to identify gender specific opinions, concerns, interests; the existence of practical knowledge in Odisha's Liveable Habitat Mission to ensure that experts have not only been working in the back end of the mission, but also participated in site visits and a general understanding of the missions goals and implementation methods at local level are in place; the variety in occupational positions within Odisha's Liveable Habitat Mission to ensure insights and perspectives from different professions and angles of contribution; the personal experience made with slum communities in a work relationship to provide a basis for a general understanding of informal communities, their local structures and collaborations. In total, interviewee age ranged between 25-36 years displaying the consideration of junior and senior experts (lower and higher ranks) with 5-16 years experiences in their professional background. Gender distribution among interviewed experts was 40% females and 60% males. Experiences in the mission ranged from 2-3 years. The occupational status differed in terms of 80% consultants and 20% technical experts. All interviewed experts have practical experiences in working with slum communities at local level under the Mission. The subjects of expert interviews were acquired via personal contacts to experts from the first research phase and contacts to different local institutions supporting OLHM.

Part II – Liveable Life Index Development

Based on the requirements derived in Part I, liveable life indices were identified as an instrumental opportunity to improve the guidance of slum upgrading. In relation to a general study of the most relevant, recently used liveability indices and most impactful publications on the subject, a review was conducted to highlight practices related to slum upgrading, participatory measures and their interrelated gaps and blind spots. Objects of investigation are the general conception, selection of meaningful indicators, measurability in a Smart City context and relevance of the respective elements for slum residents.

Global Standards

In total 6 liveability indices/publications on liveability have been analysed and their blind spots in the context of slums identified.¹¹⁷ The indices/frameworks are as follows: The City Development Index¹¹⁸, IEEE P1950.1¹¹⁹, ISO 37120:2018¹²⁰, ISO 37122:2019¹²¹, ISO 37123:2019 (ibid.), UNDRR (United Nations Disaster Risk Reduction - formerly UNISDR)¹²², ARUP Infrastructure Australia – Planning Liveable Cities¹²³, United Nations Sustainable Development Goals⁴²). Special attention was given to the type of indicators and how they were measured.

As most indices consider standardised liveable life indicators based on the perspective of the Global North, the gap on limited guidance on liveable life indicators in informal contexts is identified.^{44, 124} Well known liveable life indicators found in developed nations, such as stable income or public transport may neglect necessities that slum areas face, where access to basic services often displays a primary liveable life indicator (ibid.). Hence, a requirement exists to contextualise liveable life indicators at slum level and analyse how these indicators can impact the sustainability of slum upgrading.

To paint the holistic picture, a structured literature review concerning conceptualisations and experiences of liveable life indicators related to slum upgrading and urban restructuring is conducted. The review helps to line out key requirements and blind spots of existing indices and serves as guidance for the mode of operation.

Within the interviews conducted in Part I questions related to aspects of a liveable life served as a basis for primary information on the perspective of slum residents and slum upgrading experts in India. The process of data generation is discussed in the section above (Part I). Differences between literature derived and empirical data are discussed. Primary and secondary research findings were categorised and classified, generating a

¹¹⁷ Paul, S. M.; Prabhakaran, K.; Vidhya, K.; Manishankar S.; Mohan S. (2021): Composite slum performance index: A methodology to make city slum free, in: AIP Conference Proceedings Vol. 2396.

¹¹⁸ Docplayer (2017): Epilogue - The City Development Index (CDI), retrieved from <https://docplayer.net/20883900-Epilogue-the-city-development-index-cdi.html> (06.04.2020).

¹¹⁹ IEEE Standards Association (2020): P1950.1 - Standard for Communications Architectural Functional Framework for Smart Cities, retrieved from <https://standards.ieee.org/ieee/1950.1/10176/> (12.04.2022).

¹²⁰ Ansi Webstore (2022): ISO 37120:2018 - Sustainable Cities And Communities - Indicators For City Services And Quality Of Life, retrieved from <https://webstore.ansi.org/Standards/ISO/ISO371202018?source=blog> (11.06.2022).

¹²¹ Ansi Webstore (2022): ISO 37122:2019 - Sustainable Cities And Communities - Indicators For Smart Cities, retrieved from <https://webstore.ansi.org/Standards/ISO/ISO371222019?source=blog> (11.06.2022).

¹²² UNDRR (2022): About UNDRR, retrieved from <https://www.undrr.org/about-undrr> (22.06.2022).

¹²³ Infrastructure Australia (2018): Planning Liveable Cities - A place-based approach to sequencing infrastructure and growth, retrieved from https://www.infrastructureaustralia.gov.au/sites/default/files/2019-06/ifa_225232_planning_liveable_cities_report_2018_fa_web_hr.pdf (22.06.2022).

¹²⁴ Alderton, A.; Davern, M.; Nitvimol, K.; Butterworth, I.; Higgs, C.; Ryan, E.; Badland, H. (2019): What is the meaning of urban liveability for a city in a low-to-middle-income country? Contextualising liveability for Bangkok, Thailand, in: Globalization and Health, Vol. 15, No. 1, p. 51.

total of four indicator classes and 16 liveable life indicators, as well as specifying their measurability (Chapter 5.1). A reduction to essential indicators aims to reduce complexity, set the frame, and keep attention on those liveable life indicators which are considered to hold a high local value in slums. Criteria for identifying a high local value, is the quantity and intensity in expressions of statements made that gave conclusions about indicator relevance and importance in FGDs, as well as secondary research verifications. It is essential to mention that during focus group discussions not only the answers to questions were noted, but also the body language and side conversations among and with slum residents recognized and documented. To develop a LLI approach which can be applied location-independent, but with its application results in location-dependent outcomes, indicators have been framed in a sense, which allows local measurability. Climate zones, cultures and further criteria influence a locally developed LLI and lead to a modification in indicators. These factors need to be considered for optimal adaptation to local conditions.

Part III – Result and Output

To consider the holistic and sustainable development of slum areas and raise understanding of location specific liveable life aspects, adaptable interfaces for the input and derivation of local fact and figures are included in the index model (Chapter 5). Furthermore, specific requirements and open ends to expand the LLI are obtained to make the instrument flexible and adaptable while securing its slum specific character. Developing a method that supports the formulation of a LLI to make locally-rooted liveable life indicators identifiable, measurable and guide sustainable slum upgrading, requires an adaptation potential to application scenarios.

The method of this adaptation (operationalization) is decisive, in this case the determination of concrete local liveable life indicators to identify components and priorities for upgrading. Since slum residents are not familiar with the set of pre-defined indicators, a participatory research measure can add other relevant factors to the LLI and check the factors suggested by the LLI. Therefore, in addition to the requirement analysis of liveable life indicators considered in slum upgrading, the potential of ICT in a Smart City context to facilitate participation and communication is analysed. Focal point display opportunities of digital instruments in Smart Cities to increase location specific relevance and the participatory potential of slums within urban upgrading. Connecting participatory processes with location specific data is considered a vital element to identify additional locally relevant liveable life indicators and tailor a LLI to a defined local level.

As a result, the LLI can be adaptively extended and transferred into a local guideline for slum upgrading, considering the identification and categorization of liveable life indicators to act as a lever in participative slum upgrading. This way gaps, priorities and strategies can be formulated, and their monitoring facilitated by enabling measurability. Studying residents' liveable life perceptions serves to highlight focal points in upgrading, which are

recognised to have a direct relation to community ties and the overall slum neighbourhood well-being.¹²⁵

The development procedure of the Liveable Life Index is summarised in Figure 3 and will be discussed in detail in Chapter 5.

Development Process of a Liveable Life Index

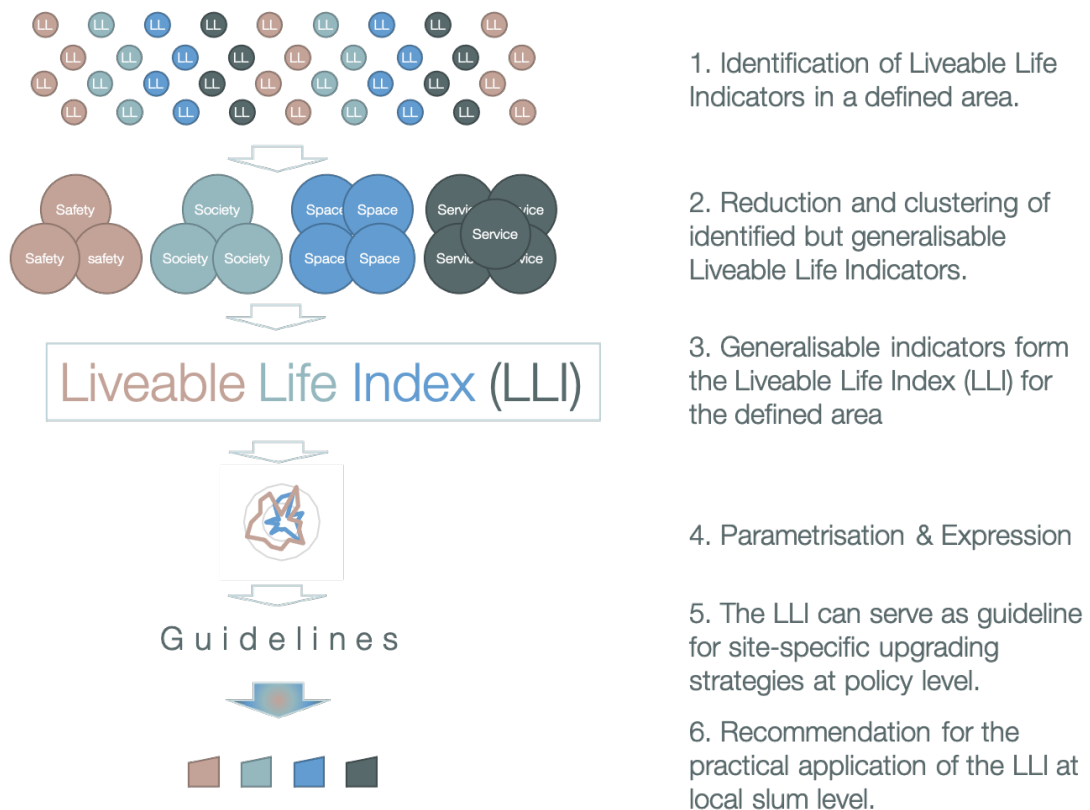


Figure 3: Development Procedure of a Liveable Life Index.

For this purpose, the opportunities associated with ICT and e-participation structures are analysed for their potential to support the entire LLI development process (Chapter 5.3). To ensure the acceptance of a digital tool most commonly used in slum landscapes, digital trends with a major focus on mobile phones in the Indian market are analysed based on primary and secondary research. In a last step, possibilities for the parametrisation and expression of the index are conceptualised to ensure an analytical and communicative usability of the index.

¹²⁵ Wellman, B.; Wortley, S. (1990): Different Strokes from Different Folks: Community Ties and Social Support, in: American Journal of Sociology, Vol. 96, No. 3, p. 558–588.

Parametrisation and Expression of Data

For the evaluation and projection of liveable life indicators within the LLI, location specific data needs to be parametrised. The process of parametrisation allows indicator measurability and comparability over a time span or among locations (Chapter 5.1).¹²⁶ In order to ease the process of the index application at local levels, parametrisation typically includes the specification of indicator scales. Hence, for each indicator, scales are developed, enabling precise data, as well as local estimates (in case of incomplete data) to be assigned to a specific range. Meaningful possibilities of classifications in qualitative and quantitative nature are explored.

Expression serves the visualisation of LLI components to communicate focal points, gaps and progress with slum upgrading experts at policy level, as well as slum residents. For a clear and comprehensible representation, different visualisation options (maps and diagrams) were examined, their applicability and ease of understanding tested, and the advantages and disadvantages compared.

Third Research Phase – Validation

The third research phase was conducted in 2022. In total, five expert interviews were conducted. Criterion for selecting experts were similar to the second research phase, as only experts were interviewed that are or have been actively integrated within the local upgrading scheme (OLHM) to evaluate the findings of the conceptualised LLI tool.

To ensure objectivity, validity and reliability of the information obtained in expert interviews, their selection is explained in the following. Criterion for selecting experts was their age (25-40 years) to ensure that adults with advanced practical experiences in their profession participate; an equal gender distribution; the existence of practical experience in OLHM to ensure a general understanding of the missions objective and implementation methods at local level; the variety in occupational positions to ensure perspectives from different professions; the personal experience made with slum residents in a working relationship to provide a basis for general understanding of informal communities. In total, interviewee age ranged between 27-38 years with experiences in the professional background ranging from 5 to 16 years. This displays the consideration of junior and senior experts (lower and higher ranks). Gender distribution among interviewed experts was 40% females and 60% males. Practical experiences in the mission ranged from 4-5 years. The occupational status differed in terms of 80% consultants and 20% technical experts. All interviewed experts have personal experiences in working with slum communities at local level under the Mission. Interviewees were acquired via personal contacts to experts from the first and second research phase.

¹²⁶ Kopf, J. (2017): Konzeption, Durchführung und Operationalisierung des Experiments, In: Evolution von Kollusion, Springer Gabler, Wiesbaden.

2 Literature Review – State of Research about Indian Slums

This chapter studies the state of research about Indian slums to analyse India's slum upgrading history, the use of participatory approaches in upgrading and community engagement under consideration of digital technology. The literature review analyses the three main components of the research question in form of a filter structure. Based on multi-criterial filtering of literature, contributions were systematically sorted out following the principle from "general" to "specific". In a first step each component is discussed individually. In a last step the components are summarised for a concluding statement.

Filter structure

1. Filter: General slum upgrading in Indian cities
2. Filter: Participatory approaches within slum upgrading of Indian cities
3. Filter: E-Community participation within slum upgrading of Indian cities

2.1 General Slum Upgrading in Indian Cities

Slums, which are areas deprived of durable housing, functioning sanitation, and safe water as well as characterized by insecure tenure rights and general overcrowding, hold about one-quarter of the world's urban population.^{127, 128} In India 52–98 million people live in urban slums, of which 59% of slums are considered to be either non notified or lack a certain degree of legal recognition.¹²⁹ According to the World Bank's collection of development indicators, 35.2% of India's urban population lives in slums.¹³⁰ Despite the country's economic growth, India is characterized by poor living conditions with one of the highest population densities worldwide. Before considering general slum upgrading in Indian cities, a brief overview outlines why Indian cities and their slums grew so fast in the second half of the twentieth century and which approaches were used to counteract slum formation. The state of research about general slum upgrading in Indian cities begins therefore with a retrospective on slum development since 1947 (Indian independence) and continues with the evolution of informal settlement upgrading programs in India.¹³¹

Pre-Indian independence, slums were predominantly found on the outskirts of cities, as most residents were employed in peripheral factories. Post Indian independence and

¹²⁷ UN-Habitat (2015): UNHABITAT Habitat III Issue Papers-22: Informal Settlements, New York, USA.

¹²⁸ Marx, B.; Stoker, T.; Suri, T. (2013): The Economics of Slum in the Developing World, in: Journal of Economic Perspectives, Vol. 27, No. 4, p. 187–210.

¹²⁹ Nolan, L. B.; Bloom D. E.; Subbaraman, R. (2017): Legal Status and Deprivation in India's Urban Slums: An Analysis of Two Decades of National Sample Survey Data, IZA Institute of Labor Economics, Bonn, p. 3.

¹³⁰ The World Bank (2018): Population living in slums (% of urban population) – India, retrieved from <https://data.worldbank.org/indicator/EN.POP.SLUM.UR.ZS?locations=IN> (01.10.2020).

¹³¹ Chimankar, D. A. (2016): Urbanization and Condition of Urban Slums in India, The Indonesian Geographers Association, Vol. 48, No. 1, p. 29.

during the country's identity creation stage, the government sector focused primarily on planned economic development of large cities, also known as the industrial revolution. With the industrial revolution, large cities became attractive, and more people moved into the city centres for the sake of economic possibilities.¹³² On account of rising living costs and low incomes, poverty levels rose and slums developed in zones, where neither legal habitat rights, nor access to basic facilities existed;¹³³ but also "[...] partition and its ethno-religious aftershocks drove millions into slums. Bombay, Delhi, Calcutta, Karachi, Lahore and Dhaka were all forced to absorb floods of refugees in the violent aftermaths of 1948 (Partition), 1964 (Indo-Pakistani War) and 1971 (secession of Bangladesh)"¹³⁴. From 1950 to 1968 slum residents increased to 18% and by 1980 slum residents displayed 50% of the urban area's population.¹³⁰ Basic municipal services, such as waste collection, road infrastructure, sanitation or drinking water were absent, making these districts subject to natural disasters, life threatening diseases and high crime rates.¹² Local governments used different methods to decrease slum neighbourhoods, such as relocating residents to the outskirts of cities, as well as forced eviction. Urban policies often failed, due to corruption or default regulation schemes.

With the drastic neoliberal restructuring of the Indian economy after 1991 and the associated high-tech boom of Indian engineers returning from overseas, GDP levels rose to poverty levels. As Jeremy Seabrook emphasizes, the early 1990s may have been "the worst time for the poor since independence,"¹³⁵ as deregulated food grain prices soared 58% between 1991 and 1994 (ibid.). The growth in GDP contributed to investments in "the information technology sector leaving agriculture to stagnate and infrastructure to decay. Rather than taxing new millionaires, the neoliberal Janata government financed itself with the massive privatization of state industry"⁴⁵, at the expense of poor communities. Bangalore belonged those days to the cities that experienced most of the high-tech boom. As a result, the demand for cheap workforce rose and Bangalores slums grew twice as fast as the general population in the 1990s (ibid.). Researchers characterized Bangalore's periphery as "the dumping ground for those urban residents whose labour is wanted in the urban economy but whose visual presence should be reduced as much as possible"¹³⁶. Especially tourists and international business relations were to remain unaware of the informal populations great proportion (ibid.).

By the mid 1990s, for the first-time discussions at community level with residents took place. International aid agencies at that time also increased their supportive presence in the slums of developing countries. To the present day, slum redevelopment has become

¹³² Arbury, J. (2006): *From Urban Sprawl to Compact City: An analysis of urban growth management in Auckland*, University of Auckland, Auckland, p. 240.

¹³³ Royuela, V.; Castells-Quintana, D. (2014): International migrations and urbanisation: 1960-2010, in: *International Journal of Global Environmental Issues*, Inderscience Enterprises Ltd, Vol. 13, No. 2/3/4, p. 150-169.

¹³⁴ Thomas, F. C. (1997): *Calcutta Poor: Elegies on a City Above Pretense*, M. E. Sharpe, Armonk, p. 41.

¹³⁵ Seabrook, J. (1997): *In the Cities of the South: Scenes from a Developing World*, Verso Books, London, p. 63.

¹³⁶ Schenk, H.; Dewitt, M. (2001): *The Fringe Habitat of Bangalore*, in: *Living in India's Slums: A Case Study of Bangalore, Delhi*, p. 131.

a policy initiative which is continuing to develop. Information exchange, practical co-operation, national experiences, and lessons learnt from past slum upgrading measures contribute to the continuous improvement in approaches. Still, a model that guides the meaningful engagement with residents to identify local priorities and bring investment decisions closer to the point of impact, displays an aspect that could not be identified. An integrated and sustainable approach in cities is key, as sustainable cities and communities start with sustainable neighbourhoods, where people can meet their needs, socialize and feel safe.¹³⁷ At the end of the 20th century, political and planning authorities started to recognise slums and intervened with approaches that accepted so-called squatters, instead of neglecting them.⁶⁴ From then onwards, the intention was to include informal areas into the formal urban system and provide the inhabitants with urban infrastructure and necessary services. However, intentions for informal settlement inclusion prior to 1990 are rare.

With a focus on participatory approaches, the goal is to “coordinate community mobilisation and organisation and to make the argument for state withdrawal from the delivery of housing goods and services in favour of providing support for local determination and action” (ibid.). Participatory approaches are based on decisions taken at the lowest effective level to stimulate engagement and guide investments of resources in domestic economic, social, and physical development (ibid.). Already in 1997, the pioneers of participatory planning, Goethert and Hamdi discovered that “the accepted best practice [...] in developing countries is [...] participatory slum improvement”^{138, 139}. Yet, in 2020 the Cities Alliance comes to the same conclusion and discloses in its work about slum upgrading that “the primary challenges in slum upgrading are to achieve coherence in the community and find a solution that covers various needs.”¹⁴⁰

Evolution in slum upgrading concepts

Next to the evolution of slum formation, there has also been an evolution in slum upgrading concepts. As can be concluded from prior paragraphs, eradicating slum regions did not solve the concerns associated with rising slum landscapes.¹⁴¹ Table 1 provides an overview of slum upgrading approaches in India from 1947 to 2022.

¹³⁷ United Nations Environment Programme (2020): Integrated Guidelines for Sustainable Neighbourhood Design, retrieved from <https://www.neighbourhoodguidelines.org> (12.11.2020).

¹³⁸ Goethert, R.; Hamdi, N. (1997) Action Planning for Cities: A Guide for Community Practices, John Wiley and Sons, New York, p 30.

¹³⁹ Goethert, R.; Hamdi, N. (1988): A Community Based Process in Programming and Development, Intermediate Technology Development, London, p. 24.

¹⁴⁰ Cities Alliance (2020): About Slum Upgrading: What are some of the challenges in slum upgrading?, retrieved from <https://www.citiesalliance.org/about-slum-upgrading> (06.06.2020).

¹⁴¹ De, I. (2017): Slum improvement in India: determinants and approaches, in: Housing Studies, Vol. 32, No. 7, p. 990–1013.

Slum Evolution

Year	Political Status	Method of Slum Management
<i>1947 (Indian independence) – 1960</i> <i>The country's 'identity creation stage'</i>		
1960	Slum removal, eradication, eviction	Authorities tend to evict, neglect or clear slum zones.
1970	Slum acceptance & relocation	Slum resettlement strategies to peripheries and construction of high-rise buildings dominated.
1980	Slums receive access to basic services & alternative housing options	Serviced land to the poor was provided in form of in-situ development & high-rise buildings. Governments started intense collaborations with aid institutions & NGOs.
1990	Slum residents receive tenure rights and basic infrastructure	Discussions and deliberations at slum community level took place. Slum neighbourhood upgrading aimed to improve the entire city context.
2000	Poverty reduction, slum redevelopment and engagements at community level ('partnership')	Mixture of top-down and bottom-up slum upgrading, free housing and financial contribution provided for residents.
2001	2001 Valmiki Ambedkar Awas Yojana (VAMBAY)	Provide and upgrade existing shelter for slum residents.
2005	Basic Services to the Urban Poor (BSUP)	Provide secure tenure, affordable housing, water, sanitation, health, education, and social security for slum residents.
2011	Rajiv Awas Yojana (RAY)	Envisages a "Slum Free India" with inclusive and equitable cities in which every citizen has access to basic infrastructure, social amenities, and shelter.
2015	Pradhan Mantri Awas Yojana (PMAY)	Housing provided to eligible communities by 2022.
2015	Smart City Mission	Drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology that leads to Smart outcomes.
2022	Participative strategies for sustainable slum upgrading with the support of e-participation in a Smart City context	Digitalised inclusion, incorporation, involvement. Bottom-up approaches override top-down ones.

Table 1: Timeline of slum upgrading approaches in India from 1947 to 2020 (own representation based on Chapter 2 State of Research about Indian Slums).

Present Upgrading Concepts

Focusing on one of the latest local upgrading approaches, the Pradhan Mantri Awas Yojana (PMAY) scheme aims to provide housing to eligible communities by 2022. Regarding the PMAY policy brief, 63% of projects under PMAY can be assigned to the

vertical “Beneficiary-Led Construction and Enhancement”.⁶² Hence, beneficiaries themselves constructed or redeveloped the majority of houses. With a high degree of so-called “self-help workers”, attention on residents’ knowledge about the quality, safety and stability of housing structures rises. It is important that builders are aware of “building typology, material choice, building design for thermal comfort, community space, and space for artisanal activities”⁶². To address the high demand of the “Beneficiary-Led” component (vertical) of the scheme and optimise building expertise of residents, the policy brief revealed that “community participation in the design process of formal as well as incremental housing under the beneficiary-led construction vertical should be promoted. Local architects should also be involved in this process.”⁶² The term “should”, implies a shortage of expert knowledge in self-help building projects. Generally speaking, only in few cases do beneficiaries possess technical house construction know-how.⁶² Keeping in mind that their construction measures vary from ground level to second or third floor houses. A lack of technical knowledge makes house constructions prone to poor building and safety norms. Establishing safe and stable housing structures, requires a network of local experts (architects and planners), who collaborate with beneficiaries and improve their technical knowledge to ensure the sustainability of local upgrading.

India’s Smart City Mission

Lastly, the role of India’s Smart City Mission (SCM) in the context of slum upgrading will be discussed. India’s Prime Minister launched the Smart Cities Mission on the 25th of June 2015. The mission is a centrally funded urban program that aims to promote the provision of core infrastructure, clean and sustainable environments and a decent quality of life of citizens through smart solutions.¹⁴² It includes two components, an area-based development (ABD) and a Pan-city initiative.⁴¹ The ABD will include either city improvement (retrofitting), city renewal (redevelopment), city extension (greenfield development) or a mix of all three (ibid.). The Pan-city initiative focuses on two or more smart solutions which will cover larger sections of a city (ibid.).

In a first phase, 100 cities have been selected to be developed as Smart Cities.¹⁴⁰ These 100 cities shall display replicable models, which act as lighthouses to inspire other cities. Bearing in mind that this chapter focuses primarily on slum upgrading contexts, rather than general urban upgrading ambitions, this mission is still considered important, as one of its core points is based on improving the quality of life of people. It displays a good reference example, as for the first time the national government highlights citizen engagement, giving it 16% weightage in the scoring criteria to evaluate Smart City proposals under the mission.¹⁴³ To facilitate citizen participation, the Government of India introduced

¹⁴² Smart Cities (2021): About Smart Cities Mission, retrieved from <https://smartcities.gov.in/about-the-mission> (10.08.2021).

¹⁴³ Cidco Smartcity (2016): Smart Cities: Demand Driven Planning In Lighthouse cities, retrieved from <https://niua.org/cidco/category/research-page/articles/articles-smart-cities/page/3/> (04.03.2021).

“MyGov”¹⁴⁴ as an official citizen engagement platform/application. Ministries and agencies use the app mainly to solicit ideas from the Indian public and solve public problems. So far, the mission rather concerns general problems and has been limited to the administration of the formal sector, although participatory measures can be used even more in many other areas.¹⁴⁵ As plans, modules and projects within the mission have already faced changes since launch, focus should be based on the potential of extending smart concepts, which take into consideration data-supported management, monitoring and citizen engagement in slum upgrading contexts.¹⁰¹

In conclusion, it can be said that a multitude of approaches characterises the general slum upgrading history in India. Starting with the focus on top-down approaches, which range from inner city evictions to the urban outskirts and relocations to high rise buildings.¹² Since science, global lessons learnt and international networks in the context of slum upgrading emerged, the participatory potential became important at policy level to design slum upgrading projects, e.g. the PMAY mission and its four pillars to which residents can independently apply.⁶² Still, there is a need for participation forms that make participatory planning processes compatible with new urban settings in informal regions, such as analysing the potentials of Smart City frameworks to facilitate sustainable urban slum development.

2.2 Participatory Approaches within Slum Upgrading of Indian Cities

To identify the degree of participatory approaches within slum upgrading, region-specific and sector-specific perspectives on participative approaches are examined. The region-specific view is based on an analysis of participative approaches within four selected cities belonging to India’s Smart City Mission. Due to limitation reasons, a number of selected, well documented cases and examples are considered for analysis. The city selection criteria is based on scope and expertise. Each of the four Smart Cities selected demonstrates a profound information base on participative approaches in slum upgrading (Bangalore, Chennai, Ahmedabad, Bhubaneswar).¹⁴⁶ It is important to mention, that there is still no specific case-study in India that considers experiences in digital citizen engagement for slum upgrading. The analysis aims to determine factors that interpret the role of digital tools in participation. For this reason, analysing cities belonging to the Smart City Mission displays a good reference example.

The sector-specific view is based on an analysis of solution strategies implemented participatively in four areas that characterise a slum. Criterion for selecting the areas, is the

¹⁴⁴ MyGov (2021): Government of India, retrieved from <https://www.mygov.in/groups/> (10.12.2021).

¹⁴⁵ GovLab (2021): MyGov India: Poll, Discuss, Do, Briefing Note, retrieved from <https://congress.crowd.law/files/mygov-india-briefing-note.pdf> (04.10.2021).

¹⁴⁶ International Association of Public Transport (UITP) (2019): List of Smart Cities in India, retrieved from <https://india.uitp.org/list-smart-cities-india> (26.03.2020).

United Nations definition of a slum.³ The United Nations notes five basic characteristics that define a slum area – lack of access to water and sanitation, poor quality housing, overcrowding, and an insecure residential status (ibid.). As the topic of sufficient living areas (overcrowding) and secure tenure (insecure residential status) have already been discussed in previous sections, focus within this section will be based on sanitation, water, housing as well as education. Education was added because case studies were identified which demonstrated a substantial information base on participative approaches within partnerships and their positive impact on slum communities.

2.2.1 Smart City Participatory Slum Upgrading Methods

This section presents the four selected Smart Cities using participatory slum upgrading methods as mentioned in Chapter 2.2.

Bangalore

Bangalore, the capital of Karnataka, has a population of 11.52 million, making it the third most populous city in India.¹⁴⁷ According to the Karnataka Slum Development Board, there are 4,050,000 people living in slums.¹⁴⁸ To address the high proportion of slum residents, a team of Stanford students studied seven years satellite images to identify slums not belonging to the official “state list of slums”.¹⁴⁹ The team concluded that the formation of new (and expansion of old) slums caused official lists the government holds to severely underestimate the existence of slums and become quickly outdated. It is important for slums to be noted in official slum lists to legally access basic services, such as drinking-water pipes. Additionally, the analysis of satellite images lays the foundation to develop locally adapted solutions and identify suitable areas for slum relocations:

- Locally adapted solutions: For recently discovered slum zones it is crucial to evaluate the geographical opportunities and establish locally adapted development practices.
- Slum relocations: For slum relocations, areas need to be considered that are close to centres of economic activity and the former slum location, in order to improve living standards sustainably and prevent sprawl.

¹⁴⁷ Roy, D.; Palavalli, B.; Menon, N.; King, R.; Pfeffer, K.; Lees, P.; Sloom, P. M. A. (2018): Survey-based socio-economic data from slums in Bangalore, India, retrieved from <https://www.nature.com/articles/sdata2017200> (11.02.2020).

¹⁴⁸ Karnataka Slum Development Board (2016): Slum Details at Glance, retrieved from <https://www.karnataka.gov.in/ksdb/Pages/Slum-Statistics.aspx> (24.02.2020).

¹⁴⁹ Ogburn, J. (2018): Research on Bengaluru Slums Receiving National Attention in India, retrieved from <https://stanford.duke.edu/articles/research-bengaluru-slums-receiving-national-attention-india> (11.02.2020).

As per the latest slum upgrading strategy, Bangalore uses community participation to prepare micro-plans at local level and for implementation of slum improvement programmes to enhance poor service infrastructure.¹⁵⁰ Problem areas are envisaged through the Urban Local Body with the support of local communities (ibid.). The involvement of slum residents contributes to a participatory character within Bangalore's slum upgrading approach, as the demands of residents' shape decisions made at local level.

Chennai

Chennai, the capital of Tamil Nadu, had in 2003 a slum population of 1,079,414 indicating that 26% of Chennai's population lived in slums.¹⁵¹ By 2014 the slum population doubled, with an increase of 51.85% and continues to rise.¹⁵² Many slums developed due to migrants searching for jobs in the manufacturing industry or along the coastline as fisherman workers. In most cases the newly developed slums are located in non-liveable areas, e.g. along railway tracks, in low lying flood-prone areas or spread around contaminated rivers. Slums along railway tracks suffer from emissions, which affect health conditions and are not protected from train tracks, creating dangerous zones for children playing nearby; slums in low lying flood-prone areas tend to suffer from heavy floods causing disastrous conditions; and slums close to contaminated rivers suffer from standing and bubbling water, where chemicals from factories and faeces are present.

The "Tamil Nadu Slum Clearance Board" (TNSCB) in Chennai has been involved in various housing, slum development, rehabilitation, and resettlement programmes to improve living conditions of slum families within the state Tamil Nadu.¹⁵³ As part of the slum upgrading plan, the TNSCB has set its focus on an ex-situ development program. Within this program, slums are relocated to areas equipped with basic infrastructure and housing (ibid.). In the past, residents rarely accepted this resettlement programme, as neither central relocation sites, nor suitable housing sizes were considered. As relocations only take place in agreement with slum residents, the TNSCB conducted local research to identify aspects that facilitate agreements. The research revealed that agreements are easier to reach when new locations are within a radius of 5km from the former slum locations and housing units at new locations meet the size requirements of each relocated family. Correspondingly, the TNSCB plans in the future to restructure the local program so that residents take over an integral part in decision-making and are actively involved in resettlement measures.¹⁵⁴ Being able to choose between resettlement locations and

¹⁵⁰ Cities Alliance Project Output (2019): Final Report on City Development and Slum Upgradation Strategy of Bengaluru, CDSUS Report, Bangalore, p. 32.

¹⁵¹ Chandramouli, C. (2013): Slums In Chennai: A Profile, retrieved from http://www.yorku.ca/bunchmj/ICEH/proceedings/Chandramouli_C_ICEH_papers_82to88.pdf (24.02.2020).

¹⁵² Philip, C. M. (2016): Slums in Chennai increase by 50% in a single decade, retrieved from <https://timesofindia.indiatimes.com/city/chennai/slums-in-chennai-increase-by-50-in-a-single-decade/articleshow/50618951.cms> (24.02.2020).

¹⁵³ Tamil Nadu Slum Clearance Board (2020): Home (Website), retrieved from <http://www.tnscb.org> (02.10.2020).

¹⁵⁴ Manimekalai, U.; Senior Planner at Tamil Nadu Slum Clearance Board (12.11.2019): Personal Communication, Expert Interview, Chennai.

determine the size of residential complexes, develops residents' sense of ownership during upgrading. The planned approach of intensifying slum communities' involvement contributes to the participatory character within Tamil Nadu's slum upgrading approach, as community perspectives are considered and incorporated into development practices.

Ahmedabad

Ahmedabad, one of the largest cities in the state Gujarat, is ranked 3rd in the amount of non-registered slums in India.¹⁵⁵ The estimated 384,000 slum households account for 10% of India's non-identified slums (ibid.). To compensate for the rise in slum households, the state government implemented several slum upgrading projects within Gujarat. In Ahmedabad, slum upgrading projects focus on the development of housing for slum residents under the central government established scheme "Pradhan Mantri Awas Yojana (PMAY)". The PMAY scheme is composed of different verticals. The verticals offer beneficiaries four types of aid measure to freely select from.¹⁵⁶

In Ahmedabad, special emphasis has been given to housing demands of people belonging to the lower castes and workers in the sanitary sector. They received housing privileges for their families, as they are considered the most neglected by society with the least prospects of moving into adequate housing.¹⁵⁷ In terms of participative strategies and to provide affordable, sustainable and physical infrastructure and social services (e.g. water supply, street lighting, individual toilets) in slums, the City of Ahmedabad developed a scheme to actively involve the local slum population in upgrading measures.¹⁵⁸ For professional implementation of projects and optimal performance of installations and knowledge sharing with local residents, a team of technical experts was formed. Additionally, financial resources required for upgrading measures were based on a partnership concept. Hence, all partners shared the costs of physical services and community developments in projects (ibid.). Actively involving the local population into development work and distributing the costs, raised ownership of developments and reduced risk, as professional support for upgradation and access to loans guaranteed local households sustainable investments.

In total, slum residents contributed 275,527.00€ towards development services within their local community. This contribution had never been done by slum residents anywhere else in India at that time (ibid.). Ahmedabad is a good example on how participative actions create a basis for a trustful partnership between different stakeholders to collaborate

¹⁵⁵ Chauhan, A. (2016): Gujarat ranks 3rd in largest non-notified slums' list, retrieved from <https://timesofindia.indiatimes.com/city/ahmedabad/Gujarat-ranks-3rd-in-largest-non-notified-slums-list/articleshow/52309243.cms> (24.02.2020).

¹⁵⁶ Global Housing Technology Challenge India (2019): About Pradhan Mantri Awas Yojana (Urban), retrieved from <https://ghtc-india.gov.in/Content/About-PMAY.html> (28.03.2021).

¹⁵⁷ Banerjee, D.; Mehta, M. G. (2017): Caste and capital in the remaking of Ahmedabad, in: Contemporary South Asia, No. 25, p. 182-195.

¹⁵⁸ Amdavad Municipal Corporation (2013): Slum Networking Project, retrieved from https://ahmedabadcity.gov.in/portal/jsp/Static_pages/slum_ntwk_project.jsp (30.09.2019).

on a shared project. With a high response to local needs, the government of Ahmedabad demonstrated that rehabilitating slums performs best in collaboration. For a detailed overview on the Ahmedabad case study, see Appendix F.

Bhubaneswar

Bhubaneswar is the capital of the state Odisha, with a population of 1,163,000 in 2020 and a growth rate of 2.83% per year.¹⁵⁹ Odisha records the lowest slum population in India, in regards to the ratio of people living in slums to the total state population.¹⁶⁰ In volume terms, of the 42 million people living in Odisha, 1.8 million people live in slums (ibid.). The comparatively low slum population can be traced back to a rise in attention paid to slum upgrading measures. Odisha is a pioneer in terms of granting free land rights to slum residents under the “Rights to Slum Dwellers Act”¹⁶¹ and promoting the creation of higher living standards on granted land under Odisha’s Liveable Habitat Mission “Jaga”¹⁰⁹. The “Rights to Slum Dwellers Act”¹⁶¹ follows a top-down culture, as governmental bodies, and supportive organisations, select individuals qualified for land rights. “Jaga Mission” on the other hand, is based on a participative approach. Its focus includes the redevelopment of slums, provision of necessary infrastructure and rehabilitation of residents by offering social programs based on local demands and active community integration. Jaga Mission’s engagement at slum level is unique in India, as the degree of participative actions and legal guidelines that aim to benefit the poor societies, cannot be found in other Indian states.

Among the emerging economies in India, Odisha is considered to “be the only region [which has] a complete spatial database of each and every slum in each and every city and town”⁹⁷. This is traced back to the intensive use of drones and GIS systems to digitally collect and interpret geographically referenced data. Already in 2017 Odisha’s commitment was rewarded, when the capital Bhubaneswar was the only Indian city found in the list of the world’s top 20 Smart Cities, ranked 19th.¹⁶² Cities like San Diego (ranked 14th), Berlin (ranked 7th) and Singapore (ranked 1st) were also listed under the survey for the “Global Smart City Performance Index”.¹⁶³ For more information on the “Rights to Slum Dwellers Act”, “Jaga Mission” and its performance in Odisha please see Chapter 3.

¹⁵⁹ Macro Trends (2020): Bhubaneswar, India Metro Area Population 1950-2020, retrieved from <https://www.macrotrends.net/cities/21196/bhubaneswar/population> (26.06.2020).

¹⁶⁰ The Times of India (2020): Odisha has lowest slum population in the country, retrieved from <https://timesofindia.indiatimes.com/city/bhubaneswar/state-has-lowest-slum-population-in-the-country/articleshow/74181288.cms> (24.02.2020).

¹⁶¹ Social Services India (2018): Jaga Fellows for World’s largest slum land titling Programme, retrieved from <https://socialservicesindia.com/wp-content/uploads/2019/06/Jaga.pdf> (27.03.2020).

¹⁶² Times Now News (2018): Bhubaneswar enters top 20 in global smart city index; Singapore tops list, retrieved from <https://www.timesnownews.com/business-economy/world-news/article/bhubaneswar-enters-top-20-in-global-smart-city-index-singapore-tops-us-uk-cities/207564> (24.02.2020).

¹⁶³ Adnal, M. (2018): Bhubaneswar, the only Indian city among World’s top global smart city ranking, retrieved from <https://www.oneindia.com/india/bhubaneswar-the-only-indian-city-among-worlds-global-smart-city-ranking-2658436.html> (24.02.2020).

Lessons Learnt

In conclusion, each of the four discussed Smart Cities exemplifies a method on slum upgrading that is aligned with local circumstances and aims for participation. Keeping in mind that India has 27 states, 9 Union Territories and 22 official languages, location specific strategies are essential.¹⁶⁴ Similar issues in slum neighbourhoods are addressed with different best practices, as each state has regional implementation logics and possesses geographic-dependent opportunities. Still, there is a lack of leveraging Smart City initiatives to increase participation, actively integrate slum residents and derive location-specific upgrading measures.

2.2.2 Sector Specific Participatory Slum Upgrading Methods

This section presents the four selected sector-specific participatory slum upgrading methods as mentioned in Chapter 2.2.

Sanitation

In India alone, more than 100,000 people die each year due to a lack of hygienic conditions.¹⁶⁵ Especially open defecation makes a significant contribution to unhygienic environments.¹⁶⁶ In India, it is estimated that every second person uses nature for daily toiletting.¹⁶⁷ From a global perspective, India is ranked first in terms of open defecation, with more than 564 million people relieving themselves in open space.¹⁶⁸ The lack of access to sanitation, absent drainage systems and missing awareness of toilet use, has fatal consequences on general living conditions in slums. To raise awareness about sanitation facility usage, control natural pollution and reduce the spread of diseases, Prime Minister Narendra Modi established in 2014 the “Swachh Bharat Mission”¹⁶⁴. The mission’s objective was to make India open defecation free from October 2014 to October 2019 (ibid.).

Since October 2014, governmental numbers revealed that 99,411,228 household toilets were built and 634 Indian districts call themselves open defecation free (ibid.). In a documentary about the acceptance of and access to sanitation, residents declared they tried to reject the “Swachh Bharat Mission”.¹⁶⁷ Authorities already recognised citizens aversion to sanitary practices in toilet equipped areas. Union Urban Development Minister Hardeep Singh Puri relates the failure of Indian cities to reach Smart City standards with the missing

¹⁶⁴ Darquennes, J.; Salmons, J. C.; Vandenbussche, W. (2019): Language Contact, De Gruyter Mouton, Berlin, p. 351.

¹⁶⁵ Swachh Bharat Mission (2019): Index, retrieved from <https://swachhbharatmission.gov.in/sbmcms/index.htm> (04.10.2019).

¹⁶⁶ Aerzteblatt (2017): Jedes Jahr sterben eine halbe Million Kinder durch infektiöse Durchfallerkrankungen, retrieved from <https://www.aerzteblatt.de/nachrichten/76436/Jedes-Jahr-sterben-eine-halbe-Million-Kinder-durch-infektiuese-Durchfallerkrankungen> (09.08.2019).

¹⁶⁷ Ghatge, S. (2018): Mission Sauberes Indien, retrieved from <https://www.zeit.de/entdecken/2018-08/indien-toiletten-hygiene-mission-narendra-modi> (03.10.2019).

¹⁶⁸ Unicef (2017): Sanitation, retrieved from https://www.unicef.org/wash/3942_43084.html (27.04.2020).

awareness of toilet usage. “You can build all the toilets you like [...] but unless people come to the conclusion that it is more hygienic to use them than going out in the open space, because unless you have the Swachhta (cleanliness) right, you won’t get the Smart City right.”¹⁶⁹ In his statement he emphasises the lacking awareness about the benefits of sanitation facilities in society, which is fundamental for a clean environment and an integral part of Smart City development.

Water-Food Management

India is one of the world’s largest, poorest, and most rapidly growing countries.¹⁷⁰ The rapid increase in population is particularly noticeable in the food segment. Past cases revealed that food producers face difficulties in meeting alimentary needs at an affordable price and in the right quantity for the growing population.¹⁷¹ In particular, heat and droughts as a result of climate change influence agricultural work and destroy fertile soil for the crops of wheat, rice and other Indian basic staples, leading to higher prices.¹⁷² Alongside the shortage in food supply, general affordability plays a major role. Poor communities, representing a large share of the Indian population, are less likely to access education and consequently face difficulty in the labour market, which among other things results in lower expenditures for food purchases.

“UNICEF”¹⁷³ and “Welthungerhilfe”¹⁷⁴ are two example organisations that support the development of basic knowledge in underserved regions, including the predominantly poor populations. The “Welthungerhilfe” executed a 15-day nutritional camp project in 120 towns within Jharkhan. The target group were mothers with malnourished children in informal areas to improve their understanding of a balanced nutrition and raise awareness about the nutrients in different foods.¹⁷⁵ Next to alimentation skills, mothers learnt how to build and use a “Tippy-Tap”.¹⁷⁶

¹⁶⁹ Dutta, S. (2018): Swachh Bharat Abhiyan Integral For The Success Of Smart Cities Mission, Says Union Minister Hardeep Singh Puri, retrieved from <https://swachhindia.ndtv.com/hardeep-singh-puri-swachh-bharat-abhiyan-smart-cities-21561/> (10.10.2020).

¹⁷⁰ The World Bank (2021): The World Bank in India, retrieved from <https://www.worldbank.org/en/country/india/overview#1> (20.12.2021).

¹⁷¹ Global Finance (2019): The World's Richest and Poorest Countries 2019, retrieved from <https://www.gfmag.com/global-data/economic-data/worlds-richest-and-poorest-countries> (04.08.2019).

¹⁷² Spohr, F. (2016): IT-Metropole Bangalore im Ausnahmezustand, retrieved from <https://www.handelsblatt.com/politik/international/wasserkrieg-in-indien-eine-der-schlimmsten-duerren-der-vergangenen-jahr-zehnte/14541786-2.html> (04.08.2019).

¹⁷³ Unicef (2019): Über uns: Das ist UNICEF, retrieved from <https://www.unicef.de/informieren/ueber-uns> (05.08.2019).

¹⁷⁴ Welthungerhilfe (2019): Informieren, retrieved from <https://www.welthungerhilfe.de/informieren/> (05.08.2019).

¹⁷⁵ Bandsom, K. (2019): Indien, Drei Farben gegen Mangelernährung, retrieved from <https://www.welthungerhilfe.de/informieren/laender/indien/drei-farbiges-essen-gegen-mangelernaehrung/> (08.08.2019).

¹⁷⁶ Tippy Tap (2019): The tippy tap!, retrieved from <http://www.tippytap.org/the-tippy-tap> (08.08.2019).

Tippy Tap Definition: The “Tippy-Tap” is a device that enables a hand free way to wash hands and reduce the transmission of bacteria. Instead of 500ml, which is the amount of water, a cup can hold to wash hands, only 40ml are used

Housing Management

With India's adoption of a mixed economy after independence, urbanization began to ascend.¹⁷⁷ The increase in urban population and the rise in housing demand that followed contributed to a shortage in living space.¹⁷⁸ According to current estimates, more than 20 million Indian homes are still missing, especially in informal areas.¹⁷⁹ The Indian government launched in 2015 the "Pradhan Mantri Awas Yojana (PMAY)" program to address the lack of housing. PMAY's core objective is "to provide central assistance to implementing agencies through States/Union Territories (Uts) for providing houses to all eligible families/beneficiaries by 2022"¹⁵⁶. The PMAY program is split into four verticals: In-Situ Slum Redevelopment, Beneficiary-Led Construction and Enhancement, Affordable Housing in Partnership, Credit-Linked Subsidy Scheme.¹⁷⁷ In total, 63% of projects under PMAY can be assigned to the Beneficiary-Led Construction and Enhancement-Vertical, which exhibits the highest degree of residents integration.^{62, 156} In order to respond to the rising demand in participation, it is intended to increase professional support in informal housing projects. With a rise in professional support, the design of housing, general construction work and the optimal selection of unit locations are aimed to be optimised. A rise in participatory approaches not only encourages unit construction, but also resident's technical competencies.

Education System

More than 400 million children live in India (below age 18), of which 200 million visit school, but only 64 million graduate from school.¹⁸⁰ In total, 336 million children (84%), who either do not enter or finish school stay uneducated and, in most cases, unemployed (ibid.). Also from a global perspective, India is said to have the highest rate of early school leavers and illiterates worldwide.¹⁸¹ In 2009, the Indian constitution established compulsory education for children under the "Right of Children to Free and Compulsory Education Act"¹⁸². The constitutional law states that children from six to fourteen years are subject to compulsory education and able to attend free school classes during this period. Especially children living in urban areas benefit from the rising middle class, higher school budgets and the associated provision of better-equipped schools.

To promote education among children of underprivileged communities, different approaches have been established. The Spark-A-Change (SAC) Foundation offers remedial

¹⁷⁷ Singh, M. A.; Singha, K. (2020): *Understanding Urbanisation in Northeast India: Issues and Challenges*, Routledge, New York, p. 155.

¹⁷⁸ Olanrewaju, A.; Shari, Z.; Gou, Z. (2019): *Greening Affordable Housing: An Interactive Approach*, CRC Press, Taylor & Francis Group, Boca Raton, p. 191.

¹⁷⁹ Maiervidorno (2016): *Erschwinglicher Wohnraum für Indien*, retrieved from <https://www.maiervidorno.de/erschwinglicher-wohnraum-fuer-indien/> (05.08.2019).

¹⁸⁰ Spark a Change Foundation (2019): *Why We Do*, retrieved from <https://www.sparkachangefoundation.org/why-we-do.php> (12.10.2020).

¹⁸¹ Hillger, D. (2019): *Expansion, Qualität, Gerechtigkeit: Herausforderungen des indischen Bildungssystems*, retrieved from <http://www.bpb.de/internationales/asien/indien/44534/indiens-bildungssystem> (06.08.2019).

¹⁸² Cohen, N.; Mönch, A. (2018): *Bildungswesen in Indien*, retrieved from https://www.bildungsserver.de/Bildungswesen-in-Indien-7002_ger.html (06.08.2019).

learning for children living in low-income communities.¹⁸⁰ The company “Vahan” offers free English classes via telephone call.¹⁸³ Lastly, the “Hole-in-the-Wall Education Project”, offers children access to education at computer terminals.¹⁸⁴ Worldwide, the project has already reached more than 300,000 children in informal areas of Asia and Africa.¹⁸⁵

Lessons Learnt

In conclusion, each of the four discussed sector-specific solution strategies exemplify a method on slum upgrading components that can selectively be aligned with location specific social and spatial conditions, which involve residents’ participation. To facilitate the identification of location specific social and spatial conditions numerous authors consider e-participation in slum upgrading as great potential within Smart City concepts allowing the selection of instruments suiting site-specific demands.^{186, 187, 188} Still, there is a lack of leveraging Smart City initiatives and considering data-supported management, monitoring and citizen engagement to facilitate the identification of local demands and streamline countermeasures. An analysis of slum community participation under consideration of digital technology in Indian cities will be discussed in the next section.

2.3 E-Community Participation within Slum Upgrading of Indian Cities

This section evaluates to what extent slum community participation can be digitalised or if it is more beneficial to digitalise other components, next to participation, within slum upgrading. Previous chapters briefly explained several circumstances in which Indian states benefit from digital technology in two distinct contexts: The use of digital technology to develop slum maps (GIS) in the context of slum upgrading and the use of digital technology to facilitate and improve citizen participation (Smart City Mission) in the context of urban development. It is a next step to unite both contexts and pay attention to scenarios where digital tools specifically support citizen engagement in urban slum upgrading. In light of this thesis, the term digital technology represents “[...] electronic tools, systems, devices and resources that generate, store or process data.”¹⁸⁹ To specify the general framework of investigation, only digital components that contribute to Geographic Information Systems, Volunteered Geographic Information, or display communication tools, such as mobile phones, will be considered.

¹⁸³ Vahan (2019): How it works, retrieved from <https://vahan.co/#how-it-works> (06.08.2019).

¹⁸⁴ Hole-in-the-Wall Education Project (2016): Solution: Nothing is more powerful than an idea whose time has come., retrieved from <http://www.hole-in-the-wall.com/Solution.html> (06.08.2019).

¹⁸⁵ Grosse, K. (2019): Lernen in anderen Ländern: Indien – Bildung als Statussymbol, retrieved from <https://magazin.sofatutor.com/lehrer/lernen-in-anderen-laendern-indien-bildung-als-statussymbol/> (06.08.2019).

¹⁸⁶ Yu, J.; Shannonb, H.; Baumannb, A.; Schwartzb, L.; Bhattc, M. (2016): Slum Upgrading Programs and Disaster Resilience: A Case Study of an Indian ‘Smart City’, in: *Procedia Environmental Sciences*, Vol. 36, p. 154-161.

¹⁸⁷ Aichholzer, G.; Rose, G. (2020): Experience with digital tools in different types of e-participation, In: *European E-democracy in practice*, Springer, Cham, p. 93-140.

¹⁸⁸ Del Hoyo, R. P.; Visvizi, A.; Mora, H. (2021): Inclusiveness, safety, resilience, and sustainability in the smart city context, In: *Smart Cities and the UN SDGs*, Elsevier, p. 15-28.

Looking into past approaches, slum upgrading displays one of the main components of future improvement measures to change slum conditions for the better.⁵¹ With upgrading, some of the most extreme regulations of past urban policy and institutional failures are directly addressed, displaying an effective method to support the urban poor in addressing their demands.⁵¹ Most often upgrading starts with the provision of basic services (e.g. electricity, streetlight, sanitation), which are connected to municipal networks and residents themselves cannot install legally. It has been proven that slum upgrading programs involving home improvement loans and technical training mobilize residents to continue with investments in development work after project completion.¹⁸⁹ Paying attention to participatory approaches during upgrading allows residents to be actively involved in and personally contribute to development measures. In recent years, not only participatory approaches within urban upgrading were of relevance for sustainable improvements in slums, but also the lack of high-quality data about slums has received renewed socio-political and academic interest.^{87, 88} Yet, scientific contribution lags behind on how Smart Cities can leverage their technologies to increase location specific relevance and the participatory potential of slums within urban upgrading.

In the past, slums have been mapped using information from physical indicators based on remote sensing data or socio-economic indicators based on census data.¹⁹⁰ Each data source is soon outdated and impedes the analysis of spatial slum trends.⁸⁷ This issue can lead to false forecasts or actions especially in less developed countries where spatial data is scarce. To overcome this issue, one potential data source for making spatial data available are GIS systems.⁸⁷ GIS systems opened new realms of data production in recent years and made it possible to detect and map the presence of slums (ibid.). To initiate slum upgrading successfully and facilitate slum mapping, several Indian states developed interest in drone imageries to establish GIS data, replacing analogue maps with digital and regularly updated ones.

The state Karnataka uses drone imageries to identify slums and update official slum lists. With regularly updated information the government is aware of geographical changes and can implement preventative measures, such as the early establishment of water taps or other basic facilities. But drone imageries do not only support the identification of slums. Imageries are also used to identify suitable locations for slums to be relocated. Locations are suitable when they are attractive to live in, which is dependent on the centrality of the new locations and general connectivity. The centrality of locations is important for a variety of reasons, such as accessing job opportunities or education facilities. General connectivity contributes to the centrality and includes nearby public transit stations, walkable

¹⁸⁹ Cities Alliance (2019): Empowering the Urban Poor to Improve Their Communities, retrieved from <https://www.citiesalliance.org/newsroom/news/spotlight/empowering-urban-poor-improve-their-communities> (28.09.2020).

¹⁹⁰ Mahabir, R.; Agouris, P.; Stefanidis, A.; Croitoru, A.; Crooks, A. T. (2020): Detecting and mapping slums using open data: a case study in Kenya, in: International Journal of Digital Earth, Vol. 13, No. 6, p. 683-707.

connections to public transport, safe access through street design interventions and connected bus routes with destinations to zones of economic activity.⁶²

The Indian state of Odisha has benefited for several years from digital tools for strategic spatial decisions made at authority level within slum upgrading approaches. Odisha has 114 cities and towns, in which 2919 slums are located.⁹⁷ A new GIS database of 2000 slums helped to combine hi-technology interventions, such as mapping of slums using high-resolution UAV imagery alongside field-based community methods. For the preparation of a broad slum landscape overview, Odisha received the “Geospatial Excellence Award” and the “World Habitat Award”.¹⁹¹ The database is particularly important for Odisha’s local programs. With their extensive database of slum neighbourhoods, Odisha is considered among the emerging economies in India to “be the only region [which has] a complete spatial database of each and every slum in each and every city and town”⁹⁷. Under the state specific land titling program “Land Rights to Slum Dwellers Act” and the complementary upgrading mission “Jaga”, 1.8 million slum residents are planned to be addressed and benefit from associated upgrading schemes.⁹⁷ The act was described “as the world’s largest slum land titling and upgrading project, when it was launched in May 2018” (ibid.). Already at the end of 2019 more than 60,000 land titles were provided to residents in record time under the local act. The fast pace of titling procedures is due to the intensive use of drones and GIS systems to digitally collect and interpret geographically referenced data. With the Covid-19 pandemic and the need to take advanced slum upgrading methods, other Indian states were inspired, requesting Odisha’s guidance to implement similar state specific land titling programs and map the presence of slums digitally (ibid.). For a detailed overview of the act’s components, partners, and phases, please see Chapter 3.

Citizen Engagement via App

Having discussed the use of digital tools to support strategic spatial decisions at authority level, this section focuses on the use of digital tools to support citizen engagement. As part of the digital India initiative, the union government has introduced several mobile apps to offer faster and less bureaucratic services to citizens (e-participation). MyGov¹⁴⁴ and Umang¹⁹² are the two most known of several apps, which provide governmental services on the smartphone with a focus on general citizen demands. Yet those two applications are not directed explicitly at the urban poor and slum upgrading schemes, they offer a solid reference point for extension measures in an informal settlement context.

The application MyGov is an e-government application for Indian citizens, which offers a single platform to improve existing services under India’s Smart City Mission. Citizens can

¹⁹¹ Business Standard (2019): Odisha awarded 'World Habitat Award' for Jaga Mission, retrieved from https://www.business-standard.com/article/news-ani/odisha-awarded-world-habitat-award-for-jaga-mission-119121000128_1.html (10.11.2020).

¹⁹² Umang (2020): About Umang, retrieved from <https://web.umang.gov.in/web/#> (08.05.2020).

make suggestions to central ministries and associated organisations and can actively participate in new policy formulations and program implementations.^{144, 145}

Research verified that in practice the MyGov platform, which aims for increased citizen participation, mainly reaches information and consultation levels, rather than a citizen engagement level.⁷² A study conducted in 2019 emphasised that “[w]ith the advent of the Smart Cities Mission, interest in citizens’ engagement has increased, since this was a criterion for selection. However, Smart Cities’ public engagement has mostly involved surveys and consultations, rather than inclusive, empowered, public deliberation”¹⁹³. An exceptional case is displayed by the City of Pune. Pune has already been engaged in various citizen participation measures prior to the Smart City Mission (SCM).⁷⁴ The local government introduced an open data policy highlighting transparent actions; established a website where citizens can access everything needed related to governmental services; implemented a participatory budgeting program in 2007 and continuously invests into a strong technological base to empower citizens, such as the Pune Care App. Regarding the SCM, the focus within Pune was from the beginning on the decentralisation of efforts to the ground level and within a phase ‘0’ the SCM was planned and organized from start to finish based on active citizen involvement. The SCM and Pune as a case illustrate that anticipating participation and realizing it, requires mutual and sustained efforts among different elements within urban systems.

The application Umang (Unified Mobile Application for New-age Governance), is an e-government application for Indian citizens, which offers access to all government departments and services via mobile application.¹⁹² The application has no specific relation to the Smart City Mission and serves rather general citizen requests. It can be accessed in 13 regional dialects and provides access to more than 490 services across 21 states, such as supporting students to view CBSE and ICSE results, helping to place passport queries, viewing weather forecasts, calculating crop insurance premiums, and making appointments at government hospitals or fund queries (ibid.).

In summary, this chapter verified the rising demand for digital technologies to facilitate urban planning and citizen engagement in decision making processes. The states Karnataka, Odisha and Pune proved the beneficial effects from using digital tools in slum upgrading. The apps MyGov and Umang proved the beneficial effects from e-participation in citizen engagement. Still, digital technologies are mainly used at authority and formal citizen level, but not as a participatory means to stimulate community engagement in urban slum upgrading projects. Reasons are unclear, but it can be assumed that a concept is missing which leverages the digital potential of Smart Cities in slums. Opportunities for more effective e-participation are discussed in Chapter 5.3.

¹⁹³ Menon, S.; Hartz-Karp, J. (2019): Linking Traditional ‘Organic’ and ‘Induced’ Public Participation with Deliberative Democracy: Experiments in Pune, India, in: *Journal of Education for Sustainable Development*, Vol. 13, No. 2, p. 193-214.

2.4 Summary of the Literature Review

Moving from slum eradication to slum improvement, and now to engagements at community level, policy initiatives to improve slum conditions have faced a variety of changes. With the chapters filter structure, it was possible to evaluate different dimensions of upgrading measures, ranging from general to participative, and to both participative and digital ones. It has been identified that India raised attention on approaches towards poor structural transformations within upgrading strategies. Among the types of approaches discussed, active resident participation is one of the most effective methods contributing to slum upgrading and advancing existing social structures without disrupting them.⁶²

Slum community participation under consideration of digital technology in a Smart City context could not be identified. There exists a lack of leveraging Smart City initiatives to increase participation, actively integrate slum residents and derive location-specific upgrading measures. Yet, India experienced significant progress in combining digital technologies with slum mapping and formal citizen engagement. So far, Smart Cities in India do not lack digital solutions, but they lack advanced methods on how to develop digital solutions for the enhancement of liveable areas that include informal neighbourhoods. The role and importance of digital tools in participation are clear. As MyGov and Umang show, digital networks have the chance to facilitate communication, create the basis for mutual decision making and provide a broader variety of options to improve existing services. E-participation is very effective in general urban management, it stands to reason that it provides a viable solution to enhance slum resident engagement in development programs. Chapter 5.3 extends the analysis on digital potential within slums based on primary and secondary research. It is a matter of defining the most valuable solution from the integration of both dimensions within slum upgrading – participation & digital technology – ensuring slum residents integration and the development of sustainable solutions for urban informal neighbourhoods.

The subsequent section will introduce the Research Area “Bhubaneswar” which is the main Case Study of this thesis. Main topics to be covered involve local upgrading under consideration of participatory approaches and the use of digital technology.

3 The Research Area – Bhubaneswar

The third section introduces the research area Bhubaneswar (capital of Odisha state) and examines the reasons for choosing Bhubaneswar (Figure 4)¹⁹⁴ as the central case study within this thesis. Bhubaneswar belongs to one of India's leading Smart Cities and has experienced the greatest progress in reducing poverty and improving living conditions of slum residents in India. With "The Odisha Land Rights to Slum Dwellers Act, 2017", Odisha introduced a pioneer state-wide policy, sensitive to the needs of those residing in slums. To support residents with granted land rights, the state focuses on a comprehensive in-situ slum upgrading process, called "Jaga Mission". Next to Odisha's pro-poor framework within the act, this section will also analyse the contribution of one of the programs' execution organisations "Tata Trusts" and its current practices, focus areas, pilot projects and lessons learnt. Tata Trusts' local experiences aid in outlining and analysing the focus areas that have been identified in promoting slum upgrading and display key elements under the act. Tata trusts' focus areas will be at a later stage compared with the research results, which are based on focus group discussions conducted within slums located in Bhubaneswar. After the conduction of focus group discussions, the thematic fields are compared with locally identified liveable life indicators to examine the efficiency and effectiveness of the local upgrading scheme, as well as contributing to the general framework of the LLI.



Figure 4: Odisha India Map (Source, Das et. Huke (2021)).

¹⁹⁴ Das, M. N.; Huke, R. E. (2021): Odisha State, India, Encyclopædia Britannica, retrieved from <https://www.britannica.com/place/Odisha> (14.05.2022).

3.1 Description of the Research Area

As per the 2011 census, 1,560,000 people (800,000 males & 760,000 females) live in 350,000 households located in a slum area within Odisha. Overall, 3.72% of Odisha's total population and 22.0% of Odisha's urban population lives in slums.¹⁹⁵ Bhubaneswar is the capital of the state Odisha, India, with a population of 1,163,000 in 2020 and a growth rate of 2.83%.¹⁵⁹ Also known as Temple City, it is the centre of financial and religious significance in Eastern India. The city's religious significance and close location to the coast reveals social, economic, and spatial polarization in the urban landscape. Latest counts in 2019 reveal that Bhubaneswar has the highest slum population in Odisha, with 164,000 slum residents (ibid.) living in 436 slums¹⁹⁶. To address the growing number of urban poor, Odisha is actively working on state-wide development conditions by having the second highest allocation of aggregate disbursement towards development purposes compared to other Indian states.¹⁹⁵

In search of a suitable research location for the thesis specific topic, Odisha's capital Bhubaneswar was selected for three reasons which will be explained in the following.

Reason 1: Bhubaneswar, the capital of Odisha is among the first 20 Indian cities of 100, to be developed under Prime Minister Narendra Modi's flagship Smart Cities Mission. This background is important, as it enhances the probability that the city deals with the latest technologies and shows interest in sustainable strategies at social and environmental level, especially in an informal settlement context.

Reason 2: Odisha belongs to the only Indian state that formulated a landmark legislation in which land rights are handed out to slum residents, supporting the transformation of slums into liveable habitats.¹⁶¹ For the provision of technical and handholding support of putting the act into place, the Housing and Urban Development Department of the Government in Odisha partnered with Tata Trusts, local non-governmental organisations, community based organisations and Slum Dweller's Associations of the respective slums. "Tata Trusts" is among India's oldest, non-sectarian philanthropic organisation that engages with individuals, such as government bodies, international agencies, and like-minded private sector organisations to nurture a self-sustaining ecosystem in India (ibid.). The Tata Group assets fund Tata Trusts, which is a global enterprise and one of the largest Indian conglomerates.¹⁹⁷

To follow up with comprehensive slum upgrading processes after the granting of land titles, the Housing & Urban Development Department of Odisha's government launched

¹⁹⁵ Planning and Convergence Department Government of Odisha (2020): Odisha Economic Survey 2019-20, Odisha Government Press, Madhupatna, Cuttack, p. 115.

¹⁹⁶ Ettling, S.; Integrated Expert for Environmental Education and International Relations (06.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

¹⁹⁷ Tata Group (2020): We are the Tata group, retrieved from <https://www.tata.com/about-us> (27.03.2020).

“Jaga Mission”. The Land Rights to Slum Dwellers Act and Jaga Mission together form Odisha’s Liveable Habitat Mission (OLHM), which was constitutionalised in May 2018. Jaga Mission focuses on the provision of basic services, support for housing and improvement of other facilities to slum residents. Tata Trusts displays the central executive body of the mission and aims to cover 2,919 slums in all 114 cities and towns in Odisha.⁹⁷

Reason 3: The last argument in favour of choosing Bhubaneswar as a site for investigation concerns the fact that Bhubaneswar not only has one of the largest shares of slums (436) compared to other cities in Odisha, but is also the centre for pilot projects associated with the development of slums under Odisha’s Liveable Habitat Mission (OLHM).¹⁹⁸ This background is important, as it ensures that investigations can be implemented at various slum locations, providing a space to conduct thesis relevant research and review scientific findings with local governments and supporting institutions.

The Tata Trusts Team located in Bhubaneswar, which operates under Jaga Mission, as well as the “GIZ” and the non-governmental organisation “Ekta Consultancy” are the three collaboration partners that conduct thesis specific research in Bhubaneswar (November 2019). The research involved slum visits in the form of focus group discussions in selected slums, as well as associated research activities, such as the analyses on upgrading optimisation or discussions on improving internal process quality. The individual components of OLHM are discussed in the next section, contributing to a greater knowledge of the mission and its societal impacts linked to the implementation.

3.2 Odisha’s Liveable Habitat Mission

Odisha’s Liveable Habitat Mission can be split into two components, “The Odisha Land Rights to Slum Dwellers Act” and “Jaga Mission”.

Land Rights to Slum Dwellers Act

In 2017, the government of Odisha enacted the landmark legislation “the Odisha Land Rights to Slum Dwellers Act, 2017”.¹⁶¹ The “act [provides the assignments] of land rights to identified slum residents, for redevelopment, rehabilitation and upgradation of slums and for matters connected therewith or incidental thereto”¹⁹⁹ in 114 Notified Area Councils and Municipalities. Overall, the legislation aims to impact 200,000 households residing in 2919 slums across Odisha.^{97, 200} The majority of slum residents live illegally on government

¹⁹⁸ Indian Institute of Human Settlements (2017): Planning, 'Violations', and Urban Inclusion: A Study of Bhubaneswar, retrieved from <http://iihs.co.in/knowledge-gateway/wp-content/uploads/2017/11/Bhubaneswar-Final.pdf> (10.02.2020).

¹⁹⁹ The Odisha Gazette (2017): The Odisha Rights to Slum Dwellers Act, 2017, Cuttack, p. 3, retrieved from <http://govtpress.odisha.gov.in/pdf/2017/1652.pdf> (10.09.2019).

²⁰⁰ Dash, S.; Urban Habitat Lead at Tata Trusts (21.09.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.

or private owned land. Legalising land rights takes away fear of eviction and encourages in-situ slum development, promoting the creation of liveable habitats in titled slums.¹² It has been verified that land rights “[...] motivate dwellers to invest two to four times the amount of funds that the government invests in infrastructure improvements in a slum area” (ibid.). Thus, land rights create a stimulus to broaden future opportunities and enable residents to develop assigned land based on personal preferences.⁹¹

Split into two phases, the pilot and the full-scale implementation, local research revealed that the organisation Tata Trusts has the greatest stake when it comes to granting land titles and supporting the pilot implementation of “Jaga Mission” in 54 slums spread across two districts.⁹⁶ With the learnings from pilot project implementation, the program is in the process of an effective full-scale implementation across the entire state of Odisha. Tata Trusts collaborates with technical agencies and other partners of the program, to develop a standard for “operating procedures, defining the scope of the work for different stakeholders and benchmarking the cost involved in executing different components (e.g. co-ordination with authorities, connecting with mapping and surveying agencies, project management of NGOs, etc.)” (ibid.). Thereby, the most out of received land rights can be achieved and residents be provided with a favourable starting position into a more prosperous future. With reference to land being allotted per family, the maximum land to be settled within in-situ frameworks is 45sqm in Municipalities and 60sqm in Notified Area Councils. Within ex-situ frameworks the maximum land to be settled is 30 sqm for both Municipalities and Notified Area Councils.²⁰¹ In the course of the act, the use of high-resolution drone imagery enabled Odisha to map slums and become India’s only state with a spatial database of every slum in every city and town.⁹⁶ The database facilitated the identification of residents eligible for the Land Rights Act and by the end of 2019, 60,000 slum residents in Odisha had already received land titles.⁹⁷

Jaga Mission

Envisaged as a complement to the Land Rights Act and to further stimulate upgrading within legalised slum neighbourhoods, Odisha’s government launched “Jaga Mission”. With a reach of over one million beneficiaries “Jaga Mission [...] is one of the largest slum titling projects undertaken by a regional government anywhere in the world”.¹⁰⁹ Jaga means “place” in the Odia language. The mission aims at transforming informal settlements into liveable places by improving the standard of infrastructure and access to livelihood opportunity services on par with better off areas within the same urban local body.²⁰² Jaga Mission is targeted to cover all slum households under the land rights program and is unique in its approach by focusing also on small and medium-sized towns, rather than only considering Odisha’s large cities.⁸⁶ As the mission involves the holistic

²⁰¹ Mohanty, M. (2018): Odisha government rolls out "world's largest" slum land rights project, retrieved from <https://economictimes.indiatimes.com/news/politics-and-nation/odisha-government-roll-out-worlds-largest-slum-land-rights-project/articleshow/64068035.cms?from=mdr> (16.10.2020).

²⁰² Paty, S.; Tata Trusts Consultant (19.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

development of infrastructures and provision of services, central, state and other development schemes converge to leverage funds from various sources. Still, the local government covers the greatest share of expenses.

Each slum upgrading approach under Jaga Mission is split into three components, targeted consecutively. In a first step, six general habitat services (road, drain, individual household latrine (IHHL), piped water supply, in-house electricity and streetlight) are established in slums, which focus on basic infrastructure, verified to be essential in any living space.²⁰³ In a second step, apart from the six general habitat services, location dependent social infrastructure is established and skill development takes place. The government is currently considering only the six previously mentioned parameters for upgradation and de-notification/delisting. A slum de-notification/delisting implies that a slum is no longer considered a slum within official slum lists at governmental level, displaying an official neighbourhood of the city. Associated therewith goes a slum rename. However, in some cases a third step is included, which deals with the granting of land rights and housing. Regarding housing, beneficiaries which have their own land or have received land rights are linked with the housing scheme “PMAY” as per its eligibility criteria. Land right certificates are only given in Municipalities and Notified Area Councils, they are not given in Municipal Corporations as per government directive for now. Hence, housing cannot be ensured unless the land ownership is confirmed. Figure 5 explains each step, in detail.

To articulate residents needs and promote the implementation of the six general habitat services, a Slum Dweller Association (SDA) in each slum is created. Slum Dweller Association (SDA): A SDA is formed in each slum to articulate the needs of the community. The SDA tends to be composed of a slum lead and selected individuals or a group of very well-connected members of the community, which take over the voice at slum level during the upgrade. During upgrading, it is important to mention that supportive institutions anticipate high degrees of resident participation.⁸⁶ With the finalization of the six general habitat services, the SDA and any institution involved within upgrading can apply for land rights and transmit a proposal for de-notification to the Urban Area Slum Redevelopment and Rehabilitation Committee (UASRRC) of the respective Urban Local Body. The UASRRC formulates the Scrutiny Sub-Committee (SSC), prepares and publishes lists of eligible households, inviting objections, settling disputes and declares the final approval for eligible households. The UASRRC then passes the land rights application to the SSC. The SSC is responsible for validating the applicant’s household details and supporting documents to determine eligibility for issuance of land rights, standards for slum de-notification and settlement details, such as layout, area, etc.⁹⁶ Subsequently to the SSCs verification, the UASRRC head approves or rejects the application. Approved applications result in a slum de-notification and the granting of land rights. Slum de-notifications imply

²⁰³ Housing and Urban Development Department Odisha (2018): Participatory Slum Upgrading and Delisting Standard Operating Procedure, retrieved from <http://www.urbanodisha.gov.in/pdf/SOP-Slum-Upgradation.pdf> (10.07.2021).

the transformation of a slum to an official neighbourhood of the city. Associated therewith comes the renaming of the slum. As most slums are named after lower castes, renaming slums reduces the tendency to later associate neighbourhoods with a slum and contributes towards easier acceptance within an already established formal society.²⁰⁴ Likewise, after a de-notification, the SDA changes to a RWA (Resident Welfare Association), as slum residents as such no longer exist. In Odisha it is planned to de-notify 1000 slums per year. The first de-notification session started in November 2020.²⁰⁰

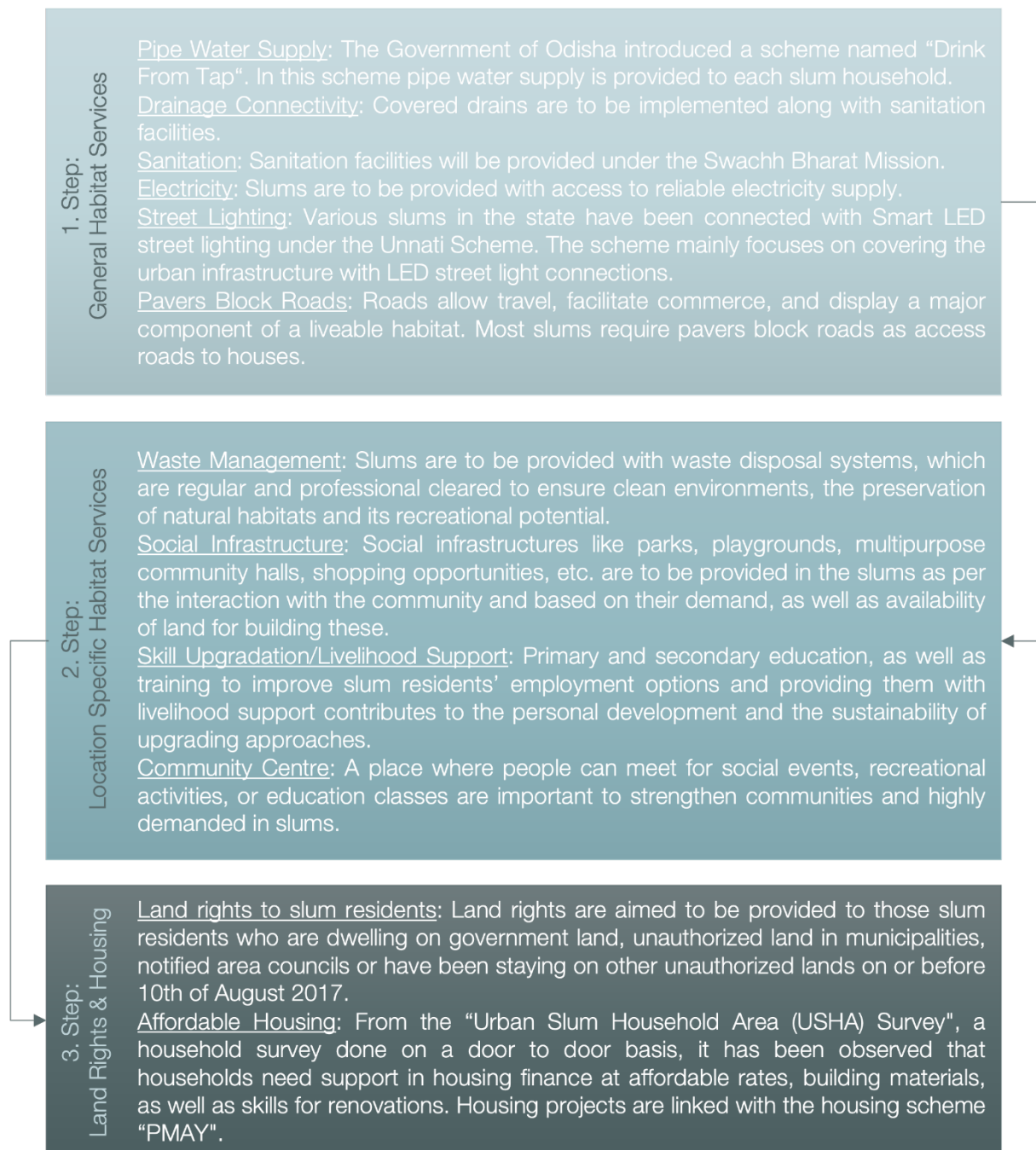


Figure 5: Jaga Mission Approach (own representation).

²⁰⁴ Debnath, R., Bardhan, R., & Sunikka-Blank, M. (2019): Discomfort and distress in slum rehabilitation: Investigating a rebound phenomenon using a backcasting approach, in: Habitat International, Vol. 87, p. 75–90.

3.3 Tata Trusts

The Tata Trusts organisation forms the project management body of the Land Titling Act and Jaga Mission (Odisha's Liveable Habitat Mission), along with the Housing and Urban Development Department (Government of Odisha). Tata Trusts expertise coupled with its active participation in local upgrading makes the organisation an ideal project partner for the thesis's local research. The four characteristics that Tata Trusts contributes to the implementation of Odisha's slum upgrading strategy and its importance as a project partner for the thesis, are as follows:⁸⁶

1. Specialist in Odisha's slums: The organisation possesses expert knowledge about Odisha's slums, by being actively involved in the digitalisation of slum related data, the granting of land titles and general slum upgrading activities.
2. Technical support: The organisation commands technical support for drone surveys, develops slum maps and supports in housing designs to create liveable habitats.
3. Capacity building: The organisation contributes to the capacity building of urban local bodies, non-governmental organisations, and Slum Dweller Associations. Capacity building implies targeted training measures of key stakeholders in the granting of land titles and general slum upgrading support.
4. Slum community mobilisation: The organisation collaborates closely with slum residents at district-level to develop personal relationships with communities, create awareness among residents about planned approaches and ensure participation.

Tata Trusts' contribution towards slum upgrading has so far reached the highest improvement levels within slum upgrading in the history of Odisha (ibid.). In order to ensure continuous optimisation in local practices, Tata Trusts aims to advance Odisha's Liveable Habitat Mission. With Tata Trusts as a project partner, lessons learnt with a major focus on participative strategies and development components in slum upgrading contribute to the general LLI framework. It is aimed to work towards an approach that is based on gained experiences to combine the most valuable upgrading strategies and conclude a holistic upgrading framework for the general slum landscape. In the following section, Tata Trusts' planned approaches to optimise local practices are discussed.

3.4 Odisha's Liveable Habitat Mission Future Prospects

In Odisha 1,560,000 people live in 2919 slums, with 200,000 households allocated to 114 Urban Local Bodies in the state.^{97, 195} As has been mentioned, at the end of 2019 more than 60,000 slum residents had been provided with land rights certificates in the state Odisha. Hence, a basis has been created for first upgrading measures.²⁰³ In total, 1,500,000 people are still without land titles or associated upgrading measures. The government of Odisha aims to pursue the state-wide and interdisciplinary Liveable Habitat

Mission in the upcoming years. Tata Trusts will be an integral part of the mission, granting land rights and contributing to liveable habitats in slums throughout Odisha.²⁰⁵

Tata Trusts' recent focus was mainly based on in-situ development. In a further step towards an optimized development structure, attention will be raised on the resettlement of residents to new sites (ex-situ). Ex-situ development is only pursued when slums are located on unsafe, health threatening or private environments, under the premise of residents' consent. To identify dwelling locations for ex-situ development, according to Tata Trusts, the following steps illustrate the selection process for a new dwelling site:

1. Identification of Land (IL)
2. Layout Mapping (LM)
3. Plan of Habitation (PH)
4. Community Consent (CC)

For optimal ex-situ development practices, government owned but untenanted land needs to be identified (IL) to ensure the granting of land rights and conduct layout mapping (LM). Once new land is identified, a plan of habitation is created (PH), which ensures a variety of parameters considered as necessary for higher qualitative living standards. These include basic infrastructure, housing according to family size and transfers to zones of economic activity for direct access to job opportunities. The plan of habitation is used to achieve community consent (CC) and assist in the voluntary resettlement of residents to new areas.

Regarding the challenges faced within general slum upgrading, expert interviews with Tata Trusts' personnel revealed missing capacity building of supporting stakeholders, which impacts the smooth execution of OLHM. Supporting stakeholders in this context, display stakeholders external to slum neighbourhoods, such as aid agencies, private organizations, NGOs, labour unions, as well as health-, housing- and environmental-groups. In selected cases only, professional assistance can be expected from Urban Local Bodies, civil society organisations or funding agencies with a development focus on OLHM.⁸⁶ The lack of local capacity building causes supporting stakeholders to develop plans for upgrading procedures in slums without considering the specifications within OLHM or having agreed upon procedures with the community, impeding upgrading sustainability. OLHM anticipates the six general habitat services and that slum residents play an integral part within planning. Given the current situation, in practice top-down approaches dominate over specified and participative strategies. Records verified that a variety of development attempts failed simply because solutions had been established benevolently, but without any preparatory research and thereby missed meeting the needs of local communities.²⁰⁰ The lead of Tata Trusts in Odisha stresses that "upgrading

²⁰⁵ Paty, S.; Tata Trusts Consultant (21.09.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.

procedures need to be adapted to local needs and display a compass for dwellers on how to ensure the sustainability of upgraded components” (ibid.).

To illustrate unsustainable upgrading conducted under OLHM, the following two examples of failed upgrading are presented:

1. Housing units were built which neglected suitable ventilation. There was too much ventilation, which impaired sewing works and general food preparation over open fire, therefore citizens returned to their old units.
2. Fishermen were equipped with new fisher boats out of plastic. As the fisherman did not possess the skills nor the equipment to repair leakages of plastic fisher boats, they returned to their old fisher boats out of wood.

Tata Trusts’ key focus within Odisha is based on the realisation of the state-wide and interdisciplinary program of Odisha’s Liveable Habitat Mission addressing 1,560,000 citizens residing in slums. In the future it is planned to raise attention on “ex-situ development” practices for citizens living in insecure areas and to optimise participative strategies. Since 3.8% of the slum population has been provided with land rights within one year, in purely mathematical terms every slum resident could be provided with land rights in Odisha in the next 26 years, by 2049. Since slum residents will grow and new slums will arise in this time, overall time needed will increase. To contribute to the long-term objective of sustainable slum upgrading, it would be a next step within OLHM to expand the framework in view of advanced realisation measures that are based on digital tools for the purpose of wider reach, facilitating participation and ensuring better coordination.

The next chapter will focus on the local research conducted within Bhubaneswar to analyse the status quo and the potential of digital tools within slum upgrading that pays attention to slum residents and their facilitated inclusion.

4 Primary Research

The fourth chapter analyses the empirical research results obtained during expert interviews and focus group discussions (FGDs) within a fieldwork investigation format conducted in 2019 and expert interviews conducted in 2021 in an online interview format. Both investigations pertain to the Indian urban slum landscape with a focus on Bhubaneswar (Odisha). The switch from local to online expert interviews is due to the Covid-19 travel ban and associated health security measures. FGDs were not conducted in the second research phase, as the focus of attention was only on undeveloped slums. In the second research phase, the local upgrading mission had already significantly advanced. Upgrading was performed under the locally established scheme “Odisha’s Liveable Habitat Mission”. Focusing only on undeveloped slums ensures a comprehensive understanding of basic needs that have the potential to form liveable life indicators. It is anticipated that with an increase in upgrading, basic needs become a matter of course and are not worth mentioning for residents. With the thesis’s aim to develop an approach 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 expert interviews and FGDs are further investigated to link with findings of expert interviews in the second research phase.

Expert interviews in the first research phase were conducted to reveal insights about the history of slum development, identify actual measures and the status quo in slums, analyse the perception of a liveable life from a personal (expert) and resident perspective, as well as identifying key stakeholders within slum upgrading. Focus group discussions were conducted to analyse the status quo, local problem areas and conventional countermeasures to problem areas in slums, as well as to identify indicators that contribute to a liveable life. As highlighted, key findings of the first research phase are further investigated in the second research phase. These key findings support a pre-definition of a liveable life within slums located in Bhubaneswar, a pre-selection of stakeholders to be considered in upgrading and a pre-specification for participative upgrading approaches. In the second research phase all three themes are further expanded for a detailed description of a liveable life and the corresponding Liveable Life Index to guide sustainable slum upgrading (Chapter 5); and practical recommendations for the realisation of a LLI under consideration of digital tools (Chapter 5.3).

4.1 First Research Phase

The first research phase starts with a general description of the data collection and evaluation method and ends with insights gained based on expert interviews and focus group discussions. The attendance and participation at the “Plan OK Please”⁶⁷ symposium in

Bhubaneswar enabled personal contacts to Indian slum experts and local slum visits. Accordingly, topic related literature outcomes were able to be verified on a local scale and expanded by new insights based on primary research in the form of expert interviews (EIs) and focus group discussions (FGDs). Experts (n=8) were selected from different areas in India and professional backgrounds to draw a comprehensive picture on India's slum evolution, local upgrading practices and the comprehension of a liveable life in slum residents living environment. FGDs (n=6) were only conducted in Bhubaneswar, centralising the research to a defined geographic area for the purpose of better comparability.

Preface of the First Research Phase in India

This section briefly describes the initiation of local research and organisations involved. A GIZ invitation to participate as a guest speaker at the “Plan OK Please” symposium, initiated research in Bhubaneswar. International and local experts, such as urban planners, government members, infrastructure experts, etc., were invited.⁶⁷ In a two-day symposium the State Government of Odisha and GIZ exchanged experiences in evaluating and creating development outcomes and deepening technical understanding in urban development ecosystems to manage increased urbanisation and the formation of slums.⁶⁷ It is argued that political perspectives help to manage development interventions within economic processes – if and how this is the case in other nations was likewise discussed. Important was the identification and understanding of relationships among individuals of different social backgrounds and how these relationships shape development practices and legislation. The structure of the symposium was divided into speeches and group workshops. All participants attended speeches. Group workshop attendance was based on personal preferences, such as the workshops' theme or a personal contribution. During the symposium a local network of slum upgrading experts was established with whom interviews were carried out and the local social network expanded.

Upon the two-day “Plan OK Please” symposium in Bhubaneswar, the researcher participated in a GIZ workshop in Delhi. The workshop strengthened the understanding of diverse GIZ projects among GIZ team members and supported general team coordination. Alongside the participation in workshop modules, an expert interview with a professor from the “Indian Institute of Technology Roorkee”²⁰⁶ was conducted.

Subsequent to the workshop in Delhi, general GIZ meetings in Chennai were scheduled. The meetings focus was based on the identification of variances in slum upgrading approaches among different Indian states to analyse best practices for region-specific frameworks. Most GIZ team members originated from different Indian states. This allowed for the discussion of slum upgrading strategies and governmental engagement at various state levels. For example, the state Odisha focuses on in-situ development, whereas the

²⁰⁶ Indian Institute of Technology Roorkee (2019): About the Institute, retrieved from <https://iitr.ac.in/Institute/About%20the%20Institute/index.html> (11.12.2019).

state Tamil Nadu concentrates on ex-situ development by moving slum residents to areas endowed with basic services and housing. In addition to GIZ meetings, an expert interview with the senior planner at “Tamil Nadu Slum Clearance Board”²⁰⁷ was conducted.

Following research conducted in Chennai the first research phase continued at the place of initial departure, Bhubaneswar. In Bhubaneswar focus group discussions were conducted and general slum visits took place. Two different organisations supported FGDs and general slum visits: “Tata Trusts”¹⁹⁷ and “Ekta Consultancy”¹⁰⁷. Depending on the organisation’s availability, either Tata Trusts or Ekta Consultancy supported date-specific research in terms of slum site selection and translations during FGDs. The outcomes of expert interviews and focus group discussions will be discussed in the following chapters. Appendix D offers a detailed overview of travel destinations, meetings, and the conduction of fieldwork in India.

4.1.1 Expert Interviews – First Research Phase

As previously mentioned, the thesis refers to two forms of data collection processes (expert interviews and focus group discussions) for which semi-structured questionnaire guidelines were developed (Appendix C). Both data collection processes adopt qualitative research methods to explore and expand on subjective experiences and key actions in the context of slum neighbourhoods. For the evaluation of expert interviews and focus group discussions the method of a qualitative content analysis according to Mayring was used.¹¹¹ It is a common tool in empirical social research, which considers a systematic and rule-based approach to process research material and ensures a high level of transparency in the research process (ibid.). Within the method fixed communications are evaluated (e.g. texts, transcripts, pictures), using a set of categories to be systematic, regular, theoretical and measure itself against quality criteria, as well as to draw conclusions that answer the research questions and verify hypotheses.

The subsequent section will introduce the findings of expert interviews with slum upgrading specialists. In total eight expert interviews were conducted, of which each took place in Bhubaneswar, Delhi, or Chennai. Expert interviews aimed to reveal insights about the history of slum development, identify actual measures and the status quo in slums, analyse the perception of a liveable life from a personal (expert) and resident perspective, as well as identifying key stakeholders within slum upgrading.

Based on the structure of the questionnaire, five thematic fields have been scrutinised under which each a selection of questions was asked. The thematic fields are as follows: Informal Settlement Evolution and Government Actions, Actual & Future Management of

²⁰⁷ Tamil Nadu Slum Clearance Board (2019): About us, retrieved from <http://www.tnscb.org/about-us/> (11.12.2019).

Slums, The Liveable Life – Experts Self-Interpretation and Interpretation for Slum Residents, Status Quo in Slums – Expert Perspective and Stakeholder Identification – Expert Perspective.

1. Informal Settlement Evolution and Government Actions

The category “Informal Settlement Evolution and Government Actions” focuses on the expert’s knowledge about the formation of slums and corresponding countermeasures to improve slum locations since India’s independence in 1947. The experts are asked within a set of questions to replicate their personal experiences made and lessons learnt regarding the previously mentioned two topics.

Based on the interviewee’s answers, experiences have been made with the evolution of informal areas in several Indian cities from 1947-2020 and especially the rejection of informal areas in political agendas after India’s independence in 1947.²⁰⁸ From 1947-1960 the government viewed informal areas as nationwide problem and it was the goal to clear them (ibid.). From 1960 onwards rehabilitation methods became a state subject and evolved over time. It was recognised that the level of poverty and the rising number of slums do not improve independently. First projects provided basic infrastructure in selected areas. In 1970, the government expanded upgrading components and residents received legal rights for the first-time. This approach followed the granting of tenure security and enabled citizens to mortgage property and avail bank loans. At that time, most of the land was government owned, but more and more private investors intervened and bought land, increasing privatised estates in urban areas. In 1990, nation-wide upgrading schemes were established, such as to provide free housing for development purposes and the support of international aid agencies in slum upgrading increased.

Beginning mid 1990’s and continuing to the current date, slum upgrading has become a policy initiative which continues to develop. Information exchange, practical co-operation, national experiences, and lessons learnt from slum development contribute to the continuous improvement in schemes. Yet, several interviewees referred to the dominance of inconsiderate measures local governments currently take. Often prestige, savings and intentions of ad-hoc changes prevail over sustainable long-term solutions. Interviewees highlighted the beneficial effects of slum upgrading that considers local planning, residents spending power, active participation, and waste system management.²⁰⁴ During the interviews, the most repeated statements had a financial background: “India does not have a finance problem, it has a planning and implementation problem”²⁰⁹ and “financial affordability is not the main constraint, but institutional capacity and political will are”²¹⁰. Interviewees justified their statements with false promises governments tend to make, their claimed actions based on unrealistic goals and corrupt motives. On the one hand it

²⁰⁸ Ghorpade, K. R.; Urbanist & Researcher (05.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

²⁰⁹ Jayakar, D.; GIZ Architect (11.11.2019): Personal Communication, Expert Interview, Chennai.

²¹⁰ Chahatray, M.; Tata Trusts Consultant (16.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

was stated that governmental authorities try to increase adherents to their political party. On the other hand, unfulfilled policy goals contribute to a lack of confidence. This vicious cycle continues with new political parties entering and old ones leaving the system. Especially bribery actions, “make the rich, richer and the poor, poorer”²⁰⁸. Claims were also made that only a few governmental institutions consider a strong focus on real necessities to improve the quality of life in slums within their policies.

Accentuating human rights among poor communities, the interviewees stressed that incorporating residents into development actions displayed so far one of the most important aspects governments ignore within their schemes. Instead of identifying citizens needs and focusing on methods of public utility, initiated upgrading schemes are based on top-down approaches. In practice, top-down guided upgrading outcomes overlook realistic necessities and as a result tend to be irrelevant for residents and disregard sustainability aspects.

The Researchers Local Experiences

In connection with the topic of informal settlement evolution and government actions in a general citizen context, short anecdotes are recounted. These anecdotes do not serve to generalise statements of individuals, but they do provide valuable information regarding opinions among members of the public on informality within India. Catalysts for conversations ranged from acquaintances of local friends met, seat neighbours during flights, hotel staff members and partners of local institutions with no specific focus on informal neighbourhoods. Each conversation took up to one hour, as not only the researcher was interested in the Indian culture, but also the researchers counterparty was interested in topics related to Germany. Most conversations started with small talk and continued with occupational background. At this point, the researcher introduced her study of slums in India. The word “informal” raised each person’s attention and revealed their awareness of the issue. Still some people tried to deny this sector of society and others made jokes about the poor: “No, we have no slums in India”²¹¹, but her body language revealed dishonesty. Another person said: “You mean those dirty people, sleeping on the street and begging all day?” followed by a loud laugh²¹².

While some seemed ashamed of revealing the truth about informal neighbourhoods in India, others emphasised their interest and possessed a well-developed knowledge about root causes. “Everyone knows the problem. Politics are corrupt and selfishness goes over fairness,” a businessman met on a flight said. “The poor are the result of good governance, being caring and attentive,” he added ironically²¹³. A woman met in the hotel lounge revealed: “The sad story behind is that all the money is there, we just need some

²¹¹ Pharmacist (12.11.2019): Personal Communication, Chance Encounter, Chennai.

²¹² Hotel Manager (07.11.2019): Personal Communication, Chance Encounter, Delhi.

²¹³ Investment Banker (12.11.2019): Personal Communication, Chance Encounter, Chennai.

clever game changers. Our waitress at home is from a basti near our house, sometimes she teaches me life lessons not even my grandmother was aware of. Their cleverness and smartness are underrated”²¹⁴.

It can be concluded that the dialogues with members of the public gave new insights about the Indian culture and their impression towards informal areas. Experiencing attitudes towards slums from a general citizen perspective revealed reasons for the strict separation among different social classes. It can be highlighted from the encounters with the public that individuals rarely move out of personal comfort zones. Interest in others exists, but uncertainty and doubt prevent individuals from initiating a change or reaching an objective that can create potentials for the growing sector of poor communities within their society.

The category “Informal settlement evolution and government actions” provides a firm basis for the need to view slums as a priority on the agenda of sustainable urban development. Simply ignoring local issues or introducing well-intentioned countermeasures in slums were shown to ignore realistic demands that address structural problems. Today, informal settlement development is viewed as a state issue and with the growing informal sector the development of new solutions has emerged over time. So too, does the evolution and shift from informal settlement ‘removal’ to ‘inclusive planning’ demonstrate the ideological transformation within government policy making and financing mechanisms. With more than half of the urban population in India living in slums, it is recognized that holistic support is needed.²⁰⁸ Still, bringing qualitative, locally demanded, and sustainable solutions to slums remains a challenge. As slum residents’ urban presence grows, their integration into society should be the basis for sustainable upgrading. Governmental institutions should proceed with optimisations in upgrading approaches within their urban concepts to contribute to viable urbanised societies in the future.

2. Actual & Future Management of Slums

The main-category “Actual & Future Management of Slums” focuses on the interviewee’s experiences made in slums during their professional career. It discusses current best practices, analyses future trends, and places special focus on the role of participative strategies in slum upgrading. Based on the expert’s answers the main-category was divided into six different sub-categories. Sub-categories are either elemental parts of the question asked during interviews or developed inductively during the analysis phase of each questionnaires’ transcript. In this case the latter occurs. The sub-categories have a direct link to the main-category and represent the most discussed topics during the expert interviews in connection with this main-category:

1. Business Collaborations with Slums
2. Current Best Practices

²¹⁴ Product Manager (08.11.2019): Personal Communication, Chance Encounter, Bhubaneswar.

3. In-Situ Development
4. Ex-Situ Development
5. Smart Cities Mission India
6. Future Best Practices

Each sub-category will be described in the following by emphasizing its position and its contribution to upgrading processes in slums from an expert perspective.

The sub-category “*Business Collaborations with Slums*” refers to slum upgrading experiences had by the interviewed experts during their occupational duties. All respondents reported on their involvement in different types of projects. The type of projects ranged from unit construction, capacity building of women, formation of self-help groups, pro-poor government schemes, SDA formation, sanitation, and health awareness, to bridging the communication gap between governments and slum residents. The capacity building of women turned out to be a trend that experienced especially high demand in slums. Based on one experts’ statement, more women take over facilitator roles than men when it comes to upgrading living environments and critical decision making. He emphasised that it is in the nature of women to create structured environments. Secondary research likewise validates this insight. It has been argued that notably women are interested in taking over key roles in projects that are related to upgrading, housing and other improvement measures.²¹⁵

The sub-category “*Current Best Practices*” focuses on experts’ perceived best upgrading practices at the current time. Several interviewees mentioned that most of the best practices have their roots in international relationships. The interviewees reported on the great art of detailed planning and precision for conducting projects based on international expert-knowledge exchange. Several interviewees also highlighted that the type of precision in managing upgrading is rarely found in projects solely conducted by local practitioners. An example is the GIZ. With its mixture of local and foreign experts and an extensive international communication network, local project objectives have the chance to benefit from lessons learnt from similar projects elsewhere. Next to the GIZ, the experts also referred to collaborations with non-governmental organisations (NGOs) as a current best practice within slum development. NGOs exhibit extensive knowledge about the people living in slums and are considered next to slum residents to be the most informed in location specific concerns.²⁰⁸ It has also been pointed out that slum residents feel more comfortable getting in touch with NGOs than supporting institutions, as hierarchically NGOs are closer (ibid.).

Accumulating the statements of interviewees originating from the state Odisha, their reported current best practices were mainly based on the components of “Odisha’s Land

²¹⁵ Imparato, I.; Ruster, J. (2003): Slum Upgrading and Participation: Lessons from Latin America, The World Bank, Washington, p. 378.

Rights to Slum Dwellers Act”, which has already been discussed in previous chapters. Especially in areas where residents fear eviction, land rights can provide a guarantee to make secure investments into property and improve general living conditions.

The sub-categories “*In-Situ Development*” and “*Ex-Situ Development*” are based on the specific types of development practices that determine the location for slum upgrading approaches. Since the interview partners originate from different Indian states, their experiences with in-situ and ex-situ development have diverse backgrounds and are approached distinctly. In-situ implies that slum upgrading is based on development practices at the current slum location. Ex-situ implies that slum upgrading is based on development practices at a different location, hence, slum communities are relocated. The interviewees reported on respective voluntary and mandatory approaches.

In-situ development is possible when slums are placed on government owned land, former development practices are still in progress or health and safety conditions are present and resettlement is considered irrelevant as the land can be optimally used for development practices. Reasons for ex-situ development can be categorized into two aspects: objection locations & non-objection locations.¹⁵⁰ Objection locations include locations along the water ways, railways, and canals where health concerns threaten life (e.g. bubbling lakes or open sewerage systems). In this case, slum relocation is vital to ensure health and safety. Non-objection locations include secure land, but the local government does not own tenure rights. For slum development to be sustainable, residents need to be provided with land titles. Non-governmental land implies that private landlords can evict residents at any time, making relocation mandatory.

In comparison to ex-situ development, interviewees mentioned that in-situ development is easier to manage and less concerned with public conflicts. In the majority of cases resettlement takes place on a voluntary basis of individuals and only in a few cases do forced evictions take place.¹⁵⁰ It is common for residents to favour in-situ development to preserve the social life and extend already built infrastructure. Slum residents are familiar with their living environment so that in-situ upgrading can be based on constructive discussions with the participating community to raise sustainability aspects of upgrading outputs. To view an example case about ex-situ development, please see Appendix G.

The sub-category “*Smart Cities Mission India*” critically reviews India’s future oriented Smart Cities Mission. The Smart Cities Mission aims to promote sustainable and inclusive Indian cities that provide core infrastructure, a decent quality of life and a clean and sustainable environment through smart solutions.²¹⁶ Still, according to the interviewees “the missions’ agenda rather neglects slum neighbourhoods”²¹⁷. Interviewees highlighted the

²¹⁶ India Brand Equity Foundation (2020): Smart Cities Mission, retrieved from <https://www.ibef.org/government-schemes/smart-cities-mission> (10.03.2020).

²¹⁷ Patro, A.; GIZ Technical Advisor (07.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

strong focus on urban improvements which mainly benefit the formal population, such as exclusive shopping malls or e-governance services. A case study about the general implementation of a Smart City initiative at a local scale and the detrimental consequences of a Smarty City project in Tamil Nadu can be seen in Appendix H.

The sub-category “*Future Best Practices*” addresses the interviewees personal assumptions about upgrading methods for sustainable informal settlement development pursued in the future. Most interviewees emphasised the grant of land rights, provision of basic infrastructure, especially housing and the focus on participative strategies to guide upgrading. Figure 6 lists the most named future slum upgrading trends interviewees recognized as fundamental. In the following, the top five trends are briefly summarised.

The most important prerequisite for upgrading measures to be successful and to lay the groundwork to stimulate active community participation are the granting of land rights, according to interviewee statements. Security of tenure is considered one of the issues that is a concern of most slum residents. With land titles, residents feel bound to a location and are motivated to invest in local improvements within the respective area. In addition to land rights, the sustainable foundation of basic infrastructure is important. Interviewees view basic infrastructure as a vital component for individual well-being that stimulates development, such as the reliable access to clean drinking water, electricity, or sanitation.

The most convincing, but practically complicated topic each interviewee addressed was the focus on participatory strategies. All interviewees reported on positive experiences with citizen participation in projects, but also raised attention on the complexity of the associated coordination to reach objectives, which are considered less of a concern in purely top-down approaches. One interviewee mentioned that “sometimes it is too complex to respect residents’ needs, even though everyone knows that integrating residents would cause greater acceptance and more consent to upgrading outcomes. Top down is easier and faster than bottom up. You only have a certain fixed timespan in which changes need to occur, everything beyond this timespan the government will not support financially”²¹⁸. Even though the interviewee seems to be biased by governmental pressures, he is still aware of the benefits participatory projects generate. Other interviewees likewise shed light on time pressure in projects, which in certain cases prevented active citizen participation. Their personal experience proved that slum upgrading measures in general require more time, compared to non-slum development projects, which involve fewer stakeholders and a narrow range of development options. Adding participatory strategies to conventional slum upgrading strategies in most cases exceeds upgrading timespans. Still, every interviewee admitted that it should be more important to focus on realistic needs and incorporate the community, than to fear the added time it takes. One

²¹⁸ Chakrabarty, A.; Urban Planner and Former Lead in the State Equity Cell in the government of Odisha’s Department of Housing & Urban Development (19.11.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.

interviewee referred to the mental benefits of participative approaches with reference to Imparato & Ruster (2003).²¹⁵ From a mental perspective, strengthening residents' contributions to determine the nature of upgrading projects develops a sense of ownership, strengthens the community voice and improves individual self-efficacy, which directly impacts a project's performance and sustainability over time (ibid.). The incorporation of local residents to focus on realistic necessities in approaches is considered a prerequisite for projects to be successfully realised.⁵¹ Rarely does any stakeholder involved in upgrading know the area and the associated problems as well as slum residents themselves.

Next to participatory strategies, the topic of centralising or decentralising informal settlement development programmes was controversial among interviewees. Centralising informal settlement development programmes implies that the central government guides upgrading measures. Decentralising informal settlement development programmes implies that the state government guides upgrading measures. Half of the interviewees view great potential in centralised informal settlement development actions. With centralisation, higher transparency in processes and developed data can be achieved. One interviewee highlighted reduced corruption due to higher transparency in processes and financial investments: "Especially local authorities are highly corrupt, as nobody really controls their actions"²⁰⁹. On the other hand, the remaining four interviewees considered decentralised informal settlement development actions as a more successful development trend in the future. Each state has its own climatic conditions, cultural patterns, etc. which should optimally be considered in each individual slum upgrading framework. States with successful upgrading approaches should rather share lessons learnt on platforms or meetings and allow other states to follow.²¹⁹ It can be concluded that there exists a need for a flexible concept, which promotes networking, mutual learning, the exchange of best practices and improved dissemination of information and communication.

²¹⁹ Paty, S.; Tata Trusts Consultant (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

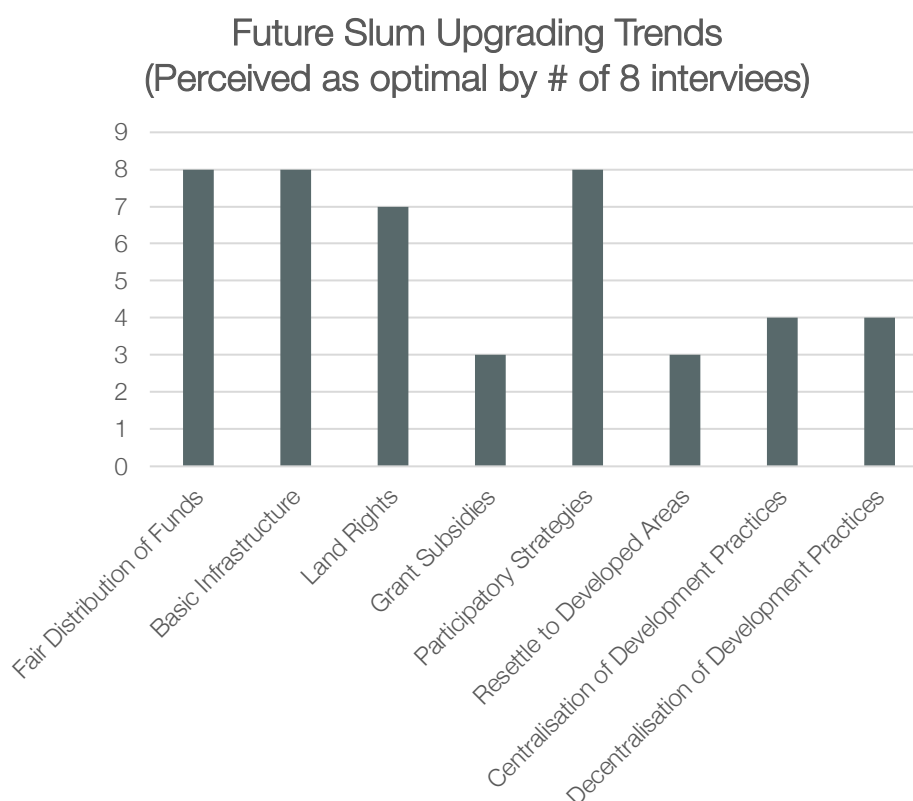


Figure 6: Future Slum Upgrading Trends (own representation).

The personal experiences experts made within projects related to slum neighbourhoods highlighted a variety of different perspectives and approaches on upgrading measures. Especially participatory potentials in upgrading are well known, but rarely realised. Likewise, to the granting of land titles or the provision of basic and reliable infrastructure. Most of the statements and arguments of all interviewees are of a similar nature with some exceptions. What all interviewees had in common was their awareness on the need for stronger social cohesion and openness for a broader integration of various stakeholders attached to upgrading. It is essential to advance the level of trust among stakeholders, as it gives scope for new ideas, where mutual learning is paramount. Based on their statements, trust and trusted approaches can develop in a variety of ways, ranging from the simple and open exchange of experiences up to international co-operation's.

3. The Liveable Life – Experts self-interpretation and interpretation for Slum Residents

The category “Liveable Life” aims to identify two perspectives of an experts understanding of a liveable life. First, it is to develop an understanding of what experts call a liveable life for themselves. The initial subjective reference is intended to facilitate the understanding of the term. Since in a second step, it is to develop an understanding of what experts believe to be a liveable life for slum residents. The assumption about the meaning of a liveable life for slum residents is compared at a later stage of the work with realistic aspects about a liveable life for slum residents which were worked out during FGDs in slums.

The aim is to clarify how assumptions differ from facts, illustrating that mutual understanding can be facilitated through collaborations and active key stakeholder engagement. With the identification of realistic liveable life perceptions at local scales, actionable conclusions can be drawn to design sustainable slum upgrading concepts.

Focusing on the expert's personal point of view, all interviewees had overlapping and shared opinions of what it means personally to live a liveable life. The most mentioned aspects were good health conditions, living a life in freedom, being independent, shaping their personal future and having access to high-quality education. With a focus on the belief of what it means for residents to live a liveable life, expert's statements continued to resemble each other's. The ten most mentioned liveable life characteristics which experts believe are important for residents, are listed in Figure 7. In the following, the three most significant expert assumptions are briefly explained: shelter, drinking water and health. The term "shelter" is associated with a lack of housing, conditions of housing, insecure tenure rights, evictions or relocations. Interviewees argue that a slum residents' liveable life comprises a permanent residence to settle and develop. The term "drinking water" is associated with a lack of access to clean water in general. Local municipalities manage water access and slums whose existence is illegal, rarely tolerated or unknown are automatically not provided with water pipes. Experts consider that a liveable life comprises permanent water access to serve basic human needs. The term "health" is based on a combination of the two previous mentioned aspects (tenure rights & drinking water). Several experts emphasised that tenure rights and drinking water are among the main catalysts for physical and psychological health concerns. Poor access to or the affordability of local doctors most often further endangers health.

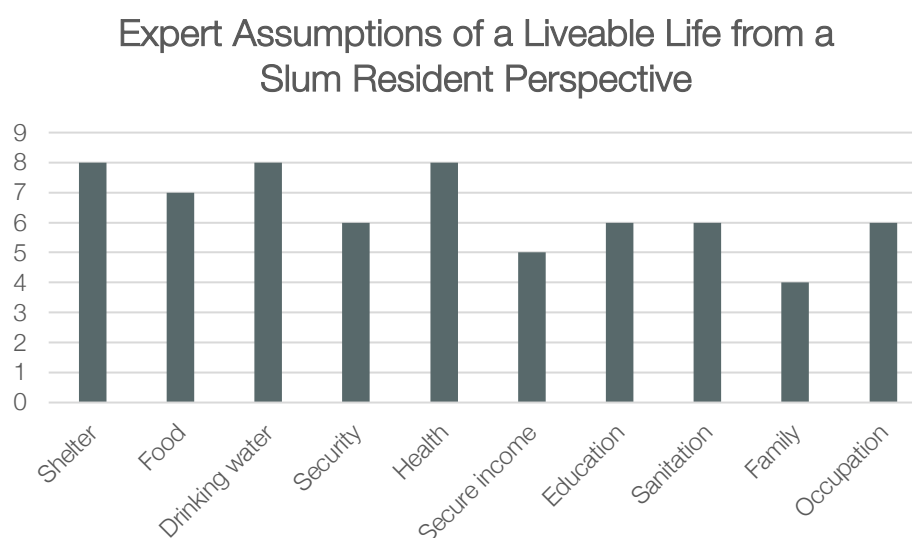


Figure 7: Expert assumptions of a liveable life from a slum resident perspective (own representation).

It can be concluded that statements made about the meaning of a liveable life among experts are very similar. This applies to their personal perception, as well as to assumptions of a slum resident's perception. However, on analysing experts' assumptions about slum residents' liveable life perceptions and comparing them to actual viewpoints from slum residents reveals a gap between assumptions and realities. This gap emphasizes the importance of closer interactions among key stakeholders during upgrading projects. With the awareness of locally-rooted liveable life perceptions, different perspectives can be summarised and evaluated to guide sustainable slum upgrading.

4. Status Quo in Slums – Expert Perspective

The category “Status Quo in Slums” aims to analyse the current slum landscape from an expert perspective. To analyse participative patterns and community networks in slums that can be considered within sustainable urban slum upgrading, the status quo in slums is analysed. Focus areas of the general slum analysis are strengths, weaknesses, opportunities, and threats (Table 2).²²⁰ Results of this section have also been used to identify components for the formulation of questions within focus group discussions and to compare experts' comprehension of the status quo in slums to slum residents' comprehension of the status quo in slums. The comparison takes place upon slum residents' comprehension of the status quo. In the following, the answers of the experts were summarised with a SWOT analysis - strengths, weaknesses, opportunities, and threats.

Strengths

Focusing on the characteristic “strengths”, favourable elements, processes, and behaviours within slums are determined. All interviewees agreed independently from each other on similar strengths slums exhibit. Slum inhabitants value their strong community cohesion. Especially community unity at different social levels, like youth groups, women groups and senior citizen groups are strong. Survival skills and management of problem areas displays further strengths. Many residents work as ragpickers and recycle garbage for private usage or resale at recycling plants. Slum residents are viewed as “survivor artists”²²¹, as the majority have lived for generations in slums and are used to surviving on the bare minimum, such as living without basic services or functioning infrastructure.

Weaknesses

Focusing on the characteristic “weaknesses”, limitations within slums are determined that keep slums from achieving objectives. Most interviewees referred to poor educational levels as a main reason for poverty and lower living standards. Low educational attainment, low school completion rates and high early school leaving rates discourage individual opportunities to escape poverty. With limited access to education, it is difficult to enter the formal working sector or pursue individual objectives and personal development

²²⁰ Blokdyk, G. (2019): SWOT Analysis A Complete Guide - 2019 Edition, 5STARCook, Australia, p. 14.

²²¹ Gupta, A.; Professor at India's National Disaster Management Institute, under Ministry of Home Affairs, also in charge of health and climate issues (05.11.2019): Per-sonal Communication, Expert Interview, Bhubaneswar.

opportunities. In many cases children contribute to the family income and already enter employment at early ages, e.g. as tailors, prostitutes, or workers in stone quarries. But not only the educational level, also the place of residence is detrimental when applying for a job. Revealing a slum address perpetuates stereotypes and decreases job offers. A further weakness of slums is the lack of hygienic environments, which impacts health. Likewise, the caste system and forced practice of cultural customs, such as child marriage, are a weakness. Lastly, little concern for associating with or attaining a higher social class represents a weakness. Slum residents are rarely accepted in formal structures and reduced to their affiliation, which impacts general development and a sense of social belonging.

Opportunities

Focusing on the characteristic “opportunities”, elements in the slum environment are determined which have the chance to improve slum conditions. The interview partners view co-operation’s with international aid organisations as an opportunity for sustainable impacts at slum locations. Slum residents have little confidence in government initiated upgrading projects due to false promises in the past. Still, one interviewee mentioned that slum residents enjoy working with foreigners, such as international aid organisations. It is especially the visual presence and language spoken that makes members of international aid organisations different and motivates residents to participate. Tenure security displays a further opportunity. All interviewees from the state Odisha reported on “Odisha’s Land Rights to Slum Dwellers Act”. The act promotes the assignment of land rights to identified slum residents. Insecure tenure is associated with a constant threat of eviction, impairing residents’ ability to execute development work.

Another opportunity within slums is perceived to be access to financial systems, such as easily accessible micro-credits. Financial support motivates residents to start their own businesses which they can operate from home. It is very common in slums that residents live and work at the same place. Women tend to do tailoring work from home to simultaneously take care of children and the elderly. Likewise, street food sellers prepare their street food at home during the night and sell it on nearby streets during the day.

Lastly, most experts highlighted community participation, compulsory schooling and social acceptance, as further opportunities in slums. Community participation in slum upgrading has been mentioned as a key component for sustainable project results. Compulsory schooling has been addressed regarding the establishment of school laws, which ensure school visits of each child to prevent child labour and ensure basic knowledge. Social acceptance has been mentioned in the context of slum residents’ acceptance in formal societies. For example, it is common for slum residents to attend university, but live in slums due to low living costs. Still, applying for formal work and providing a slum address for contractual agreements leads in many cases to job rejections.

Threats

Focusing on the characteristic “threats”, elements in the slum environment are determined that could impede conditions in slums. Regarding the interviewees, corruption, and the black-market display major threats. Corruption reduces government spending and the black-market lowers tax revenues, both of which reduce investments in slum upgrading. Most slum residents work in the informal sector and “[...] live in the here and now. For most residents it is inconceivable to pay taxes, when fighting with less than 1€ per day for survival”²⁰⁹. In addition, slow bureaucratic processes impact upgrading realisation. Several interviewees stated that governmental processes take longer to approve a project, than to realise it. Also, a change in priorities of governmental agendas creates a risk to slum communities. One example are international intentions to tighten regulations on environmental protection measures. Several interviewees stated that environmental policies redirected governmental focus on areas like renewable energy or modernised plants, at the expense of improved development measures in slums. Lastly, forced prostitution and child trafficking display a threat. Prostitutes mainly origin from informal areas and are often neglected even within their own community.

It can be concluded that the SWOT analysis provided a detailed overview of the elements that effect conditions in slum landscapes. With this background, insights have been obtained about slums that were partly translated into questions for focus group discussions, as well as focus areas to pay attention to during slum visits. Particularly dominant is the gap between the formal and the informal sector. Research revealed that there is a need for measures that aim for sustainable and long-term goals in slums. It is about creating awareness for societal development and social cohesion in communities. Responding in a socially diverse and efficient way to problem areas increases local strengths, eliminates weaknesses, and threats and builds on opportunities that exist or arise as a result.

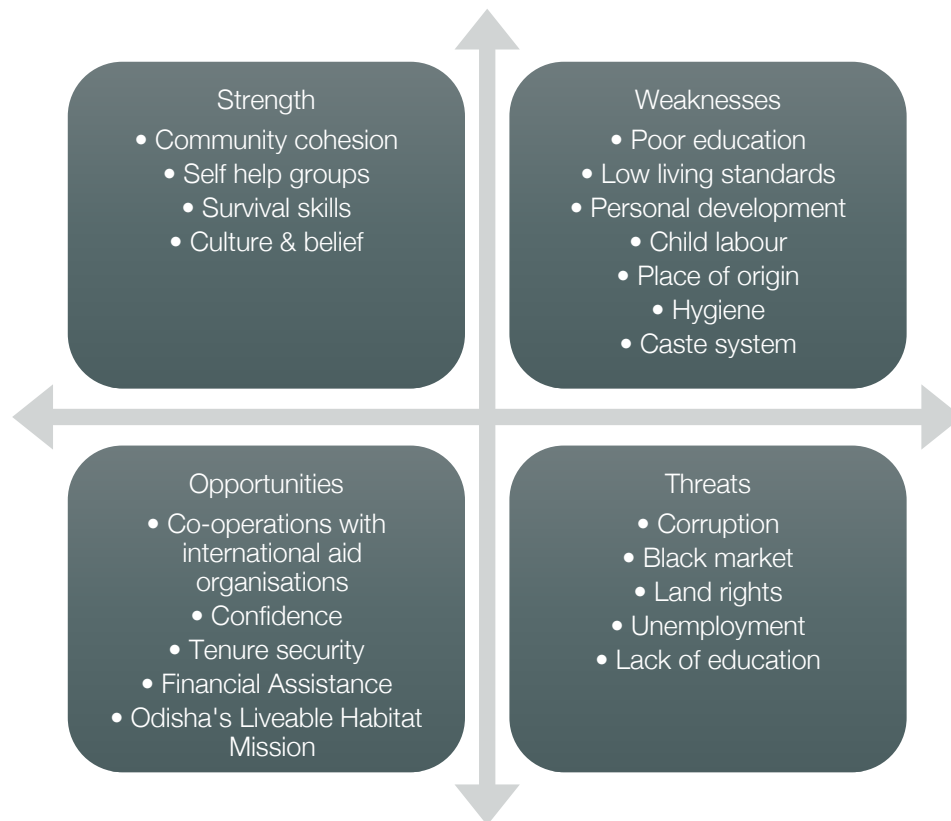


Table 2: SWOT Analysis of Slums – Expert Perspective (own representation).

5. Stakeholder Identification – Expert Perspective

The category “Stakeholder identification” aims to identify key stakeholders that have or could have a direct influence on slum upgrading processes. As the thesis’s intent is to develop an approach that considers location specific relevance and active participation of key stakeholders in slum upgrading, stakeholders are identified whose expertise is considered to support sustainable approaches.

Stakeholders can be split into internal and external stakeholders. The slum inhabitants themselves display the central internal slum stakeholders. For the internal stakeholders to be effective, collaborations with external stakeholders need to be approached. In the following, the ten most named external stakeholders, which are considered to have the greatest impact on slum upgrading will be listed and afterwards briefly discussed:

- Local Government/Municipal Corporation
- Private Landowners
- Slum Co-operators
- Slum Neighbours
- Property Investors
- Financial Institutions (Banks)
- NGO National
- NGO International

- Aid Agencies National
- Aid Agencies International

Local governments are considered the main driver for initiating upgrading projects and providing funds. Private landowners play a key role when slums illegally occupy privately owned land. For the legal upgrading of slums at their living location, private landowners must rent or sell the demanded land to the government. The government then in turn has rights over the land which can be granted to slum residents. Slum co-operators have only been addressed by the interviewees originating from Odisha. In Odisha, slum co-operators include people who work on behalf of the government, forming the connection between slum inhabitants and governments. They support governmental institutions in identifying areas of improvements or necessities in slums and are assigned to initiate relevant actions. Slum neighbours include inhabitants of the formal neighbourhoods located adjacent to slums (informal neighbourhoods). They have a direct relation to residents (positive or negative).

Property investors include private investors who privately invest in residential buildings that can be either rented or sold to residents. Financial institutions have been mentioned as banks that follow pro-poor schemes and offer micro-credits. Micro-credits enable residents to realise small business-, housing- or other development-projects. National and international NGOs generally enjoy good rapport when working with slum residents and can recruit experts with fewer restrictions than governmental institutions. Lastly, national and international aid agencies are considered key stakeholders within slum upgrading. They possess financial means to support development work, can draw on a wide range of experiences and are globally well connected.

The identification of key stakeholders related to slum upgrading in general creates the basis for a multi-stakeholder map, which represents key stakeholders and their direct influence on different elements associated with sustainable slum upgrading processes. With this approach, it is possible to holistically integrate and involve local networks to exploit the location specific knowledge base and ensure strategic decision making.

Conclusion

Cities are complex systems of interdependencies, where numerous actors and processes interact. As expert interviews confirmed, there is a need for building supporting capacities in underserved neighbourhoods to manage the complexity of local challenges. It has been acknowledged that especially informal neighbourhoods suffer from insufficient basic services for a variety of reasons, such as missing contribution of key stakeholders or a lack of awareness of unofficial slum locations. Cases show that improving slums is feasible under certain conditions. Essential are pro-poor governmental policy schemes and key stakeholders' active involvement to acknowledge local demands and contribute towards improved living conditions.

Most experts interviewed originated from different states in India. Focusing solely on state specific approaches toward slum upgrading, customised frameworks to local conditions are noted. Still, a common factor is missing – relationship building and a lack in trust among authorities and informal communities. This condition is considered one of the main reasons for collaborative failure. Collaborations work well within social classes, but rarely beyond, making it a key contributor towards the growing urban poor sector.

As most experts highlighted, where strong political will is present and responsibility is regulated, local upgrading contributes to significant results in urban slums. Responsibility is a status symbol and implies power, which everyone wants to have (until something goes wrong). Developing strategies jointly, such as slum upgrading approaches, spreads responsibility and failures can be addressed jointly. Slums stand out for their well-networked community; based on expert interviews, community engagement displays a pre-requisite for the successful realisation of upgrading programs. To ensure that a sense of ownership develops among citizens about the use and maintenance of upgrading outcomes, participation makes sense in the planning phase and construction work, enabling citizens to learn about operating systems. The goal should be to improve participative actions, trust, and social cohesion beyond informal or formal sector boundaries and approach objectives in a community sense.

4.1.2 Informal Settlement Selection Overview

This section provides a brief outline about the selected slums for focus group discussions within the first research phase. The focus group discussions consider six exemplary slums, which have a strong community movement, can express themselves and belong to Tata Trusts pilot projects for redevelopment under Odisha's Liveable Habitat Mission. The pilot projects serve as a basis to develop a slum upgrading concept that can be implemented at a larger scale within Odisha. In the following, each visited slum will be introduced. The introduction of each slum includes a slum profile and picture (Figure 8). This overview is organized according to the individual visits.

Informal Settlement Selection Overview



Figure 8: Informal Settlement Selection Overview (own representation).²²²

4.1.3 Focus Group Discussions – First Research Phase

This section will introduce the findings of focus group discussions conducted in slums located in Bhubaneswar. In total six focus group discussions were conducted, of which each took place in the community hall of the respective slum and with the participation of 15-20 local slum residents. Focus group discussions were conducted to analyse the status quo, local problem areas and conventional countermeasures to problem areas in slums, as well as to identify indicators that contribute to a liveable life. For this research a semi-structured questionnaire was developed (Appendix C).

Based on the structure of the questionnaire, four thematic fields have been scrutinised, under each of which a selection of questions was asked. In the following, a summary of each thematic field is provided. The thematic fields are as follows: The Liveable Life – Slum Residents Self-Interpretation, Status Quo in Slums – Slum Resident Perspective, Management of Problem Areas and Stakeholder Identification – Slum Resident Perspective.

1. The Liveable Life – Slum Residents Self-Interpretation

The first category “Liveable Life” aims to identify slum residents’ personal perception of a liveable life. With the subjective reference it is intended to understand the term from a slum resident perspective. To introduce the main question (“What does it mean for you to live a liveable life?”), two introductory questions anticipated the main question (“What are the things you like most about your neighbourhood?” and “What are the things you like least about your neighbourhood?”). The introductory questions aimed to initiate and simplify the main question and facilitate its central context statement. Figure 9 and Figure 10 capture the twelve most frequently mentioned likes/dislikes. Table 3 represents the set of liveable life indicators from a slum resident perspective. As experts’ assumptions about a liveable life from a slum resident perspective has been identified within expert interviews, a comparison will be made at a later stage within this section against the actual perception of a liveable life from a slum resident perspective. The aim is to clarify how assumptions differ from facts, illustrating that mutual understanding can be facilitated through collaborations and active key stakeholder engagement. With the identification of realistic liveable life perceptions at local scales, advisory conclusions can be drawn to design sustainable slum upgrading concepts.

In all visited slums, residents emphasised shelter, strong community commitment and staple food affordability, as the most liked aspects of their neighbourhoods. Shelter provides security, protection and creates an environment of privacy. Community commitment and responsible actions were related to joint local construction tasks, community game matches and general mutual confidence. Staple food affordability was referred to

²²² Harijan Sahi, Maa Mangala Lumbini Vihar Basti, Maa Mangala Sahi Basti, Nala Muha Sahi, Niladri Vihar Harekrushna Nagar, Omkar Kinner Basti; Slum Residents (15.11.2019 – 21.11.2019): Personal Communication, Focus Group Discussion, Bhubaneswar.

by a large number of employed residents and local street food sellers. In none of the visited slums, did residents suffer from malnutrition. Also access to public sanitation facilities (pit latrines) was praised, which contributes to public and environmental hygiene. Other likes, which were mentioned but cannot be linked to all visited slums are land rights and central locations. Living close to places of economic activity enables residents to have easy access to workplaces, schools, hospitals, and temples. One slum also reported on a good relationship to formal sector neighbours, whose support facilitated the slum's reconstruction after it was hit by a cyclone.

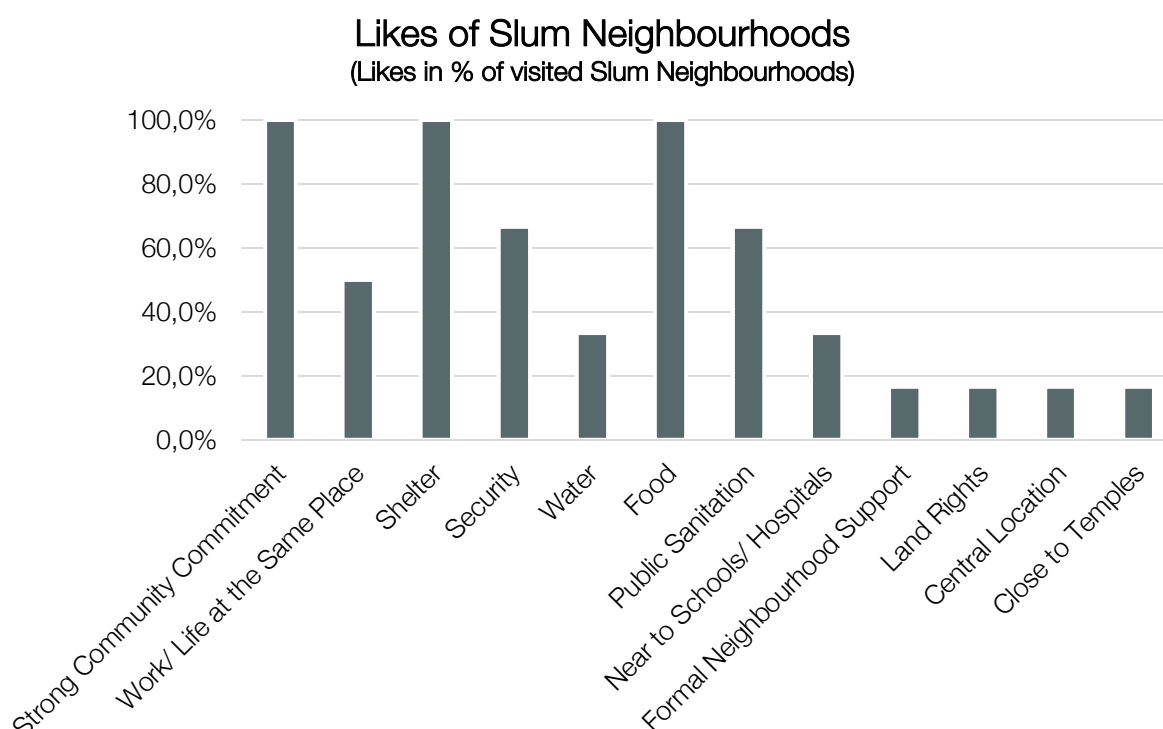


Figure 9: Likes of Slum Neighbourhoods (own representation).

In all visited slums, residents emphasised broken or blocked drainage and sewage systems, as well as the management of waste and poorly built internal roads as the most disliked aspects of their neighbourhoods. Open drains are used as a source of water for cooking, washing, cleaning, thereby impairing hygienic environments and negatively impacting health conditions. Poor waste management has been related to slum residents' careless rubbish disposal and missing dumpster collection. Poorly built internal roads contribute to increased motorcycle accidents and the complicated and time-consuming transport of goods. In five out of the six visited slums, missing tenure security was highlighted. Without occupancy rights general living conditions are precarious and there is little motivation "to create places that feel like home"²²³. Formal sector discrimination was another complaint. Residents reported on constant judgements and hostile attacks from

²²³ Social Worker at Maa Mangala Lumbini Vihar Basti; Social Worker (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

nearby neighbours. For slum residents it is difficult to socialize beyond slum boundaries when constantly living in fear of eviction or an attack by a more powerful neighbour.

Further dislikes are the lack of drinking water (water suitable for drinking) or sufficient water (water accessible 24/7), poor construction of houses and missing community centres to keep social interactions alive and celebrate festive periods. Poor house constructions impair safety and protection. Community centres play an important role during festive seasons. It is believed that the less festive seasons are celebrated, the less gratitude is shown to gods. Public schools, private toilets, the vicious circle of poverty and drug consumption have also been highlighted as dislikes. Despite compulsory school attendance, many children fail to reach an adequate standard of education, as they enter the job market at an early age and contribute to the family income by begging or doing physical work. Private toilets are often impossible as corresponding infrastructure is not in place. The vicious circle of poverty mainly takes its roots in the caste system, making it difficult for slum residents to self-actualise and access better job opportunities, which contributes to personal frustration and drug consumption.

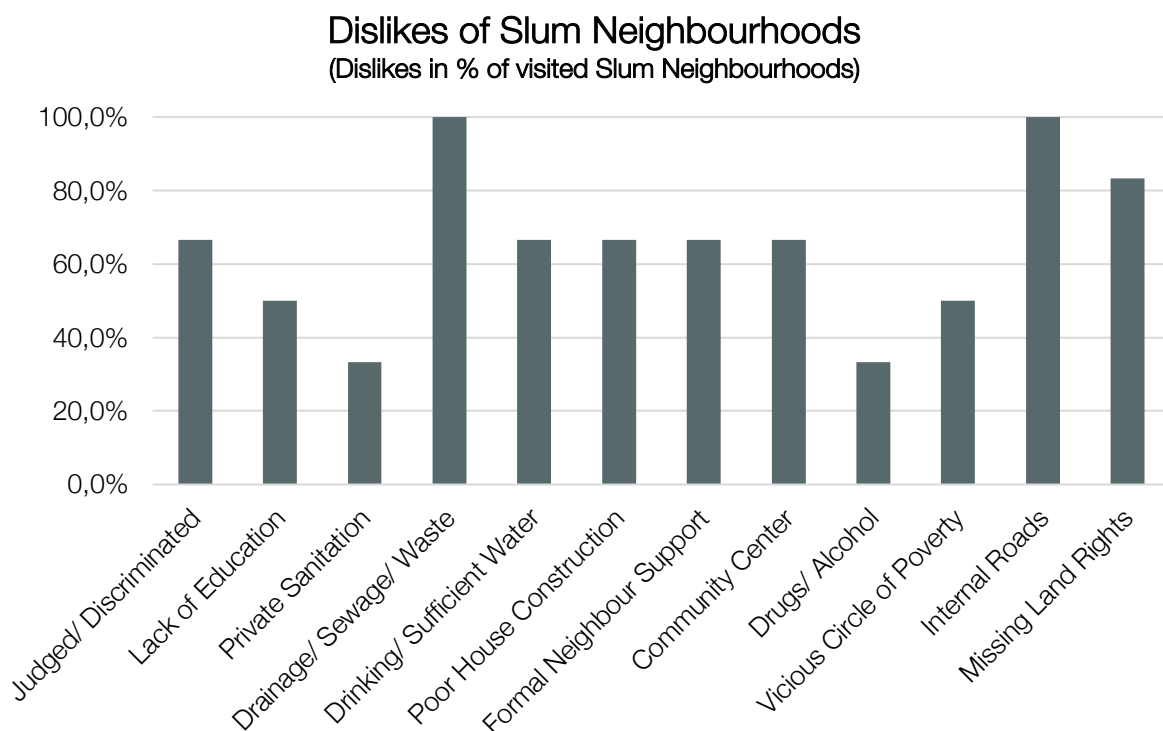


Figure 10: Dislikes of Slum Neighbourhoods (own representation).

From the likes and dislikes, it can be concluded that not only infrastructural changes are needed to develop slums according to local preferences. Residents require assistance to meet their responsibilities in relation to various local opportunities; be it social, cultural, or educational. Still, required assistance differs among slums. The awareness of local conditions and demands gives valuable information in the context of slum upgrading to focus on approaches that apply to and consider location specific needs.

The Liveable Life

Returning to the initial question by having used the two introductory questions, a general comprehension of the term “liveable life” was facilitated. As already identified in the expert interviews, liveable life perceptions are subjective and differ from person to person. Enquiring the local population about personal liveable life perceptions allowed the researcher to gain insights into realistic locally-rooted viewpoints. The entire set of indicators identified within FGDs were summarised and the 16 most mentioned indicators categorised under four elements (Table 3). These indicators display the liveable life indicators of slums located in Bhubaneswar. In the following, each element is briefly discussed.

The *safety* element addresses aspects with a focus on general neighbourhood safety, tenure security, stable working conditions, and the protection against natural hazards.

The *service* element sheds light on aspects with a focus on general services in the direct vicinity of slums, such as the density of doctors, education facilities, public transport stops and distance to employment opportunities.

The *society* element emphasises aspects with a focus on social assistance, financial assistance as well as relations to communities external to slum neighbourhoods.

The *space* element highlights physical aspects with a focus on basic services, adequate housing, parks and green spaces, clean environments, and community centres.

Safety	Neighbourhood Safety
	Tenure Security
	Formal Employment (Working Contract)
	Natural Hazard Protection
Service	Health Care Services
	Education Facilities
	Areas of Economic Activity
	Public Transport Services
Society	Social Assistance
	Financial Assistance
	External Neighbourhood Relations
Space	Basic Services
	Adequate Housing
	Parks & Green Spaces
	Neighbourhood Cleanliness
	Community Centre

Table 3: Liveable Life Indicators Identified in Slums located in Bhubaneswar (own representation).

2. Status Quo in Slums – Slum Resident Perspective

The category “Status Quo in Slums” aims to analyse the current slum landscape from a slum resident perspective. To analyse participative patterns and community networks in slums that can be considered within sustainable urban slum upgrading, it is important to get a general impression of the status quo in slums. Focus areas of the general slum analysis are strengths, weaknesses, opportunities, and threats (Table 4).²²⁰ Results of this section have also been used to compare experts’ comprehension of the status quo in slums against slum residents’ comprehension of the status quo in slums. In the following, the answers of slum residents were summarised within each segment - strengths, weaknesses, opportunities, and threats.

Strengths

Focusing on the characteristic “strengths”, favourable elements, processes, and behaviours within slums are determined. All FGD participants agreed independently of each other on similar strengths within their slum. Slum residents value their strong community cohesion. They reported on respectful interactions and an open and caring behaviour among individuals. One resident summarised their understanding of community cohesion as: “We stand as a unit and fall as a unit”²²⁴. Another strength is the power of fast verbal communication. Not everyone possesses a mobile phone, and the power of fast verbal communication ensures that information circulates among those to be influenced, as well as stimulates ad hoc support.

Next, the establishment of worker associations in the form of self-help groups was a strength. Worker associations support residents with occupational orientation and career guidance frequently combined with job exchange platforms, training for job interviews and new skill acquisitions, e.g. sewing. Lastly, the management of accusations and religious beliefs was highlighted as a strength. Slum residents are often the first blamed when a local crime is committed. Slum residents explained that they first correct themselves and look what went wrong from their side. If they are falsely blamed, they work towards proof of their innocence. It is crucial for them to always analyse own actions critically. Residents lay special focus on honest behaviour and do not fear to take responsibility, especially due to their strong belief in “karma”.²²⁵

Weaknesses

Focusing on the characteristic “weaknesses”, limitations within slums are determined that keep slums from achieving objectives. The majority of FGD participants referred to the lack of job opportunities in the formal sector. Employment found in the informal sector tends to be unfairly paid. Most slum residents work in the informal sector for more hours

²²⁴ Slum Lead at Nala Muha Sahi; Slum Lead (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

²²⁵ Ashwini, D.; Goel, D.; Khanna, S. (2018): Bad Karma or Discrimination? Male-Female Wage Gaps Among Salaried Workers in India, in: World Development, Vol. 102, p. 331–344.

than they are paid for. As a result, residents usually manage several jobs to ensure sufficient income. Some residents reported eighteen-hour work days and the resulting impacts on mental and physical health. Additionally, the lack of community centres was addressed as a weakness. It may happen that issues need to be discussed in enclosed spaces or festive seasons be celebrated at larger scale. A social worker revealed that with the establishment of community centres, social environments suitable for integrating new activities can be established.²²³ Public spaces in general are believed to revitalise social interactions in slums.

Weaknesses are also recognised in the poor infrastructure of slums. For example, open drains, lack of sanitation and the absence of street lighting. In some slums, children are not allowed to play outside, as open drainage systems create a danger. Insufficient drinking water access and poor electric facilities are further factors that limit people in their daily business. Many street food vendors prepare and cook food at night and sell it during daytime. If the electricity or light is missing even one night, they lose an entire day of earnings on which more often than not an entire family is dependent.

Next, limited living space and unit constructions was a weakness. Living as a family of six in 3sqm self-built houses is difficult to imagine yet a common scenario. Consequently, the private atmosphere suffers, and poor professional building know-how impairs general unit stability. Another weakness is waste management. Little awareness exists on how to treat and keep the natural environment intact, as waste tends to be thrown out into the environment without considering the consequences of its long-term impacts. Lastly, the addiction to dangerous substances (drugs, alcohol, cigarettes), has been categorized as a weakness in slums. Especially the consumption of drugs has been associated with domestic violence.

Opportunities

Focusing on the characteristic “opportunities”, elements in the slum environment are determined which have the chance to improve slum conditions. In the majority of visited slums, FGD participants referred to the central slum location and easy access to job opportunities. Living close to the centre of economic activity offers residents a broader selection of workplaces and short work paths, which reduce travelling costs and canteen expenses, as residents can spend lunch breaks at home. The central location also simplifies access to educational institutions. Due to a higher density of children in urban areas the availability of schools is higher.

Opportunities are also recognised in the supporting actions of social workers in slums. In many slums social workers organise self-help groups to address actual demands of slum residents. For example, at Niladri Vihar Harekrushna Nagar most elderly people are illiterate. Volunteering teachers organise self-help groups to train elderly in reading, writing and arithmetic skills. A social worker revealed that the high demand for self-help groups

is based on voluntary and participative engagement. Participative processes enable them to consider individual needs and it is more likely that residents develop skills from mutual learning, build confidence in their own strengths and feel a sense of ownership from the output they created.²²⁶ Lastly, residents view a strong opportunity in OLHM. Some residents reported during FGDs on their knowledge about first pilot projects under the mission in nearby slums, where improved living standards are already clearly visible.²²⁴

Threats

Focusing on the characteristic “threats”, elements in the slum environment are determined that could impede conditions in slums. Residents referred in this context to poor living conditions, which result from unpleasant relationships with adjacent formal neighbours. Often disrespectful behaviours and accusations are used as a method to evict slum communities. Another threat is the eviction of slum communities living on privately owned land. As already mentioned, Odisha’s Liveable Habitat Mission (OLHM) aims to assign land rights to identified slum residents.¹⁰⁹ So far, pilot projects have begun but to provide all slums in Odisha with land rights takes time. Residents highlighted that lacking tenure rights is the root cause for unemployment, poor infrastructure, and low education levels, as they feel less obligated to invest and settle if eviction can take place at any time.

Threats are also recognised in the absence of general education. Residents perceive education as a status symbol which is a prerequisite for formal employment. Without education, it is difficult to enter lucrative employment conditions. A lack in education has also been related to mental dissatisfaction.²²⁷ Educational activities promote awareness of personal potential; without education, individuals lack intrinsic motivation for personal development, as it is rarely possible to self-actualise, nor meet personal potentials (ibid.).

Access to water and sanitation is also perceived as a major threat to well-being in slum communities. Even though at general urban level, tap water and sanitation access are on an upward trend, urban slum residents estimate that only 1-5% of slum households have continuous access to tap water and sanitation facilities.²²³ Most slums are located on unauthorised land, access to water pipes is often established illegally and sewage systems for sanitation facilities are often missing (ibid.). Lastly, residents perceive the lack of governmental support for developing activities as a threat. OLHM has already started, but it will require several years for upgradation of each slum under the mission. As a result, government workers have been assigned to slums which have not yet benefited from OLHM. FGDs revealed that in theory, a government worker visits a slum once per week to take note of local problems and conduct countermeasures. Yet, community requests have neither been forwarded, nor realised.

²²⁶ Social Worker at Niladri Vihar Harekrushna Nagar; Social Worker (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

²²⁷ Slum Resident at Maa Mangala Lumbini Vihar Basti; Slum Resident (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

It can be concluded that the SWOT analysis enabled an extended perspective on strengths, weaknesses, opportunities, and threats of slums located in Bhubaneswar. Residents highlighted their preference to live in slums, as per their statement, slum communities possess a strong sense of community cohesion, appreciate a sense of belonging and value respectful interaction. Particularly dominant is the gap between the formal and the informal sector, as well as cooperativeness among social classes. Research revealed that there is a need for improving local living conditions which are sometimes life-threatening, such as the lack of clean drinking water. In comparison to the anticipated status quo in slums (expert interviews), the realistic status quo in slums (FGDs) focuses much more on society aspects. It can be noted that premises for sustainable upgrading are the understanding of locally realistic needs and the inclusion of those for whom a solution is being sought.

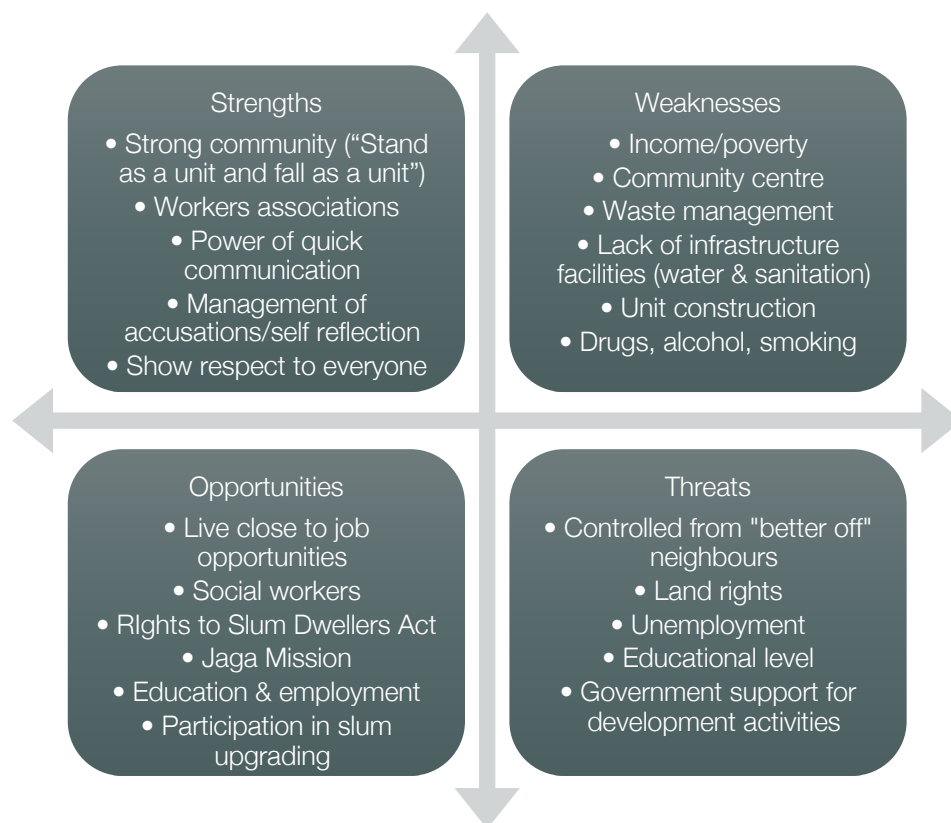


Table 4: SWOT Analysis of Slums in Bhubaneswar – Slum Resident Perspective (own representation).²²²

3. Management of Problem Areas

The category “Management of Problem Areas in Slums” aims to identify from a slum resident perspective, conventional countermeasures to acknowledged problem areas in slum landscapes. The discussion of problem areas is split into two steps. In a first step, problem areas are discussed which have been acknowledged during secondary research as conventional problem areas in slums: Waste management, hygienic environments,

sanitation facilities, drinking water, food supply, education, health care, transportation.²²⁸ In a second step, location specific problem areas are identified, and their countermeasures discussed. Starting with the discussion of problems that are based on secondary research serves to familiarize slum residents with the content in question and not raise uncomfortable feelings when asking the community to name their local deficiencies right at the beginning. This could lead to a tense atmosphere. From the previous questions asked within FGDs it emerged that it is easier for slum residents to answer questions when led with introductory examples. On the other hand, it also analyses the validity and representativeness of secondary data. As the thesis's intent is to develop an approach which increases location specific relevance and participation in decision making from a key stakeholder perspective, it is important to get a detailed overview of countermeasures to problem areas in slums. Analysing countermeasures helps to further detail local strengths, best practices and optimise systematically anticipated key stakeholder integration within upgrading.

Waste Management

The first problem area addressed is waste management. Waste management was identified as a major issue in informal regions, as its management has no organised process. In most cases rubbish dumps can be found throughout slums and bins are rarely present. As per statements, waste management can be split and weighted as follows (Figure 11): 60% of waste is thrown in the open environment. The Bhubaneswar Municipal Cooperation (BMC) collects 30% of waste. Whereby residents emphasised that BMC undergoes cleaning sessions. Instead of weekly clean-ups, bins are professionally cleared every two months. Lastly, 10% of waste is collected and brought to large incineration plants by residents. At incineration plants residents are paid for each kilogram of waste submitted.

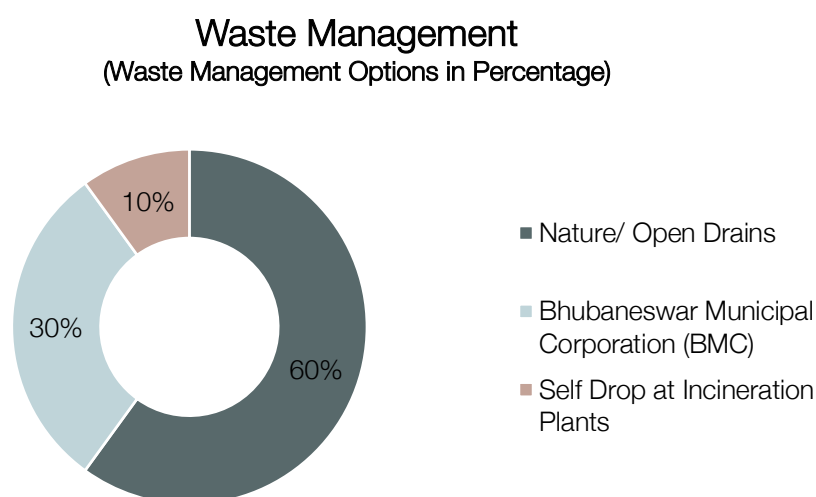


Figure 11: Focus Group Discussion Sub-Category – Waste Management (own representation).

²²⁸ El-Hagggar, S.; Samaha, A. (2019): Roadmap for Global Sustainability — Rise of the Green Communities, Springer, Switzerland, p. 159-167.

Hygienic Environments

The next topic deals with slum residents' concern for hygienic environments. Residents differentiate between individual household hygiene and public hygiene. The results within the questionnaire (Figure 12), revealed that all interviewed residents reported to clean their individual households daily. Slum visits verified residents' dedication to keeping homes clean. Shoes are placed outside houses, after each meal the floor is swept, and clothes worn were spotless. Still, public cleanliness is lacking. In none of the conducted FGDs, did residents report to take care of waste or rubbish dumps in public environments themselves. One slum resident revealed: "Most people are not aware of the need to keep the environment clean, and others are anxious about the transfer of diseases from waste. For them, the most convenient option is to watch the mountains of waste growing."²²⁷.

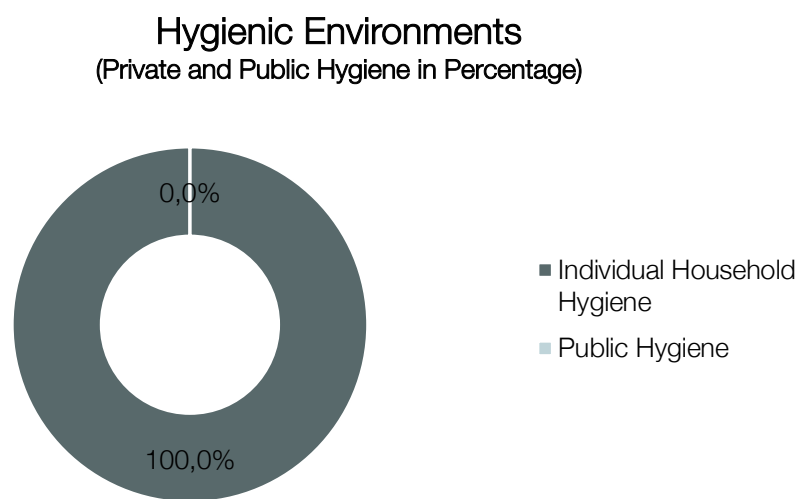


Figure 12: Focus Group Discussion Sub-Category – Hygienic Environments (own representation).

Sanitation Facilities

The next topic deals with slum residents' access to sanitation facilities. Figure 13 reveals the possible sanitary options present in slums. Overall, 53% stated to have access to individual toilets, 33% stated to use public toilets and 14% use the open space even with access to a toilet. In each visited slum sanitation facilities are present, and most people have access to private toilets. Based on statements, both private and public toilets are cleaned daily. Private toilet owners clean private toilets. Hired cleaners, which the government pays, clean public toilets. During a slum visit, one hired cleaner reported that he and his wife have been cleaning toilets for three generations. His parents passed the job on to him. The hired cleaner is at the same time a slum resident and is proud about contributing actively to general well-being. Even though toilet usage is in high demand, many elderly people continue to follow long-lasting traditions and prefer the open space rather than "fancy new sanitation technology"²²⁸.

Sanitation Facilities (Sanitary Options in Percentage)

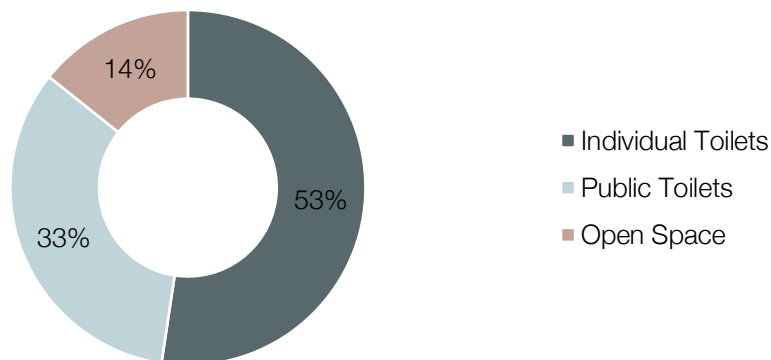


Figure 13: Focus Group Discussion Sub-Category – Sanitation Facilities (own representation).

Drinking Water

The next topic deals with slum residents' access to drinking water. Figure 14 illustrates the sources available in slums to access drinking water. Each visited slum has at least a shared water pipe. In one of the visited slums each household had additionally a private water pipe connection. Another visited slum had along with the shared water pipe, access to water via a water vending machine, locally called "water ATM". The water ATM is connected to a water tank and allows individuals to buy water whenever pipes are not working. Defect pipes are a common issue in all visited slums. In two of the visited slums, next to the shared water pipe, water bottles were also used as a source of drinking water. In all visited slums, residents confessed to having illegally constructed water pipes, as governmental promises to install legal water pipes had not been realised. Furthermore, it has been highlighted that local governments initial intention was to provide two pipes, one for drinking water and one for toilet water (wastewater). Yet, in none of the visited slums could two different water pipes be identified.

Drinking Water (Drinking Water Sources in # of 6 Visited Slums)

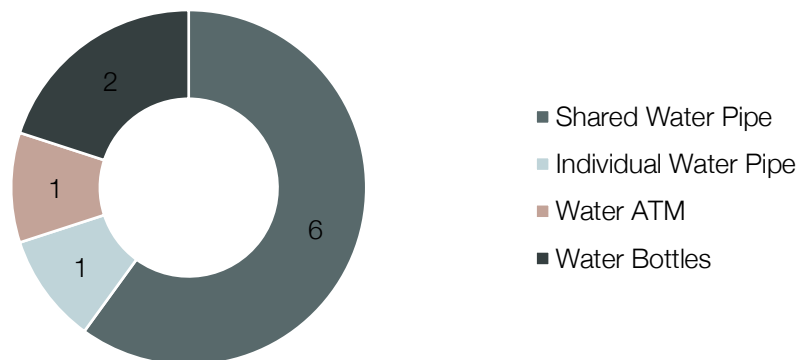


Figure 14: Focus Group Discussion Sub-Category – Drinking Water (own representation).

Food Supply

The next topic deals with slum residents' access to food supplies. In all visited slums access to three meals per day can be guaranteed, as Figure 15 illustrates. Residents confirmed that in most families, each member contributes to the family income, which is shared and ensures that a sufficient supply of food is given. Rice is the main component of meals of which 1kg costs 1 Rupee, which is equal to 0.012€. With focus on the type of dishes served, residents revealed that their alimentation follows religious customs. Mondays, Thursdays and on festival days only vegetarian meals are allowed to be prepared and consumed. The rest of the week, residents can freely decide on the consumption of meat. In most cases chicken is consumed, but beef is also common.

Food Supply (Access to Daily Meals in Percentage)



Figure 15: Focus Group Discussion Sub-Category – Food Supply (own representation).

Education

The next topic deals with access to education for children living in the visited slums. Residents highlighted their awareness of the importance of ensuring children access to education. In all visited slums it was mentioned that children join pre-school and primary school (Figure 16). In four slums visited, children have access to secondary school. In one slum visited, several children visit high school. Visiting high schools is not common for slum children, as most families cannot afford associated fees. In certain cases, children receive scholarships, which enables them to visit high school for free or parents take up loans. A main reason for the high degree of school joiners in the visited slums is the central slum location, which ensures a short distance to public schools. In two visited slums the research team was invited to join classes and get an impression of the teaching content in maths and geography. The following bullet points clarify at what age children attend school and who bears the expenses, regarding the school system in Bhubaneswar:²²⁹

- Pre school
 - Age 3.5 – 5
 - Government bears government school & parents bear private school fees
- Lower primary school: class 1 – 4
 - Age 5 – 10
 - Government bears government school & parents bear private school fees
- Upper primary school: class 5 – 8
 - Age 10 – 14
 - Government bears government school & parents bear private school fees
- Higher secondary school: class 9 – 10
 - Age 14 – 16
 - Government bears government school & parents bear private school fees
- High school:
 - Age 16+
 - Not available everywhere
 - Not paid from governmental budgets, except there exists a scholarship
 - Parents bear school fees

²²⁹ Chahatray, M.; Tata Trusts Consultant (17.03.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.

Education (Education Options in # of 6 Visited Slums)

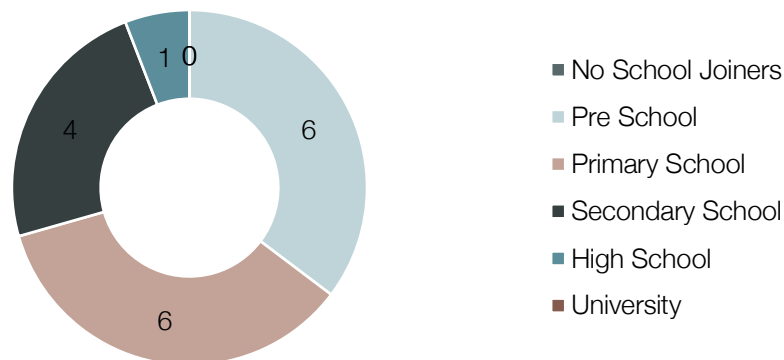


Figure 16: Focus Group Discussion Sub-Category – Education (own representation).

Health Care

The next topic deals with slum residents' access to health care facilities. Regarding Figure 17, five out of the six visited slums have access to health care facilities. Serious health concerns, such as bone fractures or high fever are treated by doctors or nearby hospitals. Less serious health concerns, such as a cold or cough are cured with homemade herbal mixtures. The visited transgender slum, is the only visited slum with no access to health care facilities. Individuals revealed their lack of social acceptance, neglect from general society and prohibition to enter health care centres. In case of illness, members of the transgender community can either hope that their illness is cured by itself or they have to live with it. Sometimes private connections enable doctor appointments, but hospital visits are strictly prohibited. In addition, the topic of health insurance was discussed. Insurance is described as a luxury service and only accessible for the formal sector society. Residents mentioned that health insurance does not accept clients without a permanent address or an address from a slum location.

Health Care (Access to Health Care Facilities in Percentage)

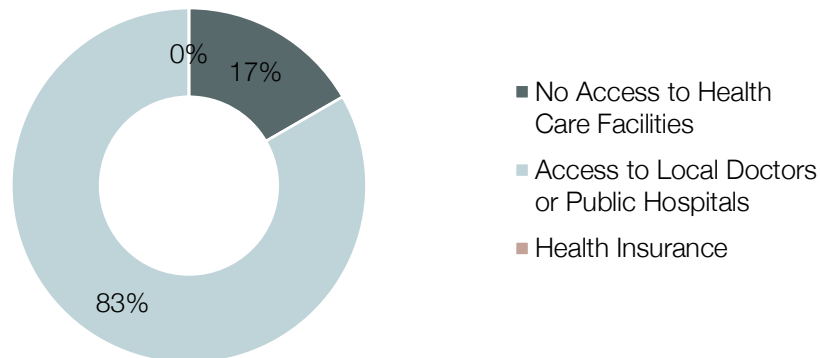


Figure 17: Focus Group Discussion Sub-Category – Health Care (own representation).

Transportation

The next topic deals with slum residents' access to and method of transportation. As primary and secondary research revealed, modes of transportation are limited for slum residents living in the outskirts of city centres, making it difficult to access zones of economic activity and pursue job opportunities, visit education facilities, etc.⁶² Private means of transport are important when public transportation runs on irregular intervals or does not exist. As already mentioned, all visited slums are located close to zones of economic activity. Still, local means of transport are in high demand. Cars, rickshaws, motorcycles, scooters, and bicycles are the main means of transport (Figure 18). Among adults, the use of rickshaws is most common, as many adults perform the job as a rickshaw driver. Among children, the use of bicycles is common, which they mostly reclaim from landfills.

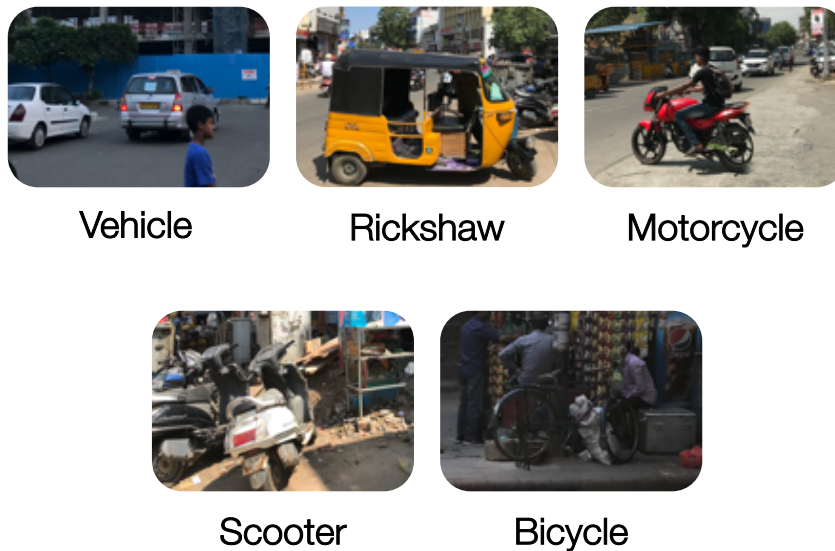


Figure 18: Focus Group Discussion Sub-Category – Transportation (own representation).

Identification of Local Concerns

Subsequent to the discussion of acknowledged problem areas based on secondary data, FGD participants were asked to express their local concerns (Figure 19). Among all FGDs the three most frequently mentioned problem areas were: land rights, financial support for area-based improvements and community influence on government actions. What all three problem areas have in common are that their countermeasures require support from individuals external to slum neighbourhoods. Regarding the topic of “land rights”, OLHM already aims to provide slums with land rights in Odisha. It will take time until slums are covered under the act. The problem area “area-based improvement” mainly takes into consideration difficulties in accessing loans from banks for local development, such as house construction. The lack of “community influence on government actions” is connected to residents’ experiences with forced eviction and redundant upgrading practices within their neighbourhood. It is perceived as a problem not to discuss projects with governments and agree on common approaches. Residents demand active participation in decision making and building networks beyond slum boundaries.

Special attention is also placed on two problem areas, which had not been expected in this form: “dead people care” and “outdoor bathrooms”. Both problem areas are perceived as unique, as they were neither addressed during expert interviews, nor can they be found within secondary data. Regarding “dead people care”, residents mentioned that there exists no adequate support for the transportation of dead people to burial places. Residents are afraid of disease transmissions and refuse to transport dead bodies in private vehicles. Regarding “outdoor bathrooms”, residents referred to washing rituals for the practice of religious customs. In some cases, religious practices are followed by taking a bath to guarantee cleanliness. Without taking a bath, residents are practically not allowed to enter the house.²³⁰ As most bathrooms are located inside dwellings, religious practices cannot be properly performed.

²³⁰ Slum Resident at Maa Mangala Sahi Basti; Slum Resident (16.11.2019): Personal Communication, Expert Interview, Bhubaneswar.

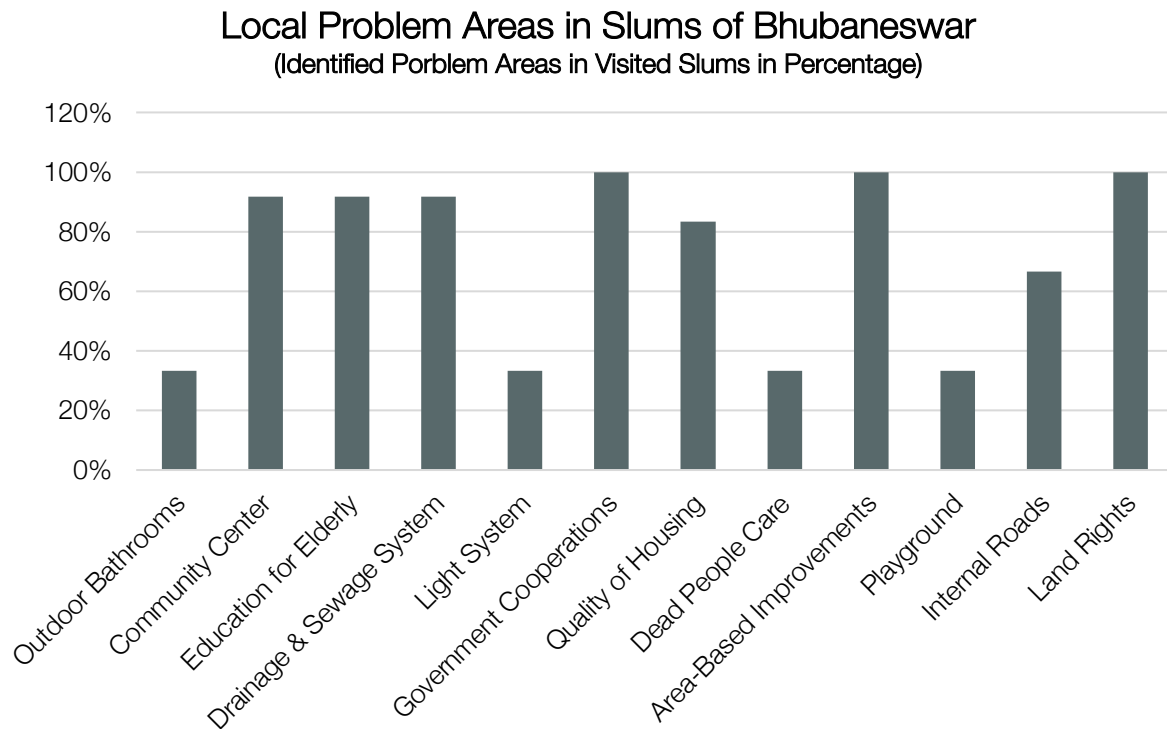


Figure 19: Focus Group Discussion – Local Problem Areas in Slums of Bhubaneswar (own representation).

In summary, the category “Management of Problem Areas in Slums” provides a broad spectrum of both expected and unique problem areas. It has been highlighted that expected problem areas based on secondary data, differentiate from realistic problem areas identified during FGDs. Regarding the thesis context, light has been shed on the nature of location specific concerns, which can also contribute to the individual perception of a liveable life. A further conclusion is that problems and associated countermeasures can not only be defined and analysed, but also classified. Problem areas can be classified into three major categories: Problems which residents can only address themselves, problems only external stakeholders can address, and problems residents and external stakeholders can only address in common. Hence, the establishment of a multi-stakeholder network prior to upgrading should serve as an integral component when addressing problems. As research revealed so far, little effort has been made on participatory strategies during slum upgrading that combines local know-how and expert know-how. Residents clearly expressed their desire to extend social networks beyond slum boundaries. An “integrative upgrading framework” would open up opportunities for higher intrinsic motivation and collaborative slum upgrading approaches.

4. Stakeholder Identification – Slum Resident Perspective

The category “Stakeholder Identification” aims to identify stakeholders external to slum neighbourhoods, which slum residents consider relevant in slum upgrading. As the thesis’s intent is to develop an approach that considers location specific relevance and active

participation of key stakeholders in slum upgrading, stakeholders are identified whose expertise is considered to support sustainable approaches.

During the FGDs five different types of external stakeholders were identified (Figure 20): Non-governmental organisations, financial institutions, Tata Trusts, formal sector neighbours, local government/area co-operator. In all visited slums, non-governmental organisations are regarded most highly due to positive experiences from previous collaboration. Residents highlighted that some NGO members originate from their neighbourhood, which improves working conditions and streamlines collaboration. In four out of six slums, financial institutions, such as banks are considered essential in the provision of financial assistance. Residents emphasised dependency on micro-credits for the renovation of living units and seed capital for businesses. It is often the case that the granting of credit is refused due to the absence of a personal address, diminished income, or fixed-term employment contracts. In four out of six slums, Tata Trusts is perceived as a key stakeholder in upgrading, as they are a central component in the realisation of OLHM. At the time when FGDs were conducted, Tata Trusts' team did not intervene in any of the visited slums, but residents were aware from reports of nearby upgraded slums under the mission that their contribution initiates holistic changes.

In three out of six slums, adjacent neighbours are perceived as significant due to their proximity to slums. Residents primarily mentioned negative experiences with adjacent neighbours, but they believe that a shift in attitudes and formal neighbours' willingness to accept and support slum neighbourhoods could raise slum conditions. In three out of six slums, the government is perceived as a relevant supporter in slum upgrading due to its high status in society and general power in decision making. Still, residents raised concerns in respect to governmental reliability, which is the result of false promises in the past. Residents perceived that openness and proximity create authenticity and transparency, which helps actions to gain popularity within slum communities – "local governments neither strive for openness, nor for proximity".²³⁰ One resident reported that "taking care of slums not only benefits slum residents, but the entire city can benefit from improved living conditions and a sustainable city structure." Local governments are aware of the poor conditions in slums, but their inability to set social priorities is reflected in their missing concern for slums. Still their contribution is valued, as their funds are in most cases the basis for any type of change".²³⁰

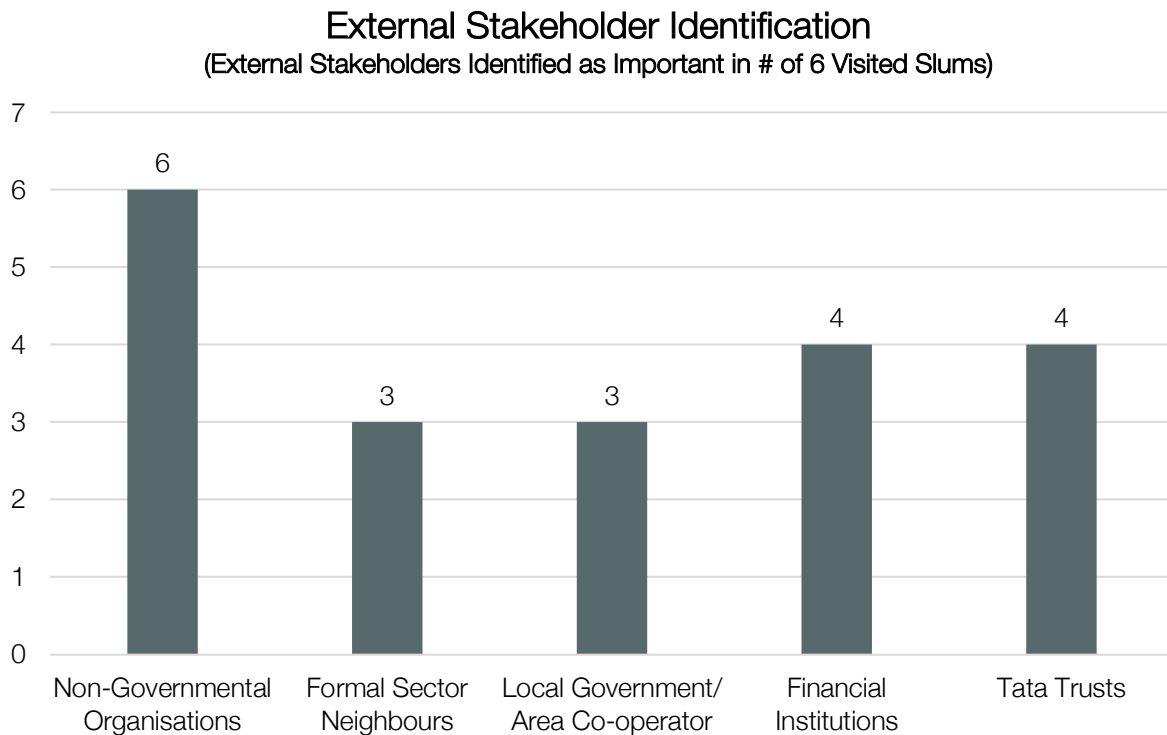


Figure 20: Focus Group Discussion Sub-Category – External Stakeholder Identification (own representation).

It can be concluded that residents consider non-governmental organisations and Tata Trusts as the most important external stakeholders during slum upgrading. Trustworthiness, grounded communication, and honest interests contribute to reliability in approaches. Still, it has been mentioned that up to the time of writing, the local community manages general upgrading independently with a minimal use of resources and maximal risk in outcomes. There is a need for collaborative problem-solving at community level through external stakeholder support. Associated expert know-how plays a significant part in leveraging competencies for the purpose of sustainability in upgrading.

Conclusion

The conduction of six focus group discussions in slums located in Bhubaneswar, enabled the identification of essential characteristics, which could not be concluded in its entirety from secondary data. Especially intense discussions with residents and walks through slum neighbourhoods created a realistic image of the status quo in slums. Residents soldered and welded without protective equipment, children bathed in dirty rivers and street food vendors fried food in enclosed spaces, inhaling smoke several hours a day. In most households, women and men are working daily without holidays or privacy. Respect, decency, honesty, and social values form the foundation of their life, giving them support and orientation. Residents highlighted that the appreciation of “social values” in slums make inhabitants survival artists that take nothing for granted and appreciate what they have without complaining.

Within FGDs, residents emphasised that slums can be categorised as economic powerhouses where cleaners, drivers, sex workers, servants, leather workers, metal workers, waiting staff and many other trades flourish. The informal sector displays a parallel economy, which is often declared as a problem by formal society; but they are often blind to the fact that informal workers are the ones supporting the middle and upper class in their comfort. Further, within FGDs, residents shed light on their demand to actively participate in upgrading projects. Residents are willing to personally contribute to local development, want to feel a sense of ownership and prefer dialogues beyond their slum boundaries. When developing slums, it is important to step back from prejudices about settlements and view them for what they are. Not just areas of misery, but a place in which many people have lived for generations, a place they call home.²³¹

A major outcome of the first research phase are the liveable life indicators (sub-elements). In total, 16 liveable life indicators have been identified and assigned to four main-elements: (1) Safety (Neighbourhood Safety, Tenure Security, Formal Employment, Natural Hazards); (2) Service (Health Care Services, Education Facilities, Areas of Economic Activity, Public Transport Services); (3) Society (Social Assistance, Financial Assistance, External Neighbourhood Relations); (4) Space (Physical Space, Basic Services, Adequate Housing, Green Infrastructure, Neighbourhood Cleanliness, Community Centre).

To consolidate results of the first research phase, a second research phase was conducted. The next chapter covers insights gained in the second research phase. As already mentioned in the Methodology, only experts with a direct link to Odisha's Liveable Habitat Mission are interviewed and focus group discussions are not conducted. Covered themes in the second research phase with a direct link to major outcomes of the first research phase are as follows: Participative upgrading approaches, stakeholder collaborations and the focus on liveable life elements within OLHM.

4.2 Second Research Phase

Preface of the Second Research Phase in India

The results of the first research phase led to a pre-specification for participative upgrading approaches, a pre-selection of stakeholders to be considered in upgrading and a pre-definition of a liveable life within slums located in Bhubaneswar. The second research phase consolidates all three themes for the development of a holistic upgrading approach to guide sustainable slum upgrading; and practical recommendations for the realisation of the developed upgrading approach under consideration of digital tools in Smart Cities.

²³¹ Mehra, C. (2020): From Dharavi to Sao Paulo's favelas, a Covid-19 response must engage the communities that live there, retrieved from <https://scroll.in/article/960980/from-dharavi-to-sao-paulos-favelas-a-covid-19-response-must-engage-the-communities-that-live-there> (09.05.2020).

A major outcome of the first research phase are the liveable life indicators. In total, 16 liveable life indicators have been identified and assigned to four main-elements. These indicators are further analysed in the second research phase. As research revealed, local liveable life perceptions deviate from upgrading components under OLHM. Therefore, it can be assumed that the design of slum upgrading approaches could improve under consideration of locally-rooted liveable life perceptions. During the time of the first research phase, pilot projects of OLHM took place. During the time of the second research phase adaptations in OLHM based on outcomes of the pilot projects took place. Therefore, the second research phase aims to analyse if local liveable life indicators received greater attention in upgrading.

4.2.1 Expert Interviews – Second Research Phase

This section will introduce the findings of expert interviews conducted with slum upgrading specialists located in Bhubaneswar. As already mentioned, based on the research carried out in 2019, a second research phase was implemented in 2021 to consolidate findings. In total, six expert interviews were conducted, of which all possess extensive knowledge about and have been or still are integrated within Odisha's slum upgrading program "Odisha's Liveable Habitat Mission" (OLHM). For the second research phase a semi-structured questionnaire was developed (Appendix C).

For reasons of clarity, a short recap of the phases associated with the upgrading process under OLHM is given. The mission's first phase focused on the identification and demarcation of slums. This took place within a timeframe of 20-40 days per city in 2017 and included drone surveys for slum demarcation and mapping, as well as bureaucratic processes. The second phase, which is still ongoing, focuses on slum upgradation. Pilot projects started in November 2019, followed by a scale-up in November 2020. From November 2020 to April 2021, 500 slums were upgraded. Those slums were able to be upgraded within a short period of time, as they were not lacking basic facilities. Basic facilities were either in place but were not functioning or were easy to (re-)build, due to locational advantages or necessary infrastructure already in place. Each step conducted under both phases within the mission is well known among the interviewed experts.

Based on the structure of the questionnaire, four thematic areas have been scrutinised under which each a selection of questions was asked. In the following, a summary of each thematic field is provided. The thematic fields are as follows: Participatory Approaches, Responsiveness & Risk Awareness, Stakeholder Network and Liveable Life & Slum Habitat.

1. Participatory Approaches

The first thematic area addresses the use of participatory approaches within OLHM. Experts reported that slum residents' participation within upgrading is one of the most important factors when considering slum upgrading under the mission. The local community forms the main stakeholder, and their involvement is regarded as a main component for the guidance of upgrading. As the size of slum residents varies among areas, participation can only be guaranteed to a certain extent. In most cases, it is impossible to integrate the entire community within upgrading. For this reason, experts reported that a Slum Dweller Association (SDA) is defined within each slum. The SDA is composed of a slum lead and selected individuals or a group of very well-connected members of the community who speak on behalf of the slum during upgradation. Next to tracking the standardised upgrading procedures, the SDA also collects upgrading proposals from the community, which are forwarded to supporting institutions. Experts emphasised that residents' intense inclusion in upgrading created a dynamic that also raised personal financial investments at each location, reinforcing upgrading results. Likewise, increasing awareness of the importance of hygienic environments and the need for education. Experts reported that residents started to develop future perspectives for personal capacity building and a better standard of living, which had previously not been the case.



Photograph 1 (left): Interior Cooking Space (own representation).

Photograph 2 (right): Exterior Cooking Space (own representation).



Experts also stated that several upgrading approaches would have failed without residents' active participation. For example, the construction of cooking spaces. Based on OLHM it was originally planned to provide each unit with an interior cooking space. Discussions with residents revealed that interior cooking spaces are less demanded, due to a decrease in unit space and poor air quality resulting from firewood smoke. Accordingly, kitchens were built outside each unit (Photograph 2). Already during slum visits in 2019 (Photograph 1) it was visible that street food vendors prepared "Puri" (Fried Dough Balls) in their interior cooking space. Inhaling smoke several hours a day can negatively affect people's health and contribute to respiratory diseases.

Next to the optimisation of upgrading results, participatory processes are considered by experts to have a direct relation to the personal ownership of a living space, as well as to the sense of social integration. Experts noted that with the upgrade, residents started to proudly call themselves a part of the city. They developed a sense of belonging towards their neighbourhood community. Whereas earlier, they used to feel ashamed while talking

about their residence in slums. Thus, upgradation has changed people's perspective towards their self-perception and own community.

Regarding further changes that are needed at local slum level to optimise the outcome of participative upgrading approaches, experts referred to the facilitated integration of the entire slum community. So far only SDA participation is guaranteed. Still, it is important to ensure that general participation and comprehension exists as part of servicing upgrading components. The use of e-participation in the form of a mobile phone application can overcome this burden. Experts highlighted that at least one member of each slum family possesses a mobile phone. An application would allow residents to more easily vote, raise concerns, or integrate themselves. This not only ensures holistic participation in the construction of upgrading components or maintenance of installed infrastructure, but also enhances commitment to approach better liveability aspects in the long term.

2. Responsiveness & Risk Awareness

The second thematic area analyses the responsiveness and risk awareness of key stakeholders in the development of slums under OLHM. In the context of responsiveness, experts emphasised that in order to respond to local characteristics and ensure swift upgrading, two visits per slum are scheduled. The first slum visit serves to create a slum map and communicate the missions' objectives to the SDA. The second slum visit involves the physical upgrading. Maintenance activities post upgrading have not been mentioned. Still, during upgrading responsibility is split among supporting institutions and the local community. Community integration aims to train residents on maintaining development work independently. In some cases, residents are invited to upgraded slums for exposure visits to showcase the 'before' and 'after' situation of upgrading. One expert revealed that residents tend to have rather low expectations, are fine with what they have and do not complain about current living conditions. Yet, upgrading and contacts to outside parties are always welcome, even if expectations aren't always accurate. It has been reported that during a slum visit a resident came to one of the upgrading experts and asked: "Sir, are you going to turn our small settlement into a digitally advanced living area?", the upgrading expert replied: "No, we come here to provide you with water and other basic facilities, amenities like parks, community halls etc. It is nothing fancy, only the provision of basics [...] just like in formal settlements to improve your life and bring it at par with the neighbouring formal citizens"²³².

In the context of risk awareness, experts revealed that risks take root in various dimensions and are location dependent. The most common risk during upgrading is scepticism. Residents' scepticism of planned upgrading tends to restrict participation and involvement in the upgrading process. To overcome this risk, experts involve residents from the start of the actual upgrading and allocate tasks that emphasise their contribution. The

²³² Tripathy, B.; GIZ Technical Advisor (10.02.2021): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.

second most common risk is jealousy of nearby slums. It can happen that certain slums in the city are part of current upgrading but others at a later stage. To overcome this risk, any slum located in the direct vicinity of the current slum to be upgraded is informed that all slums will at one point be considered for upgrading. The third most common risk are shared solutions for multiple slums. Sometimes only one park is built and accessible for three slums. In certain cases, the park is geographically closer to one slum than to the other two and residents complain about unfair treatment. A main determinant for park locations is space. To overcome this risk, concerned residents are informed of the amount of space needed for parks, and their final location and accessibility are dependent on what space is available. The fourth most common risk are bottlenecks in implementation processes due to governmental fund delays and a lack of technical skills. Many projects end before construction is completed, as the budget for further construction is insufficient. To overcome this risk, experts reported that development work only takes place when budgets meet construction scopes prior to upgrading and supporting stakeholders possess well-founded specialist knowledge.

3. Stakeholder Network

The third thematic area analyses the different types of stakeholders involved within OLHM. Interviewees mentioned that the range of integrated parties within slum upgrading is decisive. Different perspectives enhance the guidance of upgrading work and opportunities arise through new collaborations. All interviewees mentioned that the main stakeholders within upgrading in Bhubaneswar are local slum residents, SDAs (Slum Dweller Associations)/RWAs (Resident Welfare Associations), Government of Odisha, Tata Trusts, technical agencies and NGOs. SDAs/RWAs are the main stakeholder in slums, which communicate, select and support upgrading. Tata Trusts is the main stakeholder external to slums, that gives technical support to the project. Local NGOs are only involved in the initial upgrading phase to conduct household surveys for research purposes. Interviewed experts reported that the reliance on and collaboration with the local community goes particularly well when involving different parties during the entire upgrading process. Starting from a local status quo assessment, through planning, to execution. Various examples demonstrated the excellent internal communication in slums to facilitate upgrading implementations, such as blocking streets for construction work or communicating alternative development suggestions for implementation improvements.

A weak point is capacity building of stakeholders at city level and overly ambitious project deadlines. Capacity building is needed to ensure well-founded specialist knowledge of supporting stakeholders and involves general awareness of building typologies, technologically advanced solutions and how to practice mentorship. Experts emphasised that it has to be ensured that supporting institutions are able to professionally implement significant upgrading components. The deficiencies in and urgent needs for capacity building were discussed in a meeting with the Urban Habitat Lead of Tata Trusts in November 2020 (Expert Interviews were conducted in 2021).²⁰⁰ This indicates that capacity building displays a continued threat in upgrading frameworks, which has remained unresolved.

Further, poor communication among stakeholders has been criticised. One interviewee reported that a lack in communication has in the past contributed to misguided development in slums. In certain cases, different stakeholders acted independently from each other and undermined expectation sharing, which decreased conditions for sustainable development. Time pressures also impeded stakeholders' contribution. The government introduced fixed time limits for developmental work, which make it difficult to deal with topics holistically. It can be the case that upgrading is finalised within a certain section of a slum, but once time limits expire, other parts of the slum remain incomplete. Interviewees suggested establishing records of common implementations to facilitate upgrading at other locations. Lastly, governmental performance on the registration, regularisation, and empowerment of SDAs/RWAs was criticised. Experts emphasised that SDAs/RWAs receive rather less recognition from governments, in comparison to SHGs (Self Help Groups). SDAs/RWAs are the frontline stakeholders living in slums, who are meant to specify the direction of local upgrading and are the best informed about local systems. Enabling SDA/RWA members to form federations can be important to keep motivation, strengthen engagement and improve working conditions.

4. Liveable Life & Slum Habitat

The fourth thematic area analyses to what extent locally-rooted liveable life perceptions are considered in the development of slum habitats under OLHM. Within the context of a liveable life, it was – as in the questionnaire in 2019 – aimed at identifying an upgrading expert's perception of what it means for a slum resident to live a liveable life. Upgrading experts in this context are members who decide on development aspect within slums. For this reason, analysing an upgrading expert's assumptions about a liveable life in slums and comparing it to realistic perceptions of slum residents is considered key to identifying factors that enhance or diminish sustainable upgrading.

All interviewees considered their personal perception of a liveable life to be the same for slum residents. In the following, the most mentioned liveable life perceptions are summarised: Have a family, personal well-being, access to basic facilities, frequent bus route connections, shops in the direct vicinity, hygienic environments. With reference to the focus group discussions in 2019, it can be summarised that local experts lack awareness about slum residents' holistic and realistic liveable life perceptions (Table 2 vs. Table 4).

Conclusion

Upgrading work under OLHM follows a strict participative nature, which might be the determining factor for high success rates and swift implementation measures in Bhubaneswar. With the finalisation of pilot projects, experts revealed that residents want to move beyond the six general habitat services implemented. The main areas of interest are social factors and the general beautification of slums, such as improving waste management for healthier and cleaner environments. Residents also demand meaningful

work, formal integration, and the continuation of the mission to finance further developments. This shows that the pre-defined focus areas for upgradation under the mission display a basis for local improvement, but not a final condition that contributes towards a liveable life. In the short run, current upgrading might not have negligible effects, but in the long run the sustainability of upgrading approaches might neglect local needs in their entirety and settlements could easily revert back to old patterns.

4.3 Preliminary Results – First & Second Research Phase

This part will summarise the research results of the first and second research phase, which led to a specification for participative upgrading approaches, a selection of key stakeholders to be considered in upgrading and a definition of a liveable life within slums located in Bhubaneswar. All three themes have been analysed from an expert and slum resident perspective. The enhanced focus on only three of the various discussed themes is justified with the argument that they are most relevant to answer the thesis research questions. Supplementary insights display supporting information and are used to reinforce arguments within the course of the thesis. In the following, key insights gained from this section are briefly summarised.

Based on the theme “participative upgrading approaches”, a similar comprehension, but not execution of the term is identified within both research phases, when comparing expert’s and slum residents’ perspectives. Research found that in reality experts limit participation to the minimum. Within OLHM it has been identified that only one meeting with the community takes place to identify the local status quo prior to the establishment of the six general habitat services. Intervening in densely packed slums requires working closely with communities. Community participation aims to entail active citizen involvement in all aspects of a strategic development plan and its implementation. Implementing scarcely negotiated upgrading components tend to lack durability or trigger resistance. Residents confirmed that participation is in high demand but rarely practiced. Within slums exists the will to cooperate and personally contribute to improvements of living locations. External know-how provides residents with a basis for independent actions to achieve set targets systematically. A more integrative approach of slum residents is needed to develop and streamline upgrading.

Based on the theme “key stakeholders to be considered in upgrading”, similarities are identified within both research phases, when comparing experts’ and slum residents’ perspectives. The only difference is that the experts’ vocabulary and knowledge of different stakeholders exceeded those of slum residents. This can be traced back to the fact that slum residents are not familiar with all the different professional terms used by stakeholders involved in upgrading. Research revealed that overall engagement in upgrading is mainly based on the type of collaborating actors. Therefore, the selection of key stake-

holders in upgrading is decisive. Slum residents mainly differentiate between governmental officials, direct neighbours (formal sector society), like-minded actors (mostly NGOs) and foreigners (international aid agencies, based on outer appearance/skin colour).

Next to involving the optimal stakeholder selection within upgrading, co-operation is also decisive. Interviews revealed that upgrading productivity is highly dependent on stakeholders' willingness to cooperate and differentiates among stakeholders with a high influence and high interest compared to those with low influence and low interest. It is common that upgrading includes engineering work. Still, in very few cases do engineers possess mentoring skills to actively involve or advise residents. Social workers on the other hand are known to possess the right mentoring skills. In such cases, an optimal solution would be a cooperation among engineers and social workers to facilitate upgrading work with local residents and co-produce local solutions.

Based on the theme "liveable life perceptions in slums", disparities are identified within both research phases, when comparing experts' assumptions about realistic perceptions of residents. In the first research phase, experts suggested that physical/materialistic aspects frame a liveable life in slums. In the second research phase, experts equated personal liveable life perceptions with that of slum residents. It is important to mention that the topic has a highly subjective nature; no one will be discriminated against based on their statement of assumptions or facts. It has been identified that slum residents' liveable life perceptions are mainly concerned with interpersonal and immaterial values. The main finding is that local circumstances, individual lifestyles, and community factors shape liveable life perceptions, which individuals external to slums tend to be unaware of, but whose awareness and respect can be an important factor in the design of upgrading.

Locally identified liveable life indicators, despite originating from different slum locations and resident perspectives, have significant overlaps and synergies as research verified. This leads to the assumption that indicators identified at different slums, but within the same area can be generalised. With a generalisation of indicators in a defined area, upgrading components can be uniformly implemented and with every slum in that area deriving equal benefits. A generalization of indicators for a given area is important, as not every single slum can be analysed individually on its liveable life perspective. The analytical aspect would be too extensive and the upgrading itself would be significantly delayed.

Analysing the various liveable life indicators based on the results of FGDs, four fundamental main-elements can be identified. These main-elements aim to categorise the 16 liveable life indicators (sub-elements). Categorisations enable a better orientation among the different indicators and serve interpretation and evaluation purposes. The following main-elements have been identified: safety/service/society/space. Sub-elements (liveable life indicators) that are categorised among the main-elements can be ordered by priority and aim to shape slum upgrading designs. To what extent main-elements and sub-elements

can provide a practical tool for sustainable upgrading formats within underserved urban settlements will be further discussed in Chapter 5.

A lesson learnt is that there is no one-size-fits-all plan for optimal upgrading. Various slum upgrading schemes have conducted countless surveys, invested considerable sums and applied the concept of “participation”, but still failed because anticipated best practices and perceptions of optimal solutions overshadowed realistic demands at local level. What and how something aims to achieve needs to be tailored to local conditions and requires iterated cycles of learning and feedback, rather than a single status-quo meeting. Slum upgrading takes time to embed solutions at local level. Instead of implementing swift results (reference OLHM), upgrading processes should respect steps that keep to the local pace and ensure sustainability in approaches. This research verified that considering locally rooted liveable life indicators addresses the trade-off between sustainable development designs, participation and local relevance in slum upgrading.

5 A Liveable Life Index

The intense focus on creating worldwide liveable areas peaked in 2015, with the international acceptance of the Sustainable Development Goals (SDGs), followed by the New Urban Agenda (NUA) in 2016. Liveable areas became a priority, and the concept of liveability evoked a new sensibility for sustainable improvements for human life.⁵¹ Still, a definition of “liveable life” indicators or a concept to identify “liveable life” indicators within slums is missing.^{44, 233, 234} Aligning the trend of liveability with the thesis’s informal settlement context, it is important to identify the interpretation of a liveable life from a slum resident perspective. Literature reveals that liveability indices are mainly calculated by taking a quantitative approach to evaluate performance at general urban levels, rather than focusing on a qualitative approach within defined urban zones or differentiating between social classes and individual perceptions.^{235, 236, 237, 122} Focusing on India, the Ministry of Urban Development prescribed 79 liveability indicators, but they follow solely mathematical terms and disregard social differences or indicator interdependencies with no specific focus on informal settlements.²³⁸

The concept of a liveable life within this thesis focuses on the social patterns of informal areas and takes into consideration liveable life indicators relevant at slum level.^{44, 235} To continue the discourse on a “liveable life”, it is important to specify the term itself. Based on secondary research a generally accepted definition of a liveable life in slums has not been identified.²³⁹ However, authors like Hick et al. (2019) provided methods to systematically identify and monitor subjective meanings of the quality of life. To achieve a scientifically based conclusion, the thesis specific definition of a “liveable life” is a combination of primary research (EIs & FGDs) and secondary research (Higgs et al. and Perkins).

²³³ Onnom, W.; Tripathi, N.; Nitivattananon, V.; Ninsawat, S. (2018): Development of a Liveable City Index (LCI) Using Multi Criteria Geospatial Modelling for Medium Class Cities in Developing Countries, in: *Sustainability*, Vol. 10, No. 2, p. 520.

²³⁴ Prieur-Richard, A. H.; Walsh, B.; Craig, M.; Pathak, M.; Connors, S.; Bai, X.; Barau, A. S. (2019): Global Research and Action Agenda on Cities and Climate Change Science, World Climate Research Programme, No. 13/2019, p. 20.

²³⁵ Kovacs-Györi, A.; Cabrera-Barona, P.; Resch, B.; Mehaffy, M.; Blaschke, T. (2019): Assessing and Representing Livability through the Analysis of Residential Preference. *Sustainability*, Vol. 11, No. 18, p. 4934.

²³⁶ Badland, H.; Pearce, J. (2019): Liveable for whom? Prospects of urban liveability to address health inequities, in: *Social Science & Medicine*, Vol. 232, p. 94-105.

²³⁷ Lowe, M.; Arundel, J.; Hooper, P.; Rozek, J.; Higgs, C.; Roberts, R.; Giles-Corti, B. (2020): Liveability aspirations and realities: Implementation of urban policies designed to create healthy cities in Australia, in: *Social Science & Medicine*, Vol. 245, p. 112713.

²³⁸ Ministry of Urban Development Government of India (2017) Methodology for Collection and Computation of liveability Standards in Cities, retrieved from <http://164.100.161.224/upload/uploadfiles/files/MethodologicalReportFinal.pdf> (24.04.2020).

²³⁹ D. Hick; A. Urban; J. R. Noennig (2019): A Pattern Logic for a Citizen-Generated Subjective Quality of Life Index in Neighborhoods, in: 2019 IEEE 2nd Ukraine Conference on Electrical and Computer Engineering (UKRCON), pp. 1282-1286.

Higgs et al. (2019) views liveability as the “quality of life in a certain community, measured by the resident’s satisfaction with the residential environments, safety, attractiveness, crime rate, education, and employment opportunities, social cohesion and inclusion or amount of open space”⁴⁴. Perkins states that “livability thus touches on sustainability, quality of life, and place, giving special attention to people and their location.”²⁴⁰ ‘Place’, reflects the “particular environmental features and socially constructed settings in which people interact with each other and with nature” (ibid.). To highlight location-dependent community perceptions, decrease the focus on specific liveability indicators and leave room for location specific interpretations, Higgs et al. and Perkins framework merge with the thesis’s specific primary research results on a liveable life. The following definition is considered a liveable life within this thesis: *A liveable life is measured by the relation between locally-rooted qualitative living components in a community and the local residents’ perception of satisfaction.*

Implications for General Liveability Studies

Having specified the term itself, in the next step the implications for general liveability studies are highlighted. The lack of liveability studies prior to upgrading in slums often lead to the assumption that providing basic services (e.g. safe housing, electricity, drinking water and sanitation), automatically lead to overall neighbourhood improvements.²³⁵ Likewise, it is the case within OLHM. The mission has a fixed agenda to upgrade slums located in Odisha, allowing room for participation, but with rather little focus on upgrading measures beyond the six set verticals (road, drain, sanitation, water supply, electricity, and streetlight). As already discussed, top-down approaches and perceptions of optimal solutions at local level disregard the focus on individual preferences and opportunities. Neglecting local preferences has been identified as contributing to a loss in sustainable upgrading results.^{51, 241} In general, only limited guidance exists on the different perspectives of living a liveable life in a community or country context, be it in formal and informal communities or low and middle-income countries.^{44, 122}

Standardised liveable life indicators, just as they are found within formal communities, can rarely be related to indicators within slum neighbourhoods.^{53, 242} Especially in countries where a large proportion of the population lives in informal neighbourhoods without access to basic services and infrastructure, a liveable life varies.^{235, 243} The need for a stronger focus on and understanding of a liveable life in socially deprived communities also evolves from Goal 11 of the SDGs, which 193 nations adopted. Goal 11 depicts the

²⁴⁰ Perkins, N. D. (2008): Livability, Regional Equity, and Capability: Closing in on Sustainable Land Use, in: University of Baltimore Law Review, Vol. 37, No. 2, p. 157-202.

²⁴¹ Leby, J.; Hashim, A. H. (2010): Liveability Dimensions and Attributes: Their Relative Importance in the Eyes of Neighbourhood Residents, in: Journal of Construction in Developing Countries, Vol. 15, No. 1, p. 67–91.

²⁴² Jain, V.; Chennuri, S.; Karamchandani, A. (2016): Informal Housing, Inadequate Property Rights: Understanding the Needs of India’s Informal Housing Dwellers, in Reimagining Social Change, p. 10.

²⁴³ Haque, I. (2016): Infrastructure Development and Access to Basic Amenities in Class-I Cities of West Bengal, India: Insights from Census Data, in: Journal of Infrastructure Development, Vol. 8, No. 1, p. 36-84.

target of making cities and human settlements inclusive, safe, resilient, and sustainable.²⁷ The New Urban Agenda, seen as the delivery vehicle for the SDGs, goes one step further and mentions “enhancing liveability [...] for all”²⁴⁴ as an interlinked principle of SDG Goal 11. As of now, analysing locally-rooted liveable life indicators relevant for participative slum upgrading has not been done.⁴⁷ Yet, it is important to understand how liveable life indicators relevant in slums can be contextualised and used as a lever for participative slum upgrading in urban areas.

Contextualising liveable life indicators relevant for slums

The next section discusses a Liveable Life Index (LLI) and associated key performance indicators (KPIs), which can be used at policy level as a location specific guideline for the design of slum upgrading projects. Generally speaking, an index is a key figure from which certain KPIs can be clearly identified to guide decision making.²⁴⁵ With a few glances, actions can be facilitated and enhanced. In the context of the LLI, every liveable life indicator which shows poor performance implies a need for improvement. For example, if the *Waste Management KPI* (monthly frequency of professional waste pick-up in a defined slum) measures a 1, the indicator implies that waste management should be an action item in that specific slum upgrading project.

5.1 Formulating a Liveable Life Index

The Liveable Life Index contains indicators designed to assist cities in preparing for slum upgrading projects. To reduce vulnerability of the urban poor, these indicators will support cities in engaging relevant stakeholders and primarily slum residents; apply collaborative methods; and use information and communication technologies. The indicators can be used to improve liveable life conditions in urban slum neighbourhoods by promoting collaborative approaches to governance at slum neighbourhood levels. This involves the acknowledgement of essential upgrading elements in slums. The indicators (sub-elements) are classified into main-elements to denote areas of application. This classification has no hierarchical significance and is organized alphabetically according to the main-elements. All indicators shall be compiled on demand in preparation for slum upgrading projects. For data interpretation purposes, it is important to take into consideration a contextual analysis when interpreting results. For example, the local environment or culture can affect the capacity to apply indicators. Additionally, it is important to review the results of multiple types of indicators across elements. Focusing on a single indicator can lead to a biased conclusion. Lastly, potentially antagonistic effects (positive or negative) of particular indicator outcomes also have to be acknowledged when analysing results.

²⁴⁴ Linking the SDGs with the New Urban Agenda (2020): SDG11: Sustainable Cities & Communities, retrieved from <https://www.sdgnewurbanagenda.com/sdg11--sustainable-cities---communities.html> (10.01.2020).

²⁴⁵ Gerginov, D. (2021): Index – Definition, Arten & der DAX als Beispiel, retrieved from <https://www.gevestor.de/finanzwissen/aktien/indizes/indizes-definition-was-einen-index-auszeichnet-642771.html>.

As a basic structure, the LLI consists of a fixed and variable component. The fixed component, which display the basic LLI framework, consists of four main-elements (safety/service/society/space), Figure 21 (light blue box). The variable component, which display 16 locally measured sub-elements, form the liveable life indicators (e.g. tenure security, social assistance, basic services, etc.), Figure 21 (dark blue box). Each main-element has different sub-elements. Each sub-element is location-dependent and reflects a liveable life indicator which measures local performance and implies the need for improvement. Here a general method for developing a LLI is provided, but no generally applicable instructions for concrete slum upgrading. However, instructions can be derived, once a LLI is developed at local level for a defined area.



Figure 21: Liveable Life Index (own representation).

5.1.1 Liveable Life Index – Key Performance Indicators

In the following, each key performance indicator (KPI), also known as sub-element within the LLI will be described and its parametrisation substantiated. As secondary research verified, there exists an abundance of liveability indices/quality-of-life rankings which have

been criticized in certain aspects.^{246, 247} However, existing liveability indices have in common that they do not concentrate in specific on slum residents to provide guidance for slum upgrading projects at local scale. A set of liveability indices and modifications thereof will be discussed in a Chapter 5.2. Below the different LLI KPIs are discussed.

Baselines and benchmarks can be formulated based on different options: national & regional guidelines, scientific literature, development goals (SDGs to city level), etc. The most common way is to negotiate the benchmark after mapping the status quo and agree upon a goal definition. The baseline and benchmark can be used as a start and end point for development or be set gradually to display multistep development, e.g. the annual benchmark percentage of households with access to sanitation in a defined slum is set to increase by 2.00%. For example, the classes (non-existent, application rejected, application approved, partially existent, existent) would correspond to 0%-20%, 20%-40%, 40%-60%, 60%-80%, 80%-100%. In this case sub-classes can likewise be formulated.

In case parametrisation of indicators is not possible, the KPIs can be qualitatively assumed, as exemplified within Table 5. Ordinal classes are formulated to express the contentment of stakeholders. Endpoints would be complete target accomplishments and complete absence or status quo. The classification is broken down into 5 classes/scale designations, corresponding to 20% steps, expressing the progressive goal fulfilment. The range of objectives and the classes to be formed can be determined on a case-specific basis. It is important to agree on a uniform definition with the stakeholders at the beginning of the process, which includes the attitude of all stakeholders.

With the separation into classes, a simplified calculation can be ensured. To provide an overview of LLI results, a radar chart is most suitable. The radar chart is particularly useful for comparing multiple data series. Each data series/KPI is represented by two lines. One line reflects the actual status and the other the target status of the KPIs. Additionally, further progress can be integrated by displaying multiple points in time. Target fulfilment or an optimal condition exists when the actual-state line and target-state line are congruent. Hence, for the formation of a radar chart, next to the actual state (LLI results/current state) in a defined slum, also the target state (optimal state) in a defined slum must be set. The target state can be defined normatively, as well as relatively to the existing situation. In some instances, normative goal formulations make more sense (e.g. in two years four schools should be built), while in other instances relative goals make more sense (e.g. in two years illiteracy rate of residents should be reduced by 25%).

Main-elements of the index were selected as follows: Contributions documented during primary research concerning liveable life indicators in slums were classified. In the next

²⁴⁶ Conger, B. (2015): On Livability, Liveability and the Limited Utility of Quality-of-Life Rankings, in: SPP Research Paper, No. 7-4.

²⁴⁷ Arpan, P.; Joy, S. (2020): A critical review of liveability approaches and their dimensions, in: *Geoforum*, Vol. 117, p. 90-92.

step literature was reviewed to find corresponding classifications of indicators for slum upgrading. The highest correspondence to data collected during primary research in slums was found between indicators measuring SGD 11 in slums as defined by UN-Habitat in 2003.³ Thus, the chosen system is both locally referenced and comparable to other cases, as the SDG taxonomy is widely applied.

1 Safety

1.1 Neighbourhood Safety

General

Neighbourhood safety focuses in specific on the crime rate in a defined slum. As primary and secondary research verified, there exists a relation between slum location and crime rate.^{248, 249} For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The crime rate shall be calculated as the number of reported crimes in a defined slum (numerator) divided by the total slum population (denominator). The result shall be multiplied by 100 and expressed as the crime rate per 100 people.

Data sources

The data for this indicator can be sourced from city departments.

1.2 Tenure Security

General

Tenure security focuses in specific on legalising the land a defined slum is located on. As primary and secondary research verified, tenure security prevents the fear of eviction and has been discussed as an opportunity for slum residents to realise the sustainable upgradation of living locations.^{199, 250, 251} For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The existence of tenure rights in a specific slum shall be classified as non-existent, application rejected, application approved, partially existent, existent (Table 5).

²⁴⁸ Sutiarysi, T.; Koestoer, R. H.; Susiloningtyas, D. (2019): The challenge of slums toward a sustainable city, in: IOP Conf. Ser.: Earth Environ. Sci., Vol. 338.

²⁴⁹ Reuters (2016): Gangs, crime and slums: growing cities present new challenges for aid agencies, retrieved from <https://www.reuters.com/article/us-humanitarian-summit-urban-crisis-idUSKCN0Y80GA> (24.04.2022).

²⁵⁰ Rao, S. P.; Royo-Olido, J.; Turkstra, J. (2022): Tenure security and property rights: the case of land titling for 'slum' dwellers in Odisha, India, in: International Journal of Urban Sustainable Development.

²⁵¹ Cities Alliance (2019): Promoting Land Rights for the Urban Poor with the Social Tenure Domain Model, received from <https://www.citiesalliance.org/resources/publications/project-case-studies/promoting-land-rights-urban-poor-social-tenure-domain> (24.06.2022).

Data sources

The data for this indicator can be sourced from city departments.

1.3 Formal Employment

General

Formal employment focuses in specific on slum residents with contractual work in the formal sector living in a defined slum. As primary and secondary research verified, informal employment often comes with lower benefits and poorer working conditions, and poverty and informality are found to be strongly correlated.^{252, 253} It is important to monitor formal employment sectors of slum residents to formulate effective development policies that help residents' transition from informal to formal employment. Usually, slum residents attend several workplaces per day, which are irregularly paid, and job stability is insecure. Contractual employment is anticipated to contribute to a more regular income, defined working hours and incremental learning. For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The percentage of slum workers in formal (contractual) employment shall be calculated as the number of slum workers in formal (contractual) employment (numerator) divided by the total slum workers in employment in a defined slum (denominator). The result shall be multiplied by 100 and expressed as the percentage of slum workers in formal (contractual) employment.

Data sources

Data on employment should be obtained through labour force surveys, city employment assessments by local authorities, or the Department of Labour Employment.

1.4 Natural Hazards

General

Natural hazards focus in specific on a defined slums vulnerability to natural hazards. As primary and secondary research verified, slums are often located in hazardous areas.^{186, 254} E.g. flood risks in low lying slums are not a one-off natural disaster but a normal part of their daily struggle to survive. For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

²⁵² Marino, G. (2021): The Slum Economy: An Alliance Between Circular and Informal, retrieved from <https://www.renewablematter.eu/articles/article/the-slum-economy-an-alliance-between-circular-and-informal> (24.06.2022).

²⁵³ Cavalcanti, A. R. C. (2017): Work, Slums, and Informal Settlement Traditions: Architecture of the Favela Do Telegrafo, in: Traditional Dwellings and Settlements Review, Vol. 28, No. 2, p. 71–81.

²⁵⁴ Van Voorst, R. (2016): Natural Hazards, Risk and Vulnerability - Floods and slum life in Indonesia, Routledge, New York, p. 25-35.

The annual frequency of natural hazards in slums shall be classified as regular, often, occasionally, rarely, never (Table 5).

Data sources

The data for this indicator can be sourced from emergency management authorities and other responsible authorities.

2 Service

2.1 Health Care Services

General

Health care services focus in specific on a defined slums density of health care services. As primary and secondary research verified, slum residents often lack access to health care services.^{255, 256} Already in 1997 medical statisticians identified that “around one-third of the people in slum communities [living in Dhaka] are thought to be ill at any given time”⁸². This condition would display the equivalent of a pandemic in any other urban context.⁴⁵ Health care services within walking distance also enable residents to reduce time and expenses on traveling. For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The density of health care services in a defined slum shall be calculated as the total number of health care services (numerator) divided by the total slum population (denominator). The result shall be multiplied by 100 and expressed as the percentage of the density of health care services.

Data sources

The data for this indicator can be sourced from health authorities.

2.2 Education Facilities

General

Education facilities focus in specific on a defined slums density of education facilities. As primary and secondary research verified, slum residents often lack access to education facilities.^{181, 257} Education displays an opportunity through which slum residents can receive skill training and be empowered to escape poverty. Education facilities within walking distance also enable residents to reduce time and expenses on traveling. For this

²⁵⁵ Joulaei, H.; Bhuiyan, A. R.; Sayadi, M.; Morady, F.; Afsar Kazerooni, P. (2014): Slums' access to and coverage of primary health care services: a cross-sectional study in shiraz, a metropolis in southern iran, in: Iranian journal of medical sciences, Vol. 39, No. 2, p. 184–190.

²⁵⁶ Fayehun, O.; Ajisola, M.; Uthman, O.; Oyebode, O.; Oladejo, A.; et al. (2022) A contextual exploration of healthcare service use in urban slums in Nigeria, in: PLOS ONE, Vol. 17, No. 2.

²⁵⁷ Smile Foundation (2021): Improving Education of Slum Children, retrieved from <https://www.smilefoundation-india.org/blog/improving-education-of-slum-children/> (22.06.2022).

reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The density of education facilities in a defined slum shall be calculated as the total number of education facilities (numerator) divided by the total slum population (denominator). The result shall be multiplied by 100 and expressed as the percentage of the density of education facilities.

Data sources

The data for this indicator can be sourced from educational authorities, individual schools, and educational institutions.

2.3 Areas of Economic Activity

General

Areas of economic activity focus in specific on a defined slums access to a locally recognised central business district (CBD). As primary and secondary research verified, slum residents move primarily to urban areas in search for jobs.^{32, 38} Living space at a central location is critical in reducing time and travel expenses to access job opportunities, education facilities, etc. For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The distance to areas of economic activity to access the central business district shall be calculated as the distance between a defined slum and the most significant locally recognized areas of economic activity to access the central business district. The result shall be expressed in km.

Data sources

The data for this indicator can be sourced from surveys and using GIS mapping tools.

2.4 Public Transport Services

General

Public transport services focus in specific on a defined slums access to public transport stops. As primary and secondary research verified, public transportation services are a critical service for the functioning of slums. They play a fundamental role in community mobility and ensure access to employment, education, and recreation opportunities.^{258,}

²⁵⁹ Density of public transport stops, reliability and punctuality can be an indication of the

²⁵⁸ Rebelo, J. (2015): Access to mobility for slum dwellers with easy low-cost solutions, retrieved from <https://blogs.worldbank.org/transport/access-mobility-slum-dwellers-easy-low-cost-solutions> (22.06.2022).

²⁵⁹ Saxena, A.; Gupta, V.; Shrivastava, B. (2021): An Assessment of Public Transport Accessibility Levels for Slums in Bhopal, in: International Journal of Engineering and Advanced Technology (IJEAT), Vol. 10, No. 5.

functionality of the system. For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The density of public transport stops in a defined slum shall be calculated as the total number of public transport stops within 1km. The result shall be expressed as a number and categorised as non-existent, below average density, average density, above average density, high density (Table 5).

Data sources

The data for this indicator can be sourced from city transportation offices and local/regional transit authorities.

3 Society

3.1 Social Assistance

General

Social assistance focuses in specific on a defined slums access to social assistance programs. Social assistance programs refer to government-funded self-help groups a social worker takes lead on to provide support to local areas of interest. Such programs are based on voluntary and participative engagement and address issues within a group environment.²⁶⁰ As primary and secondary research verified, social assistance in the form of self-help groups has been recognized to encourage residents to participate in their personal development.^{261, 262} For this reason, the KPI is considered relevant in determining a liveable life within a slum and guide the design of upgrading projects.

Indicator requirements

The percentage of slum residents with access to social assistance shall be calculated as the number of slum residents with access to social assistance (numerator) divided by the total slum population of a defined slum (denominator). The result shall be multiplied by 100 and expressed as the percentage of slum residents with access to social assistance.

Data sources

The data for this indicator should be available from the government agencies responsible for providing social assistance.

²⁶⁰ Nejad, F. N.; Ghamari, M. R.; Mohaqeqi Kamal, S. H.; Tabatabaee, S. S.; Ganjali, R. (2021): The Most Important Social Determinants of Slum Dwellers' Health: A Scoping Review, in: Journal of preventive medicine and public health, Vol. 54, No. 4, p. 265-274.

²⁶¹ Justus, A. (2017): Self Help Groups Empower Women Living in Indian Slum, retrieved from <https://www.worldvisionphilanthropy.org/news/self-help-groups> (25.06.2022).

²⁶² Indian Women and Child Welfare Trust (2021): Self Help Group, retrieved from <https://www.iwcwtministry.org/donations/self-help-group/> (25.06.2022).

3.2 Financial Assistance

General

Financial assistance focuses in specific on a defined slums access to financial assistance programs. Financial assistance programs refer to governmental financial aid provided to the urban poor. Such programs can be based on subsidies or micro-credits. As primary and secondary research verified, financial assistance to low-income groups helps to ensure access to essential needs, development of their own businesses or maintenance of basic living standards.^{263, 264} For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The percentage of slum residents with access to financial assistance shall be calculated as the number of slum residents with access to financial assistance (numerator) divided by the total slum population of a defined slum (denominator). The result shall be multiplied by 100 and expressed as the percentage of slum residents with access to financial assistance.

Data sources

The data for this indicator should be available from the government agencies responsible for providing financial assistance.

3.3 External Neighbourhood Relations

General

External neighbourhood relations focus in specific on a defined slums relationship to neighbours external to their slum. As primary and secondary research verified, good neighbourhood relations contribute to a higher sense of social inclusion and belonging.^{265, 266} Close relationships can also be used to resolve and prevent local issues, as it is more sustainable if residents collaborate and address problems in an inclusive neighbourhood approach. For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The annual frequency of meetings among formal and informal resident representatives in a defined neighbourhood shall be calculated as the frequency of meetings among formal and informal resident representatives in a defined neighbourhood in a given year. The

²⁶³ Lines, K.; Mitlin, D.; Mwelu, J.; Njenga Maina, J.P.; Okoyo, O.; Otibine, E.; Wakesho, T.; Wambui, M. (2020): Bridging the affordability gap: towards a financing mechanism for slum upgrading at scale in Nairobi – analysing NGO experiences with local-level finance, in: GDI Working Paper, The University of Manchester, Manchester.

²⁶⁴ Doe, B.; Aboagye, P.D. (2022): The place of subsidy: affordable sanitation service delivery in slums of Kumasi, Ghana, in: GeoJournal, Vol. 87, p. 295–317.

²⁶⁵ Hirvonen, J.; Lilius, J. (2019): Do neighbour relationships still matter?, in: Journal of Housing and the Built Environment, Vol. 34.

²⁶⁶ Ruonavaara, H. (2022): The Anatomy of Neighbour Relations, in: Sociological Research Online, Vol. 27, No. 2, p. 379–395.

result shall be expressed as a number and categorised as never, yearly, quarterly, monthly, weekly (Table 5).

Data sources

Data on public meetings can be sourced from a city's public meeting registry.

4 Space

4.1 Basic Services

General

The provision of basic services within a defined slum relates to the provision of all essential services, which are locally recognized to be required for the continuity of life. As primary and secondary research verified, basic services are more than often non-existent or poorly functioning in slums. As a result, slum upgrading schemes tend to be primarily conducted to ensure the provision of basic services for residents.^{267, 268} For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The existence of functioning basic services accessible for all households in a defined slum shall be classified as inexistent, planned, started, in progress, existent (Table 5).

Data sources

The data for this indicator should be available from the government agencies responsible for initiating upgrading schemes that focus on the provision of basic services.

4.2 Adequate Housing

General

Adequate housing within a defined slum relates to the existence of residential brick & mortar buildings, which are recognized as adequate in view of local environmental, social, and climatic conditions. As primary and secondary research verified, most housing units in slums are self-constructed without professional equipment or architectural know-how. These living units are prone to collapsing, which impairs the security of inhabitants.^{3, 62} For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The percentage of residential brick & mortar buildings in a defined slum shall be calculated as the number of residential brick & mortar buildings in a defined slum (numerator) divided

²⁶⁷ Devkar, G.; Annamalai, T.; Narayanan, S. MS, E. (2017): Provision of Basic Services in Slums: A review of the evidence on top-down and bottom-up approaches, in: Development Policy Review, Vo. 37, No. 3.

²⁶⁸ Trindade, T. C.G.; Heather, L.; MacLean, I.; Posen, D. (2021): Slum infrastructure: Quantitative measures and scenarios for universal access to basic services in 2030, in: Cities, Vol. 110.

by the total number of living units in slums (denominator). The result shall be multiplied by 100 and expressed as the percentage of residential brick & mortar buildings in slums.

Data sources

The data for this indicator can be obtained from city departments or local authorities responsible for ensuring compliance with building standards and safety regulations.

4.3 Green Infrastructure

General

Green infrastructure within a defined slum relates to parks and green spaces in the direct vicinity of a slum neighbourhood. As primary and secondary research verified, they catalyse community life and enable citizens to exercise, encounter friends and participate in outdoor activities.^{269, 270} Additionally, green spaces have a cooling effect and can reduce the temperature in urban heat islands, which is particularly important in climate zones of high temperature. For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The number of parks and green spaces adjacent to a defined slum within 1km shall be calculated as the number of parks and green spaces slum residents can reach in a walking distance of 1km from their slum neighbourhood. The result shall be expressed as a number and categorised as non-existent, below average, average, above average, high density (Table 5).

Data sources

The data for this indicator can be sourced from the city's environmental department.

4.4 Neighbourhood Cleanliness

General

Neighbourhood cleanliness within a defined slum relates to professional waste pick-up from public waste collectors. As primary and secondary research verified, poor waste management is among the major challenges urban slums face.^{271, 272} As a consequence, open dumping, as well as burning are main waste disposal methods used. Without professional waste pick-up and incineration, it is difficult for slum residents to maintain a

²⁶⁹ Olumuyiwa Bayode, A. (2021): Green Infrastructure Can Improve the Lives of Slum Dwellers in African Cities, in: *Frontiers in Sustainable Cities*, Vol. 3.

²⁷⁰ Kaur, N.; Kaur, M.; Padhi, S. S.; Singh, K. K. (2021): Geospatial analysis of the distribution of urban green spaces: a study of four Indian cities, in: *Cities & Health*.

²⁷¹ Mukama, T.; Ndejjo, R.; Musoke, D.; Musinguzi, G.; Halage, A. A.; Carpenter, D. O.; Ssempebwa, J. C. (2016): Practices, Concerns, and Willingness to Participate in Solid Waste Management in Two Urban Slums in Central Uganda, in: *Journal of Environmental and Public Health*.

²⁷² Elgizawy, S.M.; El-Haggag, S.M.; Nassar, K. (2016): Slum Development Using Zero Waste Concepts: Construction Waste Case Study, in: *Procedia Engineering*, Vol. 145, p. 1306-1313.

clean and sustainable environment. For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The annual frequency of professional waste pick-up in a defined slum shall be calculated as the frequency of professional waste pick-up in a defined slum in a given year. The result shall be expressed as a number and categorised as never, yearly, quarterly, monthly, weekly (Table 5).

Data sources

The data for this indicator can be sourced from the city's waste management department.

4.5 Community Centre

General

A community centre within a defined slum relates to an official place where residents can meet in an enclosed space. As primary and secondary research verified, a community centre allows residents to gather for social events, education classes, or recreational activities.^{273, 274} Additionally, an enclosed space allows for more privacy during focused discussions among selected individuals. For this reason, the KPI is considered relevant in determining a liveable life within a slum and guiding the design of upgrading projects.

Indicator requirements

The percentage of community centres available in a defined slum shall be calculated as the total number of community centres in a defined slum (numerator) divided by the total slum population (denominator). The result shall be multiplied by 100, expressed as the percentage of community centres available and categorised as non-existent, below average, average, above average, high density (Table 5).

Data sources

The data for this indicator can be sourced from the city's public work departments.

5.1.2 KPI Requirements – Parametrisation

In case parametrisation of indicators is not possible, the classes can qualitatively be assumed, as exemplified within Table 5.

²⁷³ Vision Rescue (2022): Community Centers - Stationary hubs based within the poorest communities of India, retrieved from <https://visionrescue.us/projects/community-centers/> (26.06.2022).

²⁷⁴ MaSCA (2018): Rebuilding the Mathare 3a Community Centre, retrieved from <http://mathare.org/communitycentre/> (26.06.2022).

1 Safety	1.1 Neighbourhood Safety	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Very low	Below average	Average	Above average	Very high
	1.2 Tenure Security	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Non existent	Application rejected	Application approved/in progress	Partially existent	Existent
	1.3 Formal Employment	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Very low	Below average	Average	Above average	Very high
	1.4 Natural Hazards	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Regular	Often	Occasionally	Rarely	Never
2 Service	2.1 Health Care Services	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Non existent	Below average density	Average density	Above average density	High density
	2.2 Education Facilities	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Non existent	Below average density	Average density	Above average density	High density
	2.3 Areas of Economic Activity	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		>10km	5-10km	3-4km	1-2km	<1km
	2.4 Public Transport Services	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Non existent	Below average density	Average density	Above average density	High density
3 Society	3.1 Social Assistance	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Very low	Below average	Average	Above average	Very high
	3.2 Financial Assistance	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Very low	Below average	Average	Above average	Very high
	3.3 External Neighbourhood Relations	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Never	Yearly	Quarterly	Monthly	Weekly
4 Space	4.1 Basic Services	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Inexistent	Planned	Started	In progress	Existent
	4.2 Adequate Housing	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Non existent	Below average	Average	Above average	High density
	4.3 Green Infrastructure	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Non existent	Below average	Average	Above average	High density
	4.4 Neighbourhood Cleanliness	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Never	Yearly	Quarterly	Monthly	Weekly
	4.5 Community Centre	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
		Non existent	Below average	Average	Above average	High density

Table 5: Liveable Life Indicator Classification Overview, Parametrisation (own representation).

Liveable Life Index Visualisation – Bhubaneswar Case

Based on the Bhubaneswar Case, a radar chart was created to visualize the results of the LLI. “A radar chart shows multivariate data of three or more quantitative variables mapped onto an axis. It looks like a spider’s web, with a central axis that has at least three spokes [...]”²⁷⁵. In the Bhubaneswar example, the actual state (LLI results/current state) and the target state (optimal state) is based on focus group discussions and expert interviews. Table 6 highlights the KPIs and their weightage. Figure 22 displays the representative depiction of the table. As can be seen, no KPI has a congruent actual and target state, which implies a necessity for improvement.

Main-Elements	KPIs	Actual State	Target State
1 Safety	1.1 Neighbourhood Safety	65%	85%
	1.2 Tenure Security	80%	100%
	1.3 Formal Employment	20%	60%
	1.4 Natural Hazards	60%	85%
2 Service	2.1 Health Care Services	40%	50%
	2.2 Education Facilities	50%	50%
	2.3 Areas of Economic Activity	75%	80%
	2.4 Public Transport Services	20%	50%
3 Society	3.1 Social Assistance	20%	70%
	3.2 Financial Assistance	20%	70%
	3.3 External Neighbourhood Relations	40%	65%
4 Space	4.1 Basic Services	10%	100%
	4.2 Adequate Housing	40%	80%
	4.3 Green Infrastructure	20%	60%
	4.4 Neighbourhood Cleanliness	10%	80%
	4.5 Community Centre	50%	80%

Table 6: Liveable Life Index Visualisation – Bhubaneswar Case, Table (own representation).

²⁷⁵ TIBC (2022): What is a Radar Chart?, retrieved from <https://www.tibco.com/reference-center/what-is-a-radar-chart> (18.02.2022).

Liveable Life Index Visualisation – Bhubaneswar Case

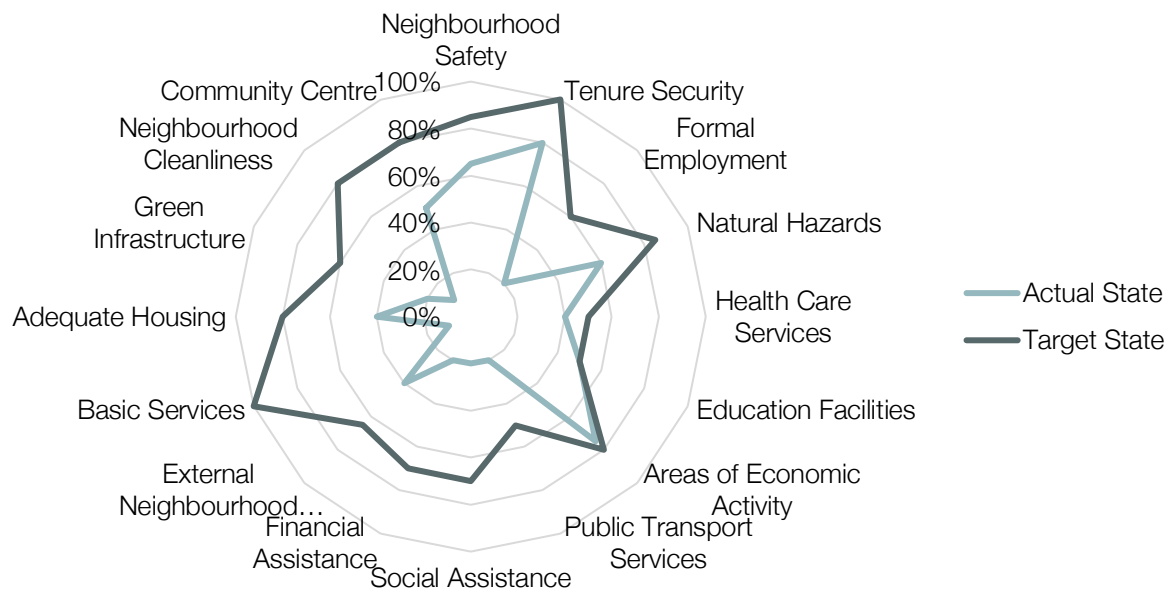


Figure 22: Liveable Life Index Visualisation – Bhubaneswar Case, Radar Chart (own representation).

Fictitious Example: Slum Upgrading Progress based on a defined LLI

In the following section, a fictitious example is presented to simulate the application of a defined LLI within the slum upgrading progress of the Bhubaneswar case. The determination of LLI applicability is central to illustrating its potential as a monitoring and strategic decision support instrument, as well as its increasing contribution to the communication between stakeholders. The scenario integrates actual development steps, accompanied by supplementary fictitious measures, and takes place over a timespan of three years (Table 7). For each year, focus areas, accomplishments and setbacks are described.

The initial situation of the Bhubaneswar case is assessed in 2019, displayed by the darkest field in Figure 23. Assessing the initial situation includes parametrisation of each KPIs' actual and target state. Indicators in this example were chosen based on the most relevant needs described by residents and OHLM experts identified in Chapter 4. The actual state of each KPI in each main-element is then analysed based on its divergence to the target state. From this analysis it can be deduced which KPIs require particular attention to prioritise main-elements with a higher density of poor performing KPIs over others during upgrading. Nevertheless, focus is still based on KPIs of other main-elements to take

advantage of synergetic opportunities, which result from combinations of upgrading components. In the present case, the prioritisation of main-elements is as follows: Space, society, safety, service.

In year 1 (2019-2020) OLHM slum upgrading projects were designed and implemented to mainly address the components within the “space” main-element. Implementations included measures like road and drainage installation, individual household latrine (IHHL), piped water supply, etc. In total, the evaluation of most KPIs in the target-element improved, except for “neighbourhood cleanliness”. The decline in KPI performance is justified with a rise in green infrastructure, which attracted more people to gather outside and spend time in public environments. As a result, outdoor waste production increased. Regarding KPIs addressed of the other main-elements, the largest progress can be noted in the provision of public transport stops, social and financial assistance, as well as external neighbourhood relations.

The project manager guiding the LLI-based approach presented its project design at board meetings and general workshops to private investors and governmental members. Since privatisation of a smart public transport system was already under discussion, new bus stops and routes were highlighted as complementary improvements associated with the new local concept. Furthermore, local politicians used Figure 23 on social media to post efforts and progress, raising awareness on the issue and stimulating communication between communities. Correspondingly, members in formal neighbourhoods located close to slums became encouraged to establish contact with slum residents. Shortly after the social media post, first neighbourhood gatherings were organised and formal and informal residents came together and socialised. As a result of “word of mouth propaganda”, the support of social workers offering social assistance programs in slums increased; and local banks enlarged financial services to open new markets and attract new customers in the low budget sector with customised financial assistance programs.

In year 2 (2020-2021) slum upgrading projects were designed and implemented to further improve KPIs of the main-element “space”. With “neighbourhood cleanliness” displaying the most concerning KPI in year 1, KPI performance rose almost tenfold in year 2. This can be attributed to an increase in the amount of public waste bins and intervals of professional waste bin clearance, as well as the foundation of an association for cleanliness in the neighbourhood. The association for cleanliness was initiated on local authority level with two further objectives next to cleanliness: raising local awareness for clean environments and offering slum residents employment opportunities.

With a rise in basic infrastructure, upgrading focus moved to the “society” element, increasing residents’ engagement to invest in personal and social developments. Based on the achievements and new opportunities of the “society” element in year 1, residents

willingly increased their engagement in social and financial assistance programs. Likewise, neighbourhood gatherings to extend social commitment and networks grew and became a bi-monthly occasion. This increase in the number of gatherings was largely facilitated due to new meeting points, such as the newly built green infrastructure and community centres.

KPIs of the remaining two main-elements “safety” and “service” also improved. Especially the number of residents in formal employment showed an upward trend. This can be related to the rise in external neighbourhood relations and the resulting broader base in contacts and connections to formal employment options. Poorly performing KPIs cannot be noted, as upgrading was based on a precise implementation plan and sufficient financial resources were ensured to address and allow progress of set priorities within the LLI.

By using the LLI, program directors of OLHM were able to highlight the progress, resulting in increased community participation as residents realised their own ideas with the support and contribution of supporting stakeholders. Based on a joint meeting with residents, priorities were set to address outstanding mismatches and measures of the more gradually performing KPIs. The project manager stated that the efficiency of expenditures in the main-element “space, safety and service” increased by 20% compared to previous periods, since underperforming sections were more readily identified, and residents feedback provided valuable insights to optimise the discussion of solutions.

In year 3 (End of 2021) almost all KPIs were either close to or had already reached the target state with minor deviations. For the following year, slum upgrading projects were planned and designed to further improve remaining KPIs, which had not yet reached their target state. For example, the KPI “neighbourhood cleanliness” deteriorated in year 1 and increased almost tenfold in year 2 but still had not reached its target state. In the following year it was planned to address the KPI with awareness raising classes for residents and waste disposal signage attached to bins. Since in year 2 the amount of public waste bins and intervals of professional waste bin clearance had already increased, it was thought that raising bin numbers or clearance intervals would not further contribute to the desired target state.

Further KPIs, identified to hold a high local value and planned to be prioritised in the following year are as follows: “neighbourhood safety”, “natural hazards”, “adequate housing”, “community centres”. Improved neighbourhood safety in the defined slum is planned to be addressed with a rise in police presence and smart lighting systems during night-time; protection against natural hazards in the defined slum is planned to be addressed with an early flood warning system, as flooding in the slum locations is an unavoidable phenomenon; the construction of adequate housing and community centres in the defined slum is planned to be addressed simultaneously to ensure that safety and security guideline standards of buildings are uniformly implemented.

Over the entire time-span the KPI “education facilities” performed particularly well, as the target state was outperformed. Reason for passing the target state was the rise in public school density accessible to children in the defined slum, which outdated planned density. With a rise in external neighbourhood relationships, optimisation processes in the local education sector were discussed among new social networks. One consideration was the nationalisation of local private schools. As a result, connections to principals of local private schools were established, of which several entered into agreements with the local government. Customised agreements allowed private schools to transform into public schools accessible to children living in the defined slum.

Main-Elements	KPIs	Actual State 2019	Actual State 2020	Actual State 2021	Target State
1 Safety	1.1 Neighbourhood Safety	40%	50%	65%	85%
	1.2 Tenure Security	80%	85%	90%	100%
	1.3 Formal Employment	20%	30%	50%	60%
	1.4 Natural Hazards	40%	50%	60%	85%
2 Service	2.1 Health Care Services	40%	45%	50%	50%
	2.2 Education Facilities	50%	50%	60%	50%
	2.3 Areas of Economic Activity	75%	75%	75%	80%
	2.4 Public Transport Services	20%	45%	50%	50%
3 Society	3.1 Social Assistance	20%	55%	65%	70%
	3.2 Financial Assistance	20%	60%	65%	70%
	3.3 External Neighbourhood Relations	40%	60%	60%	65%
4 Space	4.1 Basic Services	10%	95%	100%	100%
	4.2 Adequate Housing	40%	45%	65%	80%
	4.3 Green Infrastructure	20%	50%	55%	60%
	4.4 Neighbourhood Cleanliness	10%	5%	45%	80%
	4.5 Community Centre	50%	60%	65%	80%

Table 7: Liveable Life Index Visualisation – Fictitious Example, Table (own representation).

Slum Upgrading Progress based on a defined LLI (fictitious example)

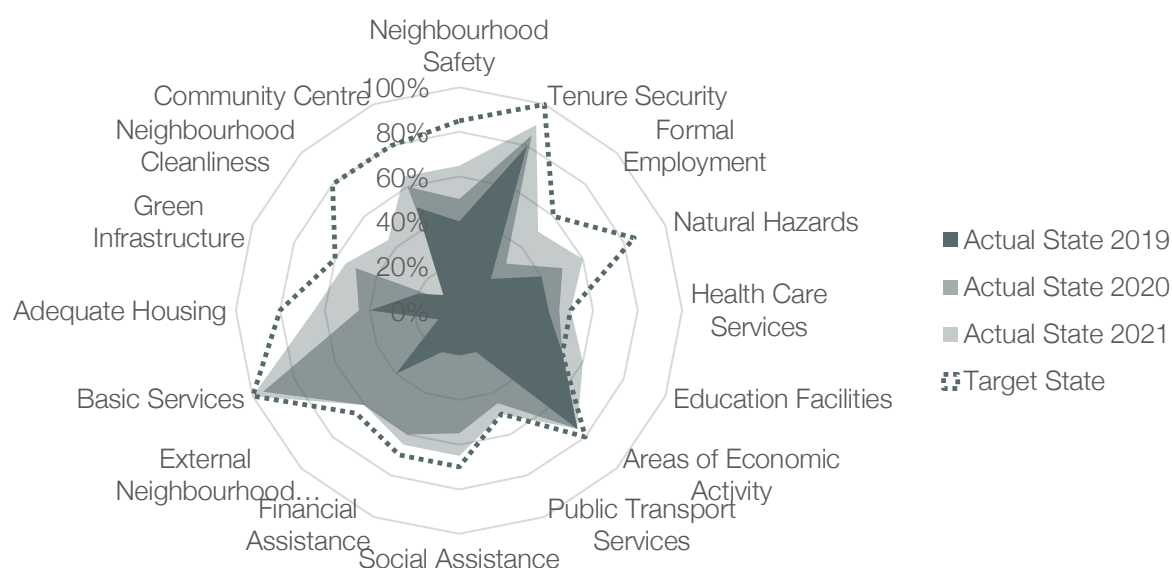


Figure 23: Liveable Life Index Visualisation – Fictitious Example, Radar Chart (own representation)

Approach to Identify Additional Locally Relevant Liveable Life Indicators

Since slum residents on site are not familiar with the set of pre-defined indicators, a participatory research measure can add other relevant factors to the LLI and check the factors suggested by literature (Figure 24). Customisation processes can be facilitated via e-participation, e.g. an application accessible from mobile devices to provide input based on local importance.

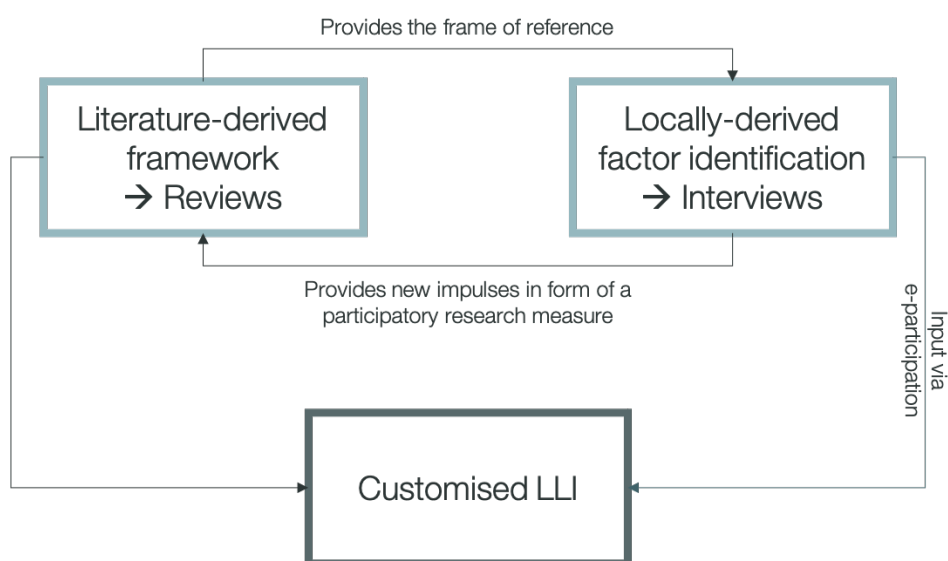


Figure 24: LLI Optimisation Process (own representation).

From the identification of neighbourhood-specific sub-elements in addition to the already existing liveable life indicators within the Liveable Life Index, three essential steps are required (Figure 25). It is a simple, flexible, and adaptable procedure. To establish an initial understanding of the approach to identify additional indicators, Figure 25 provides a summary. A detailed version of the approach can be found in Appendix I. The approach developed here is a particularly good supplementary option to optimise the LLI, as further/underestimated liveable life indicators can be identified in neighbourhoods. The subsequent section will then discuss the LLI in context of global standards.



Figure 25: Approach to identify additional locally relevant liveable life indicators (own representation).

5.2 Liveability Index Literature Review

Within the previous section a Liveable Life Index has been introduced to guide the sustainable design of slum upgrading projects at policy level. The LLI measures the level of upgrading in slums based on 4 main-elements and 16 sub-elements (KPIs). Still, the international landscape exhibits several standards and frameworks, which aim to measure a society's or city's progress and can be likewise used to depict areas for improvement in slums. To emphasise the significance of a Liveable Life Index in an informal settlement context, a general analysis of global standards and frameworks takes place. In a first step, eight standards based on their widespread use (e.g. represented by renowned and

international institutions), extraordinary scientific reception (citation frequency), high level of detail, application orientation, terminological fit to internationally used taxonomies and focus on liveability aspects, are selected and described. In a second step, blind spots of the standards are discussed. To cover the full spectrum of perspectives for the discussion, next to the blind spots identified within the eight selected standards, a systematic literature review has been conducted based on publications. Thus, a holistic perspective on gaps is covered and recommendations for the development of the LLI is addressed. In a last step, relevant and comparable standard KPIs are set in relation to LLI KPIs. The comparison aims to identify challenges and opportunities of the standards KPIs and LLI KPIs in relation to slum upgrading.

5.2.1 Global Standards

In the following, each selected global standard is briefly introduced.

The City Development Index

The City Development Index (CDI) was developed in 1997. It measures the level of development in cities and is based on five sub-indices: City Product, Infrastructure, Waste, Health, and Education.^{118, 276} In 1999 the CDI was modified, due to improved data collected in using the Index for the Asian Development Bank, Cities Data Book and United Nations Development Programme (UNDP).^{277, 278} The formula for calculating the CDI is depicted in Table 8.

Index	Formula
Infrastructure	$25 \times \text{Water connections} + 25 \times \text{Sewerage} + 25 \times \text{Electricity} + 25 \times \text{Telephone}$
Waste	$\text{Wastewater treated} \times 50 + \text{Formal solid waste disposal} \times 50$
Health	$(\text{Life expectancy} - 25) \times 50/60 + (32 - \text{Child mortality}) \times 50/31.92$
Education	$\text{Literacy} \times 25 + \text{Combined enrolment} \times 25$
Product	$(\log \text{City Product} - 4.61) \times 100/5.99$
City Development	$(\text{Infrastructure index} + \text{Waste index} + \text{Education index} + \text{Health index} + \text{City Product index}) / 5$

Table 8: City Development Index Formula (own representation based on United Nations Human Settlements Programme (UN-Habitat)).²⁷⁹

²⁷⁶ UN-Habitat (2020): People-Centered Smart Cities, retrieved from <https://unhabitat.org/programme/beta/people-centered-smart-cities> (06.04.2020).

²⁷⁷ Dentinho, T. P.; Basu, K.; Bandyopadhyay, S.; Magsi, H.; Kundu, A. (2021): Accessible Housing for South Asia - Needs, Implementation and Impacts, Springer, Switzerland, p. 240-249.

²⁷⁸ Baghdadi, Y.; Harfouche, A.; Musso, M. (2020): ICT for an Inclusive World - Industry 4.0—Towards the Smart Enterprise, Springer, Switzerland, p. 405-412.

²⁷⁹ UN-Habitat (2002): Global Urban Indicators Database, retrieved from <https://unhabitat.org/sites/default/files/download-manager-files/Global%20Urban%20Indicators%20Database.pdf> (14.06.2022).

IEEE P1950.1

IEEE P1950.1 is the “Standard for Communications Architectural Functional Framework for Smart Cities”.¹¹⁸ The purpose of this standard is to provide a common view on Smart City architectures and functionalities.²⁸⁰ It addresses the aspects of communication systems for Smart City ecosystems and the key components of each ecosystem.²⁸¹ The key components include: network access, service delivery, network and service management, and network extensions.²⁸² The standard also includes Smart City relevant terms and definitions.

ISO 37120:2018, ISO 37122:2019, ISO 37123:2019

ISO 37120:2018 (Sustainable Cities And Communities - Indicators For City Services And Quality Of Life¹²⁰) assists cities in measuring the performance of city services and quality of life.^{283, 284, 285, 286} Highlighting the relationship between sustainable-, smart- and resilient-development, ISO 37120:2018 is intended to be implemented in conjunction with two further international standards: ISO 37122:2019 and ISO 37123:2019.^{287, 288, 289, 290, 291} ISO 37122:2019 (Sustainable Cities And Communities - Indicators For Smart Cities¹¹⁹) assists cities in measuring progress towards a Smart City. ISO 37123:2019 (Sustainable Cities And Communities - Indicators For Resilient Cities (ibid.)) assists cities in measuring progress towards resilient cities, making them less vulnerable to risks, which include the

²⁸⁰ IEEE Standards Association (2020): IEEE Future Networks – Enabling 5G and Beyond, retrieved from https://futurenetworks.ieee.org/images/files/pdf/INGRVirtualWorkshop2020/5_Standardization_Building_Blocks_June_2020_VirtualWorkshopWG-_V41.pdf (12.04.2022).

²⁸¹ IEEE Standards Association (2020): IEEE Standards for Smart Cities - Helping Enable Smart City Technologies for Humanity, retrieved from <https://engagestandards.ieee.org/smart-cities.html> (12.04.2022).

²⁸² IEEE Standards Association (2021): A Transdisciplinary Framework for 5G and Future Networks Applications and Services Industry Connections Activity Initiation Document (ICAID), retrieved from <https://engagestandards.ieee.org/smart-cities.html> (12.04.2022).

²⁸³ ISO (2018): ISO 37120:2018(en) Sustainable cities and communities - Indicators for city services and quality of life, retrieved from <https://www.iso.org/obp/ui/#iso:std:iso:37120:ed-2:v1:en> (10.05.2022).

²⁸⁴ Estevez, E.; Scholl, H. J.; Pardo, T. A. (2021): Smart Cities and Smart Governance - Towards the 22nd Century Sustainable City, Springer, Switzerland, p. 77.

²⁸⁵ Syngellakis, S.; Hernández, S. (2020): WIT Transactions on Ecology and the Environment - Sustainable Development and Planning 2020, WIT Press, United Kingdom, p. 80-85.

²⁸⁶ Valentini, R.; Calfapietra, C.; Vasenev, V.; Cheng, Z.; Dovletyarova, E. (2019): Green Technologies and Infrastructure to Enhance Urban Ecosystem Services - Proceedings of the Smart and Sustainable Cities Conference 2018, Springer Geography, Switzerland, p. 253-265.

²⁸⁷ ISO (2019): ISO 37123:2019(en) Sustainable cities and communities - Indicators for resilient cities, retrieved from <https://www.iso.org/obp/ui/#iso:std:iso:37123:ed-1:v1:en> (10.05.2022).

²⁸⁸ ISO (2010): Indicators for resilient cities, retrieved from https://transparencia.caubr.gov.br/arquivos/ISO_DIS_37123.pdf (10.05.2022)..

²⁸⁹ Karaca, Y.; Gervasi, O.; Garau, C.; Murgante, B.; Blečić, I.; Tarantino, E.; Taniar, D.; Apduhan, B. O.; Misra, S.; Rocha, A. M. A. C.; Torre, C. (2020): Computational Science and Its Applications – ICCSA 2020, Springer, Switzerland, p. 794-800.

²⁹⁰ Andreucci, M. B.; Marvuglia, A.; Baltov, M.; Hansen, P. (2021): Rethinking Sustainability Towards a Regenerative Economy, Springer, Switzerland, p. 80-131.

²⁹¹ Midor, K.; Plaza, G. (2020): Moving to Smart Cities Through the Standard Indicators ISO 37120, in: Multidisciplinary Aspects of Production Engineering, Vol. 3, p. 617-630.

economy, education, energy, environment and climate change, finance, governance, health, population, urban planning, transportation, and others.²⁹²

UNDRR (United Nations Disaster Risk Reduction - formerly UNISDR)

UNDRR focuses on the disaster risk reduction of the United Nations. It does so by collaborating with governments, partners and communities to ensure safer and more sustainable futures as a result of disaster risk reduction and losses.¹²⁰ The focal point is the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030. The Sendai Framework outlines seven global targets to be achieved between 2015 and 2030.²⁹³ The UNDRR supports countries in its implementation, monitors and shares what works in reducing existing risk and prevents the creation of new risk.

1. Substantially reduce global disaster mortality
2. Substantially reduce the number of affected people
3. Substantially reduce economic loss in relation to GDP
4. Substantially reduce damage to critical infrastructure and services disruption
5. Substantially increase number of countries with national and local disaster risk reduction strategies by 2020
6. Substantially increase international co-operation with developing countries
7. Substantially increase the availability and access to early warning systems and disaster risk reduction information

ARUP Infrastructure Australia – Planning Liveable Cities

Infrastructure Australia has identified in its paper published in 2018 six challenges and nine recommendations to support liveable cities in Australia. To improve local planning methods for housing and infrastructure, Arup's cities specialists conducted research in Australia's five largest cities – Sydney, Melbourne, Brisbane, Perth, and Adelaide.¹²³ Drawing on the findings of the paper, advice is provided to governments, industry sectors, and the community. It is aimed to alter the perspective on how to deliver new housing and infrastructure by proposing changes to current planning systems, governance, funding, and community engagement to best meet liveability outcomes of communities.²⁹⁴ The findings and recommendations are listed in the following:¹²³

Finding 1: Infrastructure delivery is struggling to keep pace with rapid population growth in our major cities.

- Recommendation 1: The Australian Government should establish a process to better strategically plan for Australia's future population.

²⁹² Kelechava, B. (2020): ISO 37123:2019 – Indicators for Resilient Cities, retrieved from <https://blog.ansi.org/2020/01/iso-37123-2019-indicators-resilient-cities/#gref> (11.06.2022).

²⁹³ UNDRR (2022): What is the Sendai Framework for Disaster Risk Reduction?, retrieved from <https://www.undrr.org/implementing-sendai-framework/what-sendai-framework> (22.06.2022).

²⁹⁴ ARUP (2020): Planning liveable cities, retrieved from <https://www.arup.com/perspectives/planning-liveable-cities> (22.06.2022).

- Recommendation 2: Planning systems should focus the weight of decision-making on strategic level planning.

Finding 2: Australia's three-tiered governance structure can make it challenging to consistently deliver liveable places.

- Recommendation 3: Governance arrangements with appropriate funding, resourcing, and accountability arrangements are essential to ensuring that strategic metropolitan plans are translated into tangible local outcomes.
- Recommendation 4: Enhancing existing incentive mechanisms that promote improved governance and better collaboration between all levels of government will help to achieve liveable outcomes in our largest cities.

Finding 3: Sector-led infrastructure planning can lead to uncoordinated outcomes for communities.

- Recommendation 5: In areas of high growth, governments should identify and assess the full range of economic and social infrastructure required at a 'place' level.

Finding 4: Communities are increasingly disappointed by their experience of growth.

- Recommendation 6: Improving the quality, demonstrated outcomes, and longevity of community engagement is critical to the successful growth of our largest cities.

Finding 5: Our infrastructure funding mechanisms have not kept pace with growth.

- Recommendation 7: Governments should undertake an independent review of local and state infrastructure funding mechanisms and policies.
- Recommendation 8: Making better use of existing infrastructure assets and networks will deliver improved outcomes for both communities and governments.

Finding 6: Governments and industry lack a shared understanding of the capacity of different infrastructure networks.

- Recommendation 9: Our largest cities require a more coordinated, transparent, and standardised understanding of current and future infrastructure capacity to help governments optimise infrastructure use and make better investment decisions.

United Nations

At the UN Summit in September 2015, the United Nations introduced the 2030 Agenda for Sustainable Development. At its heart are the 17 Sustainable Development Goals (SDGs) and 169 targets to which all 193 United Nations Member States agreed on.⁴² The SDGs call for action in a global partnership and embrace the economic, environmental, and social dimensions of development (ibid.). The 17 SDGs are as follows:²⁹⁵

Goal 1: No Poverty

Goal 2: Zero Hunger

Goal 3: Good Health and Well-being

²⁹⁵ United Nations (2022): Transforming our world: the 2030 Agenda for Sustainable Development, retrieved from <https://sdgs.un.org/2030agenda> (22.06.2022).

Goal 4: Quality Education
Goal 5: Gender Equality
Goal 6: Clean Water and Sanitation
Goal 7: Affordable and Clean Energy
Goal 8: Decent Work and Economic Growth
Goal 9: Industry, Innovation and Infrastructure
Goal 10: Reduced Inequality
Goal 11: Sustainable Cities and Communities
Goal 12: Responsible Consumption and Production
Goal 13: Climate Action
Goal 14: Life Below Water
Goal 15: Life on Land
Goal 16: Peace and Justice Strong Institutions
Goal 17: Partnerships to achieve the Goal

5.2.2 Blind Spots of Global Standards

As highlighted within the previous section, there already exists a lively discourse – justifiably – about the term and the concept of liveability. With an overview of already recognized standards and frameworks varying from local to global perspectives, theoretical added value as well as a valid reference system is emphasized. Still, the majority of standards, rankings and their occurrence neither focuses on informal residents in specific, nor is there appropriate data availability to carry out monitoring.^{246, 247} The visible limitations in data availability, the simultaneous vulnerability and the lack of consideration of residents' realistic needs are dominant. These widely received "standard indices" are challenging to implement in an informal settlement context and may not be suitable for the sustainable design of slum upgrading projects.^{92, 93} In the following, "blind spots" of the selected standards are identified to emphasise aspects to be included in informal areas.

To cover the full spectrum of perspectives for the analysis, next to the blind spots of global standards, a systematic literature review has been conducted based on publications listed in the ISI Web of Science and Scopus from 2015 – 2022. The categorisation of aspects relevant to the review and their abstraction into different search-termini can be identified from the following *search-algorithm* used for the literature database: "Quality of life" OR "liveability" AND "informal settlements" OR "slum-upgrading" AND "index" OR "assessment tool" AND "locally rooted" OR "local" OR "location-specific" [optional] AND "critique" OR "deficits" OR "shortcomings". The publications considered were selected based on the title, abstract and keywords. In individual cases, a forward or backward analysis of potentially relevant sources was performed by references in the publication referenced by the algorithm. The selection is based on individual assessment.

Blind Spot Results of the Eight Selected Standards

In the following, the blind spots of eight selected standards are discussed.

Whereby *The City Development Index* and *United Nations SDGs* highlight the global poor population, no specific guidance is given for local upgrading measures, nor participative approaches for residents' integration highlighted. The general lack of studies about slums often leads to the assumption that upgrading actions, such as improved construction, social service provision, or access to water automatically lead to improved living conditions.⁴⁴ Yet the neglect of the comprehensions of local people, as well as assumptions about optimal upgrading measures rather contribute to insufficient upgrading effects.

Especially the *IEEE* and *ISO 37122:2019 standard* miss within their Smart City agenda the crucial aspects of highlighting the management and inclusion of underserved communities within local strategies. It would be a next step to direct attention to the broad variance of social classes when developing Smart Cities and highlight the inclusion of minority groups whose presence is rising and whose needs have to be considered in urban agendas. Primary and secondary research revealed that smart approaches in urban areas focus rather on the formal sector society but lack a focus on slum landscapes where development support is needed.^{70, 230} To improve the conditions of informal diversity in urban areas, it is important to reach informal neighbourhoods and identify upgrading approaches based on realistic demands.⁵³ Digital technologies display an overriding factor to facilitate communication and ensure appropriate data availability, but there is a need to find a way to leverage the potential of digital technologies for the common good of slum residents to enable them to be the true planners of their neighbourhoods. Confronted with the large number of slums in India and the growing Smart City sector, participation forms are required that make participatory planning processes compatible with new urban settings.^{94, 98, 101}

Paying attention to general risk reduction and resilient cities, the *UNDRR (formerly UNISDR) and ISO 37123:2019* emphasised a set of goals and indicators at global scale. Still, both concepts lack a focus on deducing specific guidelines in areas identified to possess high risks. For example, to “reduce global disaster mortality” is not a specific guideline for local improvements, as disaster mortality can have different roots. In an informal settlement context, it is important to introduce indicators which aim to guide local insights to design countermeasure options. To channel assistance, a more realistic and improved demand assessment of problem areas in informal areas is needed.

Focusing on recommendations to support liveable cities, *ARUP*, and *ISO 37120:2018* presented a set of indicators. *ARUP*'s framework focuses specifically on Australia, whereas the *ISO* standard provides a general framework. Still, the variety of recommendations to improve liveability follows a path that might not be relevant to the conditions in

informal neighbourhoods. Informal areas face a different combination of challenges, which need to be identified and addressed considering local development trajectories. Already existing studies verified that perceptions of a liveable life mostly refer to the various types of formal settlements.⁵³ But in countries of the Global South, such as India, a large proportion of the population lives in slums.⁴⁷ A holistic approach to identify and prioritise liveable life indicators for the design of sustainable slum upgrading at local scale has yet to be developed. Yet, research revealed that community perceptions of a liveable life are the most influential indicators, and they perform weakest in slum upgrading. There is a need for an approach that expands on local structures, by providing on the one hand a standardised framework for general implementation, but on the other hand a customised approach when being implemented at local scale.

Having reviewed the selected standards, in the subsequent section only relevant KPIs of the selected standards that can be set in relation to LLI KPIs are discussed. The comparison sheds light on deficiencies and benefits of the standard KPIs and LLI KPIs.

Blind Spot Results of Publications

The following analysis of publications serves for the consideration of further perspectives and identification of blind spots in present research. Based on the structured keyword search in literature databases, 20 publications were identified in a first round. In a manual sorting process, 10 of the 20 publications were again eliminated due to limited matches in content. Facing a scarcity of publications matching described criteria, the remaining publications also include cases not directly connected to the slum upgrading context but rather for urban restructuring, which include helpful points for transformative index use. These publications focus on gaps and recommendations for liveability aspects in urban areas, giving insights to instrument design that can be useful regardless of the circumstances or to identify blind spots due to different focus areas. After collecting the relevant aspects, identified gaps and recommendations to be included in the index formation were categorized into gaps (Table 9) and recommendations (Table 10). In total, five categories are formed for the gaps and recommendations. Index-relevant aspects that are not mentioned in other publications are also evaluated as evidence for the blind spots.

Nr.	Authors	Year of Publication	Title	Category 1: Most urban indicator frameworks use coarse spatial scales that don't allow intra city comparisons	Category 2: Missing visualizations	Category 3: Lacking focus on vitality	Category 4: Missing link of Smart City & slum upgrading	Category 5: Insufficient sustainability principle in the expansion of neighbourhoods
1	Boeing, G.; Higgs, C.; Liu, S. et al. ²⁹⁶	2022	Using open data and open-source software to develop spatial indicators of urban design and transport features for achieving healthy and sustainable cities	x			x	
2	Dhingra, M.; Singh, M. K.; Chattopadhyay, S. ²⁹⁷	2016	Rapid Assessment Tool for traditional Indian Neighbourhoods: A Case Study of Alwar Walled City in Rajasthan	x			x	
3	Musakwa, W.; Tshesane, R. M.; Kangethe, M. ²⁹⁸	2017	The strategically located land index support system for human settlements land reform in South Africa		x		x	
4	Mohamed, A. A.; Ubarevičienė, R.; van Ham, M. ²⁹⁹	2022	Morphological evaluation and regeneration of informal settlements: An experience-based urban design approach	x		x	x	
5	Sarkar, A.; Bardhan, R. ³⁰⁰	2020	Socio-physical liveability through socio-spatiality in low-income resettlement archetypes - A case of slum rehabilitation			x	x	x

²⁹⁶ Boeing, G.; Higgs, C.; Liu, S.; Giles-Corti, B.; Sallis, J. F.; Cerin, E.; Lowe, M.; Adlakha, D.; Hinckson, E.; Vernez Moudon, A.; Salvo, D.; Adams, M. A.; Barrozo, L. V.; Bozovic, T.; Delclòs-Alió, X.; Dygrýn, J.; Ferguson, S.; Gebel, K.; Ho, T. P.; Lai, P. C.; Martori, J. C.; Nitvimol, K.; Queralt, A.; Roberts, J. D.; Sambo, G. H.; Schipperijn, J.; Vale, D.; Van de Weghe, N.; Vich, G.; Arundel, J. (2022): Using open data and open-source software to develop spatial indicators of urban design and transport features for achieving healthy and sustainable cities, in: The Lancet Global Health, Vol. 10, No. 6, p. e907-e918.

²⁹⁷ Dhingra, M.; Singh, M. K.; Chattopadhyay, S. (2016): Rapid Assessment Tool for traditional Indian Neighbourhoods: A Case Study of Alwar Walled City in Rajasthan, in: Sustainable Cities and Society, Vol. 26, p. 364-382.

²⁹⁸ Musakwa, W.; Tshesane, R. M.; Kangethe, M. (2017): The strategically located land index support system for human settlements land reform in South Africa, in: Cities, Vol. 60, Part A, p. 91-101.

²⁹⁹ Mohamed, A. A.; Ubarevičienė, R.; van Ham, M. (2022): Morphological evaluation and regeneration of informal settlements: An experience-based urban design approach, in: Cities, Vol. 128, p. 103798.

³⁰⁰ Sarkar, A.; Bardhan, R. (2020): Socio-physical liveability through socio-spatiality in low-income resettlement archetypes - A case of slum rehabilitation housing in Mumbai, India, in: Cities, Vol. 105, p. 102840.

			housing in Mumbai, India					
6	Sowińska-Świerkosz, B.; Soszyński, D. ³⁰¹	2022	Spatial indicators as a tool to support the decision-making process in relation to different goals of rural planning	x		x	x	x
7	Lowe, M.; Arundel, J.; Hooper, P. et al. ²³⁷	2020	Liveability aspirations and realities: Implementation of urban policies designed to create healthy cities in Australia	x		x	x	x
8	Higgs, C.; Badland, H.; Simons, K. ⁴⁴	2019	The Urban Liveability Index: developing a policy-relevant urban liveability composite measure and evaluating associations with transport mode choice	x		x	x	x
9	Dawodu, A.; Cheshmehzangi, A.; Akinwolemiwa, B. ³⁰²	2018	The systematic selection of headline sustainable indicators for the development of future neighbourhood sustainability assessment tools for Africa, in: Sustainable Cities and Society	x		x	x	x
10	Shrivastava, V. P.; Singh, J. ³⁰³	2019	Review of Performance Indicators of Smart Cities in India – Ease of Living Index: A Case of Jabalpur Smart City	x				

Table 9: Gaps identified within a systematic review of selected publications.

Category 1: Most urban indicator frameworks use coarse spatial scales that don't allow intra-city comparisons

Most indices are used for inter-city comparison and refer to data that at best refers to city level policy and evaluation. In particular, socially marginalised areas and milieus are either not considered or are insufficiently emphasised in comparison to the context as a whole.

³⁰¹ Sowińska-Świerkosz, B.; Soszyński, D. (2022): Spatial indicators as a tool to support the decision-making process in relation to different goals of rural planning, in: Land Use Policy, Vol. 119, p. 106180.

³⁰² Dawodu, A.; Cheshmehzangi, A.; Akinwolemiwa, B. (2018): The systematic selection of headline sustainable indicators for the development of future neighbourhood sustainability assessment tools for Africa, in: Sustainable Cities and Society, Vol. 41, p. 760-776.

³⁰³ Shrivastava, V. P.; Singh, J. (2019): Review of Performance Indicators of Smart Cities in India – Ease of Living Index: A Case of Jabalpur Smart City, in: International Journal of Scientific & Technology Research, Vol. 8, No. 10.

As a result, there is insufficient problem sensitivity, which is generally reflected in the corresponding assessments derived from them. On the contrary, results of a social space analysis, e.g. Sarkar et al. (2020), allows for highly resolved milieu-specific analyses and performative strategic decisions.³⁰⁰

Category 2: Missing visualizations

In most cases, analyses are presented without spatial display, graphic KPI visualisation or physical/story-telling based examples, thus remaining abstract and superficial. As a consequence, they are difficult to understand for non-trained staff, which complicates the consideration of participation and transparent drafting of measures. For example, Musakwa et al. (2017) use GIS to improve the identification process of areas suitable for smart human settlements.²⁹⁸ Beyond the cartographic presentation, the preparation of key figures in clearly understandable graphs or charts is particularly helpful for decision-making. The key figures should be visualised in a factual and generally understandable way so that time sequences, degrees of target achievement and target fields are clearly comprehensible. An example could be a public tide gauge in neighbourhoods that have an increased risk of flooding.

Category 3: Lacking focus on vitality

Vitality in this context describes the “capacity for survival or for the continuation of a meaningful or purposeful existence”.³⁰⁴ Many cases discussed within the publications disregard vitality and liveability elements in the context of urban development. Vitality in relation to an index also hasn’t been discussed. Especially in neighbourhoods that stand out due to their differences in social characteristics, the missing focus on neighbourhood-specific strategies can be a criterion for a more difficult implementation in measures. The majority of studies about informal urbanism covers social, economic and political frameworks, e.g. Mohamed et al. (2022), yet less is known of how informal urbanism performs in terms of urban vitality, which can be decisive when improving living conditions in informal neighbourhoods.²⁹⁹

Category 4: Missing link of Smart City & slum upgrading

The analysed publications on the whole exhibit a missing link between Smart City policies and those that consider slum upgrading measures. Especially the idea of sustainable solutions in Smart Cities established at local level reaches in most cases only the formal spheres. Likewise in India, public smart city policies rarely aim at informal formats.¹⁶⁹ As a result, slum residents tend to be excluded from local optimisations. This can also be detrimental in the long term for established smart solutions, as they are not fully utilised or receive less recognition than potentially possible. Taking into account the “Ease of Living” concept of Smart Cities in India, e.g. Shrivastava et al. (2019), allows for the improvement and facilitation of measurements of selected indicators, such as citizens’ health, identifying slums in low-lying areas, etc.³⁰³

³⁰⁴ Dictionary (2022): Vitality, retrieved from <https://www.dictionary.com/browse/vitality> (15.08.2022).

Category 5: Insufficient sustainability principle in the expansion of neighbourhoods

Creating project development with permanent and lasting structures is a common policy aspiration discussed in all publications. However, the capacity of urban policies to deliver this aspiration often undervalues the expansion of neighbourhoods. Policy-relevant and neighbourhood-specific indicators to detect urban inequities in the implementation of policy targets related to urban liveability are a main concern that should receive a greater degree of attention. With the aim to achieve lasting impact in societies, e.g. Dawoduet al. (2018), it is essential to consider indicator longevity.³⁰²

Nr.	Authors	Year of Publication	Title	Category 1: Use of open data and open-source software	Category 2: Linking indicators to development contexts	Category 3: Focus on community-based development at micro level	Category 4: Identification of strategic places	Category 5: Linking different indicators in the assessment
1	Boeing, G.; Higgs, C.; Liu, S. et al. ²⁹⁶	2022	Using open data and open-source software to develop spatial indicators of urban design and transport features for achieving healthy and sustainable cities	x				x
2	Dhingra, M.; Singh, M. K.; Chattopadhyay, S. ²⁹⁷	2016	Rapid Assessment Tool for traditional Indian Neighbourhoods: A Case Study of Alwar Walled City in Rajasthan		x	x		x
3	Musakwa, W.; Tshesane, R. M.; Kangethe, M. ²⁹⁸	2017	The strategically located land index support system for human settlements land reform in South Africa	x			x	x
4	Mohamed, A. A.; Ubarevičienė, R.; van Ham, M. ²⁹⁹	2022	Morphological evaluation and regeneration of informal settlements: An experience-based urban design approach				x	x
5	Sarkar, A.; Bardhan, R. ³⁰⁰	2020	Socio-physical liveability through socio-spatiality in low-income resettlement archetypes - A case of slum rehabilitation housing in Mumbai, India					x
6	Sowińska-Świerkosz, B.; Soszyński, D. ³⁰¹	2022	Spatial indicators as a tool to support the decision-making process in relation to different goals of rural planning		x	x		x

7	Lowe, M.; Arundel, J.; Hooper, P. et al. ²³⁷	2020	Liveability aspirations and realities: Implementation of urban policies designed to create healthy cities in Australia		x		x	x
8	Higgs, C.; Badland, H.; Simons, K. ⁴⁴	2019	The Urban Liveability Index: developing a policy-relevant urban liveability composite measure and evaluating associations with transport mode choice		x		x	x
9	Dawodu, A.; Cheshmehzangi, A.; Akinwale, B. ³⁰²	2018	The systematic selection of headline sustainable indicators for the development of future neighbourhood sustainability assessment tools for Africa, in: Sustainable Cities and Society	x		x		x
10	Shrivastava, V. P.; Singh, J. ³⁰³	2019	Review of Performance Indicators of Smart Cities in India – Ease of Living Index: A Case of Jabalpur Smart City	x	x		x	x

Table 10: Recommendations identified within a systematic review of selected publications.

Category 1: Use of open data and open-source software

Most of the reviewed indices use or recommend the use of open data and open software to develop spatial indicators and improve the analysis of spatial evaluations. Particularly, in socially marginalised areas, where insufficient data often exists, a spatial analysis based on an open-source data can improve the understanding of local patterns which can be translated into indicators and display identified target points for local improvement. The application of open data and open software has proved to be impactful especially in marginalised contexts, facilitating information availability for planners and residents which is documented in numerous studies, e.g. Boeing et al. (2022).²⁹⁶

This principle is also recommended for the development of the instrumental structure and presentation of the index-building processes, e.g. Shrivastava & Singh (2019).³⁰³ In this way, different cases and influences can be compared in a comprehensible way and are available for a more democratic use.

Category 2: Linking indicators to development contexts

Location specific indicators in upgrading are considered to reflect relevant aspects of the general contextual trends at local scale likely to have an influence on the upgrading pro-

gress. Therefore, it is crucial that indicators are customised locally and regard development contexts in a defined zone, e.g. Lowe et al. (2020)²³⁷. By combining index use with local planning frameworks and status quo, Dhingra et al. (2016) achieved positive results when analysing linkages among development indicators and development contexts, such as the analyses among characteristics of multi-functional spaces and heterogeneous societies.²⁹⁷

Category 3: Focus on community-based development at micro level

Local community participation is highlighted as a key determinant within upgrading at micro or macro level. Especially in neighbourhoods where social patterns are rarely reflected in official processes, community participation in upgrading allows development experts to design solutions that combine and maintain a balance between the integration of neighbourhoods into the macro urban framework and social responsibility at micro level. By adding social components to the description of causes and solutions and the intrinsic motivation of the participants, a greater permanence of interventions and their integration into the informal structures is possible, e.g. Dhingra et al. (2016).²⁹⁷

Category 4: Identification of strategic places

For the implementation of measures, the prioritisation and identification of influential, usually central points, is essential. Visible lighthouses ensure greater acceptance of measures, serve to communicate progress and facilitate the implementation of several consecutive measures in one place, e.g. Mohamed et al. (2022).²⁹⁹ In order to identify locally significant and strategically important places, the presentation of multidimensional spatial analyses by means of an index is a variable and comprehensible solution in which causal research and progress analysis can be carried out on the basis of the same parameters. Providing this option qualifies a good index, e.g. Musakwa et al. (2017).²⁹⁸

Category 5: Linking different indicators in the assessment

In all of the publications examined, the linking of different areas of life through individual indices and their multi-criteria presentation and manipulability of the correlations plays a role, e.g. Sarkaret al. (2020).³⁰⁰ While it is hardly possible to establish quantitative impact relationships between the individual categories on a small scale and in variable cases of application, an ex-post analysis can be applied at several stages of the investigation. In this way, correlation effects that are not directly visible can be highlighted. However, a general grouping of factors is sufficient in the eyes of most researchers (and practitioners). A balanced distribution is to be made in each case by the local developer.

5.2.3 Global Standards & Liveable Life Index Interlinkages

A slums' preparedness for sustainable upgrading can be characterized by developing a detailed understanding of the risks to informal areas, by acting to reduce exposure and by enhancing the awareness and local participation of residents. Upgrading aims to make

slums (or designation after the upgrade: official neighbourhoods) able to recover from disasters and stresses in a timely and efficient manner, ensuring the restoration of relevant basic services, such as water, food, sanitation, electricity, waste management, and so on. Having discussed a subset of standards and their contribution towards more sustainability in urban areas and framing Smart Cities, this section aims to set the standards in relation to the LLI. In specific, it is highlighted to what extent selected KPIs of the discussed standards can be linked to the KPIs of the LLI. Each LLI main-element with its associated sub-elements (KPIs) is discussed individually and set into relation.

Safety

The main-element “Safety” has the following sub-elements (KPIs) attached to it:

1. Neighbourhood Safety

- LLI KPI: Crime rate
- City Development Index KPI: Crime – as a component of regional data analysis in the Global Urban Indicators Database
- LLI Indicator relation *Neighbourhood Safety*: Within the standards it was not possible to identify a KPI which measures the local crime rate. The CDI only considers within its Global Urban Indicators Database a general overview and a definition of crime in analysed areas, as it is stated that “the incidence of reported crime however is not related to the level of development”²⁷⁹. Based on the LLI, measuring the crime rate is considered relevant, as low crime rates have been identified to contribute to a liveable life in slums.

2. Tenure Security

- LLI KPI: Existence of tenure rights
- City Development Index KPI: Housing – as a component of regional data analysis in the Global Urban Indicators Database
- LLI Indicator relation *Tenure Security*: Within the standards it was not possible to identify a KPI which measures the local tenure status. The CDI only considers within its Global Urban Indicators Database a general overview and a definition of housing tenure in analysed areas. Based on the LLI, measuring the coverage of tenure rights is considered relevant, as secure tenure has been identified to contribute to a liveable life in slums.

3. Formal Employment

- LLI KPI: Percentage of slum workers in formal (contractual) employment
- ISO 37123:2019 KPI: Economy – Percentage of the workforce in informal employment
- LLI Indicator relation *Formal Employment*: The LLI KPI and ISO KPI complement each other. Subtracting the workers in contractual (formal) employment from total workers in employment will provide the number of workers in informal employment, and vice versa.

4. Natural Hazards

- LLI KPI: Annual frequency of natural hazards
- ISO 37123:2019 KPI: Safety – Percentage of city population covered by multi-hazard early warning system
- LLI Indicator relation *Natural Hazards*: The ISO KPI displays a supplementary measure to the LLI KPI to contribute to improved evacuation measures in slums. Still the LLI KPI provides for a broader sense of information, such as the relevance for relocation of a slum, the need for local protective measures, etc.

Service

The main-element “Service” has the following sub-elements (KPIs) attached to it:

5. Health Care Services

- LLI KPI: Density of health care services
- ISO 37123:2019 KPI: Health – Percentage of population with basic health insurance
- LLI Indicator relation *Proximity to Doctors*: Within the standards it was not possible to identify a KPI which measures the proximity to health care services. The ISO KPI selected here measures only the percentage of population with basic health insurance. In an informal settlement context, it is considered rather irrelevant to focus on health insurance, as healthcare systems in lower developed countries mainly address the formal population.

6. Education Facilities

- LLI KPI: Density of education facilities
- ISO 37123:2019 KPI: Education – Educational disruption
- LLI Indicator relation *Proximity to Education Facilities*: Within the standards it was not possible to identify a KPI which measures the proximity to education facilities. The ISO KPI selected here measures only educational disruption and focuses on the specific content taught in schools.

7. Areas of Economic Activity

- LLI KPI: Distance to areas of economic activity
- ISO 37123:2019 KPI: Urban/local agriculture and food security – Percentage of the city’s population living within one kilometre of a grocery store
- LLI Indicator relation *Proximity to Employment*: Within the standards it was not possible to identify a KPI which measures the proximity to areas of economic activity, for example to access employment. Still, the ISO KPI selected here provides a rough estimate about the distance to areas of economic activity, as it is considered that grocery stores can also display employment options, which tend to be located in areas of economic activity/central business districts.

8. Public Transport Services

- LLI KPI: Density of public transport stops
- ISO 37123:2019 KPI: Transportation – Percentage of public transportation trips operating on schedule
- LLI Indicator relation *Proximity to Public Transport*: The LLI KPI measures primarily the distance to public transport, which ensures a resident's mobility. The ISO KPI is a well-founded supplement to the LLI KPI. Measuring the percentage of public transportation trips operating on schedule helps in optimising local transport networks.

Society

The main-element "Society" has the following sub-elements (KPIs) attached to it:

9. Social Assistance

- LLI KPI: Percentage of slum residents with access to social assistance
- ISO 37123:2019 KPI: Population and social conditions – Percentage of population with access to social assistance programs
- LLI Indicator relation *Social Assistance*: Both, the LLI and ISO KPI refer to government-funded social and financial aid that provides support to individuals who cannot meet their basic living costs due to various reasons. The need for assistance can be temporary or long term.

10. Financial Assistance

- LLI KPI: Percentage of slum residents with access to financial assistance
- ISO 37123:2019 KPI: Population and social conditions – Percentage of population with access to social assistance programs
- LLI Indicator relation *Financial Assistance*: Both, the LLI and ISO KPI refer to government-funded social and financial aid that provides support to individuals who cannot meet their basic living costs due to various reasons. The need for assistance can be temporary or long term.

11. External Neighbourhood Relations

- LLI KPI: Annual frequency of meetings among formal and informal resident representatives
- ISO 37123:2019 KPI: Population and social conditions – Percentage of neighbourhoods with regular and open neighbourhood association meetings
- LLI Indicator relation *External Neighbourhood Relations*: The LLI KPI focuses in specific on neighbourhood meetings among formal and informal resident representatives that occur at least annually. The ISO KPI refers to neighbourhood association meetings among neighbourhood associations in general, with no specific focus on social classes.

Space

The main-element “Infrastructure” has the following sub-elements (KPIs) attached to it:

12. Basic Services

- LLI KPI: Existence of functioning basic services
- ISO 37123:2019 KPI: Energy – Percentage of critical facilities served by off-grid energy services
- LLI Indicator relation *Basic Services*: The ISO KPI anticipates that electricity is already established. As many slums develop in areas without functioning infrastructure, the LLI KPI focuses rather on general electricity presence. In case of electricity absence, the ISO KPI offers a complementary measure in the installation phase. With an extension of off-grid services to general electricity ones, the probability rises that energy reliability and functionality can be ensured even in times of emergency.
- ISO 37123:2019 KPI: Water – Number of different sources providing at least 5% of total water supply capacity
- LLI Indicator relation *Basic Services*: The ISO KPI anticipates that water pipes are already established. As many slums develop in areas without functioning infrastructure, the LLI KPI measures in this context water pipe presence. In case of water pipe absence, the ISO KPI offers a complementary measure in the installation phase. With an extension of different water sources to one source, the probability rises that water pipe reliability and functionality can be ensured even in times of emergency.

13. Adequate Housing

- LLI KPI: Percentage of residential brick & mortar buildings
- ISO 37123:2019 KPI: Housing – Percentage of residential buildings not in conformity with building codes and standards
- LLI Indicator relation *Adequate Housing*: The LLI KPI primarily ensures the presence of adequate living units in the form of brick & mortar houses. The ISO KPI is a well-founded supplement to the LLI KPI. With the establishment of building codes and standards, uniform housing projects can be anticipated.

14. Green Infrastructure

- LLI KPI: Number of parks and green spaces
- ISO 37123:2019 KPI: Environment and climate change – Percentage of city surface area covered with high-albedo materials contributing to the mitigation of urban heat islands
- LLI Indicator relation *Green Infrastructure*: The LLI KPI ensures primarily slum residents' access to any parks or green spaces in the direct vicinity. The ISO KPI can offer a guiding principle for any (re-)built surface areas within slums to ensure environmental and sustainability aspects.

15. Neighbourhood Cleanliness

- LLI KPI: Annual frequency of professional waste pick-up
- ISO 37123:2019 KPI: Solid waste – Number of active and temporary waste management sites available for debris and rubble per square kilometre
- LLI Indicator relation *Neighbourhood Cleanliness*: Whereby the LLI KPI focuses on the regularity of professional waste pick-up onsite in slums, the ISO KPI highlights general waste management sites. Local research verified that slums most often are left out of official waste pick-up routes. Consequently, mountains of waste and health threatening areas develop. In this case, the ISO KPI is of rather less importance in the LLI context, as it neglects the crucial measure of professional local waste pick-up regularity.

16. Community Centre

- LLI KPI: Percentage of community centres available
- Standard KPI: none
- LLI Indicator relation *Community Centre*: Within the standards it was not possible to identify a KPI which measures the availability of community centres in slums. Based on the LLI, measuring the availability of community centres in slums is considered relevant, as community centres have been identified to contribute to a liveable life in slums.

5.3 Leveraging Smart City Approaches (E-Participation)

The anthropologist Sirpa Tenhunen (Professor of Social and Cultural Anthropology at the University of Helsinki) understands the kinds of mobile phone uses as ‘social logistics’ that can be observed when mobile phone penetration is reaching into lower socio-economic groups.³⁰⁵ Mobile technology amplifies ongoing processes of cultural change but does so selectively, bringing about the homogenization of social logistics.³⁰⁶ This ‘homogenisation’ of social logistics focuses on social constellations among a variety of processes. As mobile phones are related to ongoing local processes and contribute to changes in culture and society, there is a need to understand this relationship. Robin Jeffrey (professor specialised in Indian history) and Assa Doron (specialist in urban anthropology) approach mobile phones in India rather differently to Tenhunen.³⁰⁷ They see mobiles as transformational technologies that change societies and cultures and describe

³⁰⁵ Tenhunen, S. (2018): *A Village goes Mobile: Telephony, Mediation, and Social Change in Rural India*, Oxford University Press, New York, p. 515.

³⁰⁶ GSM Association (2017): *Triggering mobile internet use among men and women in South Asia*, retrieved from https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/11/GSMA-Triggering-Mobile-Internet-Use_Web.pdf (24.01.2020).

³⁰⁷ Jeffrey, R and Doron, A. (2013): *The Great Indian Phone Book: How Cheap Mobile Phones Change Business*, C. Hurst and Co., London, p. 39.

mobile phones as “the most widely shared item of luxury and indulgence the country had ever seen” (ibid.). Tenhunen states that instead of homogenizing cultures, mobile technology reinforces these cultural patterns and processes that can be reconciled with emerging social logistics.³⁰⁵ Jeffrey and Doron give it a far more ‘disruptive potential’ that helps to escape existing structures. It can be concluded that the results based on primary research in Bhubaneswar align with Tenhunen’s understanding about the potentials of mobile phones. Mobile phones magnify residents’ relationships, add diversity of connections, intensify social constellations among a variety of processes and reinforce cultural patterns. As per the research conducted, Jeffrey and Doron miss the crucial part of local cultures and meanings and credit the technology itself with the power to transform.

Mobile Phones as ‘Social Logistics’

In the following, Tenhunen’s approach to viewing mobile phones to reinforce social logistics is pursued, as this perspective aligns with local research. Thus, the following section takes a closer look at the e-participation potential via mobile phones in the context of Smart Cities to leverage and adapt a local LLI. In addition to the pre-defined KPIs within the LLI an approach has been presented to identify supplementary locally relevant liveable life indicators and customise a LLI to a defined slum level (Figure 25). This approach has been framed as LLI Optimisation Process (Figure 24) and considers research conducted in a slum at stake in the form of household visits or FGDs with slum residents.

To simplify the conduction of research in the identification process of additional locally relevant liveable life indicators, communication and participation opportunities in Smart Cities are analysed. As India’s Smart City Mission shows, the country has a broad base in smart solutions, digital networks and a high affinity for developing Smart Cities.¹⁹ Onsite visits and secondary research revealed that smart approaches in urban areas tend to raise citizen participation in various aspects, but focus is rather on the formal sector rather than towards slum landscapes where development support is needed.^{70, 227} Hence, the potential exists to facilitate the process of identifying additional locally relevant liveable life indicators at a defined slum level by means of digital connectedness.

The possibilities of Big Data analyses are deliberately not further discussed. It is primarily about how slum residents themselves can contribute to LLI adaptation. This is due to typical Big Data analyses in Indian practice being designed to be used top-down and tend not to be collected in a way that is in the interest of local residents. This aspect was pointed out during expert interviews. To promote residents’ engagement in slum upgrading processes just as pursued within the LLI, it is relevant to raise understanding on the determinants and explore the potentials of e-participation.

Similarly, tendencies of restrictive use instead of empowerment can be observed in the context of Smart Cities surveillance mechanisms, making them less applicable to the

herein pursued democratic understanding of Smart City potentials.^{308, 309, 310, 311} Focusing on the Smart Cities Mission (SCM) in India, Prasad et al. (2020) place emphasis on the empirical research to investigate the typologies of implementing Smart Cities across the nation. They criticise that prioritized proposals within the SCM only cover smart governance, smart citizen, etc. at the expense of overlooked dimensions, e.g. smart environment and smart economy.³⁰⁸ Likewise, Hoelscher (2016) analysed India's SCM with the conclusion that "the smart cities agenda in India appears to be characterized by a failure to conceptualize and develop an integrated set of policies, and while a clearer (yet contested) concept is emerging, the prospects for success are uncertain"³⁰⁹. Praharaj et al. (2018) go even one step further and declare Smart Cities themselves as "being another stand-alone initiative"³¹⁰. Criticism is placed on the plethora of urban policies and plans cultivated, which are often overlapping or conflicting and as a result do not produce desired outcomes. They conclude that the "integration of plans and unification of smart city visions with the overarching city development goals can better support effective urban transformation and local innovation"³¹⁰.

Focusing on Smart City governance in developing countries generally, Tan et al. (2020) also criticise "the high financial cost involved in infrastructure maintenance, the substantial size of the informal economies, and various governance challenges [that] are curtailing government idealism regarding smart cities"³¹¹. Additionally, it is highlighted that adopting smart technology and ICT in Smart Cities should take into account the needs of "those from the informal sectors who have not benefited from the conditions that have fuelled development in developing countries in the past"³¹¹. The general opinion is that governments should pay closer attention to the additional challenges that arise from the large share of informal communities in developing countries and ensure that concerns are taken into consideration in the process of Smart City development. To build sound Smart City policy frameworks in emerging economies, it can be argued that the perspective of smartness in Smart Cities misses in current frameworks the overarching role of all social classes (ibid.). Smart Cities that make broad use of digital technologies in developing countries may better meet the rising demand for services and infrastructure, when extending the level of smartness to local development goals, such as smart environments, smart economies and smart communities. As a consequence of the presented arguments, a local, people-centred approach is pursued and solutions are sought within the frame of the LLI application.

Smart City Approaches

³⁰⁸ Prasad, D.; Alizadeh, T. (2020): What Makes Indian Cities Smart? A Policy Analysis of Smart Cities Mission, *Telematics and Informatics*, Vol. 55.

³⁰⁹ Hoelscher, K. (2016): The evolution of the smart cities agenda in India, in: *International Area Studies Review*, Vol. 19, No. 1, p. 28–44.

³¹⁰ Praharaj, S.; Han, J. H.; Hawken, S. (2018): Urban innovation through policy integration: Critical perspectives from 100 smart cities mission in India, in: *City, Culture and Society*, Vol. 12, p. 35–43.

³¹¹ Tan, S. Y.; Taeihagh, A. (2020): Smart City Governance in Developing Countries: A Systematic Literature Review, in: *Sustainability*, Vol. 12, No. 3, p. 899.

Making cities ‘smarter’ is a subject of debate. Using data and technology, cities analyse and try to tackle the challenges of modern urban life. Smart cities are taking on sustainability issues like demographic change, population growth, environmental pollution, climate change and scarcity of resources.¹⁴ Besides, in the context of urban slum upgrading it is known that both governments and aid institutions experience difficulties in sustainably upgrading urban slums.^{312, 98} The consolidation of these two conclusions – Smart City focus and sustainable slum upgrading – may display a future oriented view to promote dialogue and address slum upgrading. The term dialogue implies advanced communication strategies among different social levels to allow holistic participation. It has been identified that participation of key stakeholders in slum upgrading is fundamental to identify locally rooted upgrading components.²²⁷ Participation needs communication and today’s communication is often based on digital social networks and internet platforms.³¹³ In that sense, the approach to identify additional locally-relevant liveable life components and optimise a LLI could benefit from facilitated communication through a mobile phone application concept. Besides facilitating communication, digital connectedness has the potential to improve participation, keep residents engaged and motivated, reduce operational costs and above all, increase flexibility.^{314, 315}

In connection with Smart Cities and their overarching aim to enhance the quality of life for citizens through smart technology, the following sections discuss how e-participation via mobile phone application enlarges the scope of slum upgrading competence.^{305, 316} The growing mobile sector and advanced internet connectivity makes it reasonable that slum residents are able to share problem areas via mobile phone app.³¹⁷ Essential for the exploitation of information are digital footprints and their automatic transmission, like GPS data from mobile devices, IP addresses or sensor marks, which upgrading institutions can use to cluster and analyse problem areas via APIs for the design of countermeasures. Communicating without being physically present allows data to be captured independently of time and place, thereby facilitating participation in the initiation, planning,

³¹² World Urban Campaign (2020): COVID19 - Urban Thinkers Campus - Facing Urban Vulnerabilities In The Covid-19 Crisis: What Is Needed To Address Hot Spots And Build Resilience, retrieved from <https://www.worldurbancampaign.org/covid19-urban-thinkers-campus-facing-urban-vulnerabilities-covid-19-crisis-what-needed-address-hot> (14.05.2020).

³¹³ Münster, S.; Georgi, C.; Heijne, K.; Klamert, K.; Noennig, J.; Pump, M.; Stelzle, B.; Meer, H. (2017): How to involve inhabitants in urban design planning by using digital tools? An overview on a state of the art, key challenges and promising approaches, in: *Procedia Computer Science*, Vol. 112, p. 2391-2405.

³¹⁴ Wirehive (2021): 7 benefits of digital communication in the workplace, retrieved from <https://www.wirehive.com/thoughts/benefits-of-digital-communication-in-the-workplace> (20.07.2022).

³¹⁵ Clements-Croome, D.; Marson, M.; Yang, T.; Airaksinen, M. (2017): Planning and Design Scenarios for Liveable Cities, In: M. A. Abraham (Ed.), *Encyclopedia of Sustainable Technologies*, Elsevier, p. 81-97.

³¹⁶ Zheng, Y. (2017): Explaining Citizens’ Usage: Functionality of E-Participation Applications, in: *Administration and Society*, Vol. 49, No. 3, p. 423-442.

³¹⁷ McKinsey Global Institute (2019): Digital India: Technology to transform a connected nation, retrieved from <https://www.mckinsey.com/~media/mckinsey/business%20functions/mckinsey%20digital/our%20insights/digital%20india%20technology%20to%20transform%20a%20connected%20nation/digital-india-technology-to-transform-a-connected-nation-full-report.ashx> (03.06.2019).

implementation and closing of an upgrading project. Among the tools available in the Smart City approach, e-participation and dissemination of information and concerns seem the most promising approach for the pursued slum development use case.

E-Participation

Using the term participation in the context of urban planning has increased over the years, as its importance can be acknowledged in the improvement of various aspects: relationship building between governments and citizens, stronger levels of democracy, decision-making processes, etc.^{318, 319, 101, 320} The majority of participative theory is based on the typologies of participation derived from Arnstein's (1969) influential "ladder of citizen participation" (Figure 26).³²¹

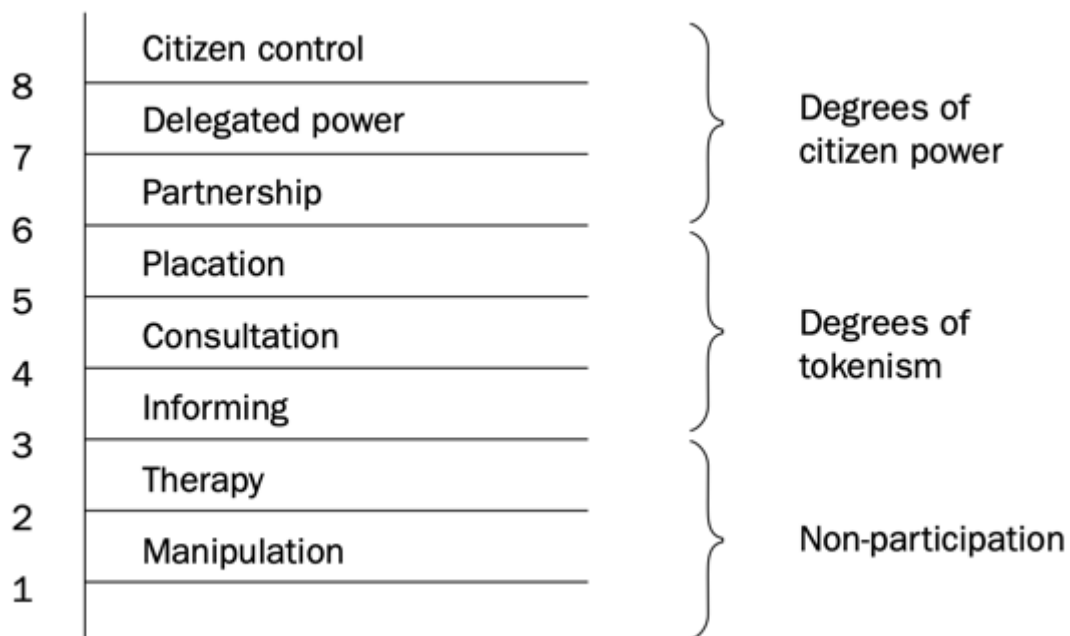


Figure 26: Arnstein's ladder of citizen participation.³²¹

Still, a detailed typology of participation is needed that allows a more disaggregated analysis of the causal links between different forms of participation and different forms of outcome. Accordingly, the Organisation for Economic Co-operation and Development

³¹⁸ Gishti, M. (2017): Citizen participation in urban and landscape planning, International Master of Landscape Architecture, Hochschule für Wirtschaft und Umwelt Nürtingen-Geislingen, p. 14.

³¹⁹ Lauria, M.; Slotterback, C. S. (2020): Learning from Arnstein's Ladder: From Citizen Participation to Public Engagement, Taylor & Francis, New York, p. 32.

³²⁰ OECD (2020): Innovative Citizen Participation and New Democratic Institutions: Catching The Deliberative Wave, retrieved from <https://www.oecd.org/gov/open-government/innovative-citizen-participation-new-democratic-institutions-catching-the-deliberative-wave-highlights.pdf> (20.10.2021).

³²¹ Arnstein, S. R. (1969): A Ladder of Citizen Participation, in: Journal of the American Planning Association, Vol. 35, No. 4, p. 214–216.

(OECD) published in 2001 a guide to improve government-citizen relations in policy-making.³²² The handbook highlights three ways in which government-citizen relations can be strengthened (ibid.):

1. *Information*: Government disseminates information on policy-making on its own initiative or citizens access information on demand (one-way relationship).
2. *Consultation*: Government asks for and receives citizens' feedback on policy-making (two-way relationship).
3. *Active participation*: Citizens actively engage in decision-making and policy-making (advanced two-way relationship).

With the rapid development of ICT, e-participation has brought unprecedented opportunities for planning and managing urban areas in a sense that it can contribute to a more efficient and effective representation of citizens' interests.^{19, 98} Based on the OECD framework, the UN developed an e-participation index (EPI) as a supplementary index to the UN E-Government Survey by simply adding the electronic elements:^{320, 323}

1. *E-information*: Enabling participation by providing citizens with public information and access to information without or upon demand.
 - E.g. access to government website in multiple national languages.
2. *E-consultation*: Engaging citizens in contributions to and deliberation on public policies and services.
 - E.g. presence of online tools to receive public opinion for public policy deliberation, such as polls, voting tools, petitions, forums, etc.
3. *E-decision-making*: Empowering citizens through co-design of policy option and co-production of service components and delivery modalities.
 - E.g. availability of e-decision-making tools.

The UN states that “the goal of e-participation initiatives should be to improve the citizen's access to information and public services; and promote participation in public decision-making which impacts the well-being of society, in general, and the individual, in particular”.³²³ In order to conduct surveys on digital participation, the EPI is used. The survey is conducted every two years in countries worldwide and evaluates the three different e-participation components in six defined sectors: education, health, finance, social welfare, labour information and the environment (ibid.).

To pay closer attention to who is participating, in what format and for whose benefit, it would be a next step to focus on clarity through specificity, if the call for participation is to realize its democratizing promise. While some forms of citizen participation, such as

³²² OECD (2001): Citizens as Partners OECD Handbook on Information, Consultation and Public Participation in Policy-Making, OECD Publications Service, France, p. 27-38.

³²³ UN E-Government Knowledgebase (2022): E-Participation Index, retrieved from <https://publicadministration.un.org/egovkb/en-us/About/Overview/E-Participation-Index> (29.01.2022).

consultation rely on the relevance of knowledge and opinions, a cooperative concept, such as the LLI, depends much more on the quality of data citizens share. It is important to characterise a detailed typology of participation that allows a disaggregated analysis of the causal links between different forms of participation and outcome. Still, there is a lack of solid evidence from various studies about e-participation potentials for contexts such as slum upgrading projects of Smart Cities.³¹¹ Regarding this, mobile applications are often flagged for their potential in improving public participation (e-participation) to establish relationships between the government and citizens based on virtual information sharing.³¹⁶ Therefore, the consideration of e-participation via mobile application in the context of LLI surveys is expected to ease participation. Communicating in an electronic format creates an environment of transparency and enhances dialogues³²⁴, which can facilitate the engagement of key stakeholders related to slum upgrading.

Digital Participation vs. Face-to-Face Participation

So far, the LLI concept has been discussed in a non-digital approach, developed within Bhubaneswar, and based on a traditional form of face-to-face participation, which has several limitations and obstacles. Most face-to-face methods are time consuming for residents as well as experts conducting local research.³²⁵ An average face-to-face method would take three to four working-days to get expected results, depending on the slum size. Furthermore, most face-to-face methods require residents' physical presence at a particular place. Face-to-face methods are also not transparent enough, as it is not clear how resident's contributions would be in an anonymous setting.³²⁶ Administrative processes are usually extensive and complex, residents' involvement in particularly large neighbourhoods require many resources and can even be impossible.

To counteract participatory limitations within the non-digital LLI approach, there is a need for participation forms that make participatory planning processes compatible with new urban settings.³¹³ Focusing on the expansion of Smart Cities, e-participation became a core element of ICT in the process of allowing easier interactions between governments and citizens. E-participation in the context of the LLI approach is expected to disseminate policy planning information and solicit slum residents' inputs. Still, the success of a digital LLI approach depends on the careful selection of best-matching technologies and ICT tools. To ensure the acceptance of a digital tool to be used in slum neighbourhoods, digital trends with a major focus on mobile phones in the Indian market have been analysed, based on primary and secondary data.

³²⁴ Santamaría-Philco, A.; Canós Cerdá, J. H.; Penadés Gramaje, M. C. (2019): Advances in e-Participation: A perspective of Last Years, in: IEEE Access, Vol. 7, p. 155894-155916.

³²⁵ Schröder, J. (2016): GESIS Survey Guidelines: Face-to-Face Surveys, Mannheim, Germany, GESIS – Leibniz Institute for the Social Sciences, p. 2.

³²⁶ Aichholzer, G.; Kubicek, H.; Torres, L. (2016): Evaluating e-Participation: Frameworks, Practice, Evidence, Springer International Publishing, Switzerland, p. 109.

The Quiet Digital Revolution

India has in the last five years undergone what is called the quiet digital revolution.³²⁷ Speaking in numbers and areas of attention which constitute the digital revolution, India has emerged as a leader in building on its biometric digital identity program (Aadhaar). With 1.2 billion citizens enrolled, in 2019 Aadhaar covered 95% of India's population, including almost all adults.³²⁸ A further integral part of the digital revolution displayed a rapid growth in the internet user base, which can be traced back to decreasing costs and rising availability of mobile phones, as well as high-speed connectivity (Figure 27).³¹⁷ Indians downloaded 12.3 billion apps in 2018 and the country had 560 million internet subscribers in 2018, ranking India second in the world behind China. It is predicted that internet subscribers will continue to grow, as subscriptions have risen by 23% since 2015. On average an Indian internet subscriber spends 17 hours on social media platforms each week and due to the countries lowest data costs in the world, the share of Indian adults with at least one digital financial account has more than doubled to 80% since 2011. Statistics also show that 3G or 4G networks cover 84% of India's population.³⁰⁶ To complement this digital revolution, a wide array of urban upgrading missions started to dominate India's urban landscapes, such as the Smart Cities Mission, National Urban Digital Mission or AMRUT. All of them move towards adopting ICT perspectives, such as integrating mobile apps, GIS mapping or drone usage into their approaches.

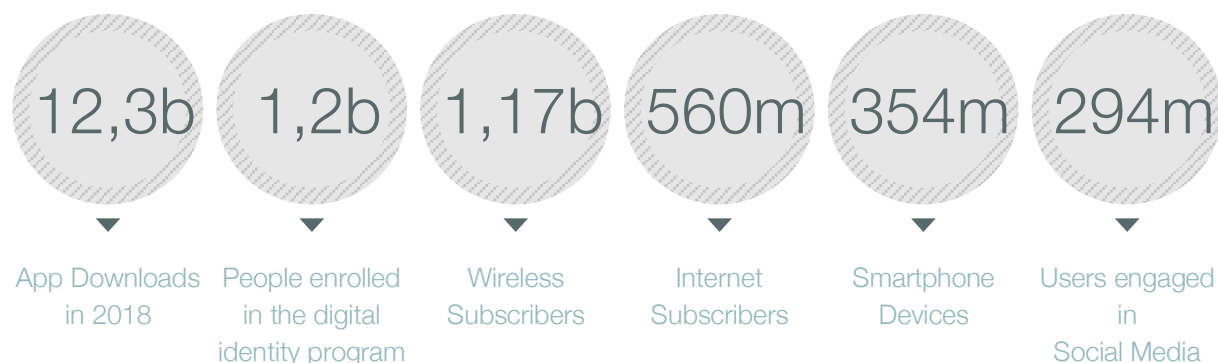


Figure 27: India's key dimensions of digital adaptation (own representation based on the McKinsey Global Institute).^{99, 306, 329, 330, 317}

³²⁷ ET Government (2021): Smart City Mission: India sets big goals, gears up for 4,000 cities expansion in 2 years, retrieved from <https://government.economictimes.indiatimes.com/news/smart-infra/smart-city-mission-india-sets-big-goals-gears-up-for-4000-cities-expansion-in-2-years/83831631> (03.12.2021).

³²⁸ Gelb, A.; Mukherjee, A. (2019): Building on Digital ID for Inclusive Services: Lessons from India, in: Global Center for Development, p. 1-4.

³²⁹ Financial Inclusion Insights (2019): India, Aave 6 Report, Sixth Annual Fii Tracker Survey, retrieved from http://finclusion.org/uploads/file/india-wave-6_final-5-28-19.pdf (18.07.2020).

³³⁰ Keelery, S. (2021): Internet usage in India - statistics & facts, retrieved from <https://www.statista.com/topics/2157/internet-usage-in-india/> (09.10.2021).

As mentioned, the number of mobile phone owners, volume of app downloads and distribution of internet accessibility is rising. With only a few formats capable of managing larger participant numbers independent of time and place, it is most reasonable to make participation in slum upgrading compatible with digital trends (ICT, e-participation, mobile application).³¹³ Mobile e-participation in the context of the LLI can create a platform for dialogues among key stakeholders in slum upgrading. This includes a remote diagnosis of local liveable life indicators and deep learning algorithms. Enabling slum residents to share liveable life perceptions in a LLI app contributes to the storage of indicators and corresponding coordinates in a data base. GPS systems in network-attached mobile devices enable the determination of coordinates. Respective experts can then analyse stored indicators and corresponding coordinates to develop a LLI and potential countermeasures for upgrading guidance at policy level. As new data in the form of indicators, locations and countermeasures enter the system perpetually, the artificial intelligence of connections (i.e. machine learning) develops. The more data is stored, the more complex connections (indicators-locations-countermeasures) can be linked, and local solutions be optimised. Hence, mobile e-participation can create an environment for engagement and facilitate citizens engagement in the design of their living place.

Mobile Phone Usage in Odisha

Having discussed mobile phone usage across India, this section focuses on mobile phone usage and availability in the research area Bhubaneswar and Odisha in general. The following information was derived from primary and secondary research. Primary research takes into consideration data on mobile phone usage and availability regarding slums in Bhubaneswar. Data on mobile phone usage and availability in slums is based on expert interviews, statements made during FGDs, and ethnographic observations during slum visits. As several ethnographic observations during slum visits also took place in other slums located in Bhubaneswar, unrelated to the FGDs, findings on mobile phone usage and availability in slums are discussed within this section rather than the questionnaire evaluation section (Chapter 4). Secondary research takes into consideration data on mobile phone usage and availability regarding the general population in Odisha.

Overall mobile phone density in Odisha is 80.28% (number of telephone connections per 100 people) and internet subscribers is 28.22% (number of internet subscribers per 100 people).¹⁹⁵ Slum visits revealed that 80% of youth between 18-30 years, 40% of adults between 31-55 years and 5% of pensioners in the age 50+ years use mobile phones on a daily basis.²²² The majority of slum residents are familiar with and able to use mobile phones in a targeted and conscious manner. As already mentioned, the large share of mobile phone density in slums can be traced back to the growing low-cost mobile market. During slum visits residents reported about the large supply in affordable low-cost mobile phones (35.60€ - 136.90€) designed for poor users by local manufacturers, such

as Micromax or Karbonn.³³¹ There exist also various options to top-up credit, starting from as low as 0.05€ usually bundled with other incentives, such as free text messages to users on the same service. Most residents in Bhubaneswar's slums have pre-paid connections, as security checks required for mobile phone contracts (usually involving submission of identification and residential proof) can be circumvented. This allows residents to acquire mobile phone connections without providing personal details they either do not possess or do not want to provide. Still, owning a mobile phone is a high priority in slums. Already in 2016 slum residents were "spending more on TV sets, computers and mobile phones than sanitation"³³². The United Nations conducted a study in India, which revealed that 565 million people had mobile phone connections, while only 366 million people had access to toilets.³³³

With reference to primary research conducted in selected slums located in Bhubaneswar, three main application areas of mobile phones have been identified: conducting business, education and socialising. Residents highlighted that local businesses have increased with the expansion of digital networks, as they benefit from a wider customer base. Especially social media and remote work options offer a convenient and time saving means to connect with customers without being physically present.²²⁷ Remote work also decreases the awareness of slum residents living background and reduces prejudices³³⁴. In terms of education, it has been mentioned that children benefit from school classes online and elderly can access education opportunities on topics of personal interest. For example, local women tend to watch sewing techniques online to offer clients a broader variety of tailoring services.²²⁴ Mobile phones also keep residents in touch with family members living elsewhere and allow to socialise and communicate on the go. It can be summarised that residents are aware of the potentials found in digital networks and it can be expected that the application areas of mobile phones in slums will only grow.

In the following, further application areas of mobile phones are listed based on direct quotations with relevance to local developments based on slum residents' statements:²²²

1. Communication in social networks to disseminate and exchange relevant information concerning the neighbourhood, such as local development (e.g. Facebook, Instagram)
2. Campaigning to attract attention on local matters (e.g. online polls)
3. Education to personally receive information about local news, global news or attend online classes (e.g. YouTube videos about sewing skills)

³³¹ Niladri Vihar Harekrushna Nagar; Slum Residents (20.11.2019): Personal Communication, Focus Group Discussion, Bhubaneswar.

³³² Hjorth, L.; Khoo, O. (2016): Routledge Handbook of New Media in Asia, Routledge, New York, p. 183.

³³³ United Nations University (2010): Greater Access to Cell Phones Than Toilets in India: UN, retrieved from <https://unu.edu/media-relations/releases/greater-access-to-cell-phones-than-toilets-in-india.html> (24.01.2020).

³³⁴ Nakagata Chala Sahi; Slum Residents (17.11.2019): Personal Communication, Slum Visit, Bhubaneswar.

It can be concluded that especially in development work the use of digital tools reasonably complements the development of structured guidelines for upgrading projects in informal areas.³¹³ Facilitating communication and dialogue among key stakeholders can contribute to the consideration of more realistic upgrading measures.⁹⁸ With the development of Smart Cities, more investments increasingly pour into ICT and new approaches of participation allow services to be offered online. It stands to reason that there exists an increase in citizens who adopt ICT tools to engage in activities they believe to be more efficient and effective.

Realising a digital LLI approach can enhance the general scope of upgrading activities, identify local risks more effectively and ensure an integrative communication strategy. Digital connectedness via mobile phone already provides a convenient communication method for residents and has a high social value within their communities.³¹⁶ The option to engage anonymously in particular, can encourage residents' contribution when disclosing sensitive information. The digital LLI approach aims to create an environment that energizes residents and makes participatory planning processes compatible with local settings. Having analysed primary and secondary research, this section explored the potentials of e-participation to facilitate the development of a LLI. The subsequent section builds upon insights gained and introduces a digital LLI approach.

5.3.1 Digital Feedback Approach to Locally Adapt the LLI

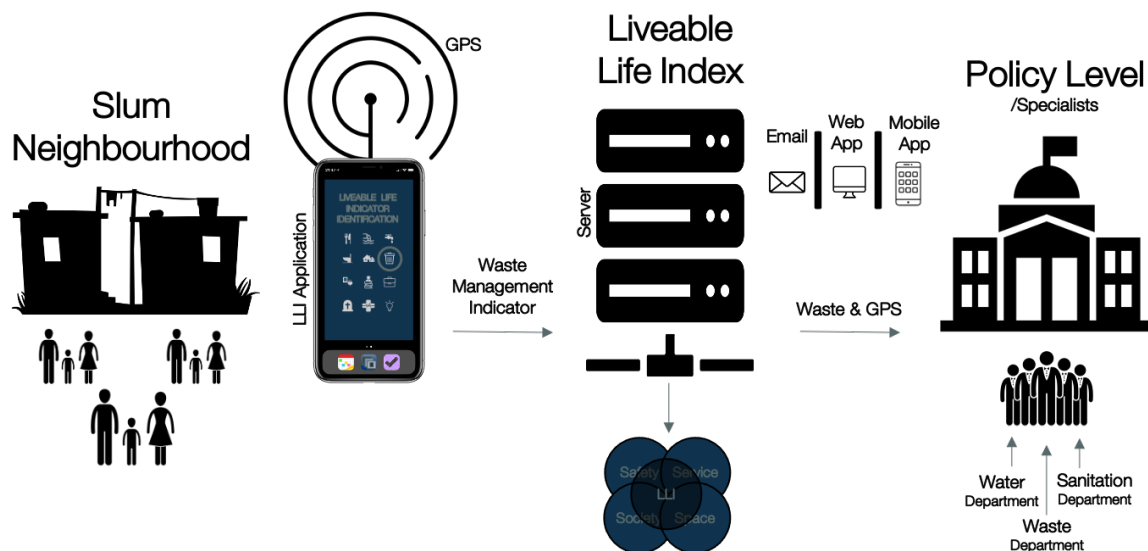


Figure 28: The Digital Feedback Approach to Locally Adapt the LLI (own representation).

India's Smart City landscape is growing and so do the number of people living in poverty.³³⁵ To address informal settlement development and optimise a local LLI, Chapter 5.1 introduced a non-digital approach to identify additional locally-relevant liveable life indicators (Figure 25). This section aims to combine Smart City trends with the approach to locally adapt the LLI. The digital approach mainly concentrates on e-participation methods to facilitate communication. Based on primary research, the smartest technology found in slums is a mobile phone. For this reason, the following section will introduce the various steps associated with a digital feedback approach to locally adapt the LLI, based on a mobile phone application concept. For a realistic representation of the different steps, the liveable life indicator "waste management" is chosen as an example.

Liveable Life Indicator Identification via LLI Application

In the context of a LLI approach, local slum residents are always the main actor, as they share indicators and are the addressees of established solutions. To increase awareness among residents on how to share liveable life indicators it is important to ensure understanding of the app. Local introduction workshops can be implemented to familiarise slum representatives with the app. Slum representatives can then share acquired knowledge with the entire community. To ensure the applications easy comprehension, the user interface is based on a simple design (Figure 29). As a starting point, the apps' main menu visualises general liveable life indicators to guide residents. Visualised indicators should optimally be oriented towards assumed local liveable life indicators and updated with new indicators entering the system - deep learning algorithms. Residents can choose from the visualised indicators either their personal indicator, type in an indicator that is not listed or record voice notes (option for illiterate people). Each indicator can be supported by a comment for clarification purposes. Once all information is provided, the personal indicator is stored for further processing until it is considered a locally recognised liveable life indicator, which can be added to the LLI. The process of converting a personal indicator into a locally recognised liveable life indicator will be explained subsequent to the fictitious example.

Fictitious Example:

The residents at Nala Muha Sahi Basti want to raise attention on the mountains of waste within their neighbourhood. The community suffered already from severe illness due to the unhygienic conditions. A few weeks ago, the slum head shared information on the new app, which supports the identification process of liveable life perceptions in slum neighbourhoods for the sustainable design of slum upgrading programs. All individuals that possess a mobile phone, already downloaded the app, and want to make a change, now have the chance to use the application. Each application user can click on the respective waste icon, type in a message, or record a voice note specifying the indicator

³³⁵ The Global Statistics (2022): Poverty in India Statistics 2021-2022, Poorest State in India, retrieved from <https://www.theglobalstatistics.com/poverty-in-india-statistics-2021/> (01.05.2022).

and click “send”. The votes for a specific indicator are then stored for further processing to be potentially turned into a liveable life indicator considered within the LLI.



Figure 29: Application to Locally Adapt a LLI (own representation).

Steps Associated to the Digital Approach

To locally adapt the LLI, as a first step, liveable life indicators should be identified in a specific area. As already explained, this implies that slum residents share via app their personal liveable life perceptions in the form of indicators (Figure 28 and 29). GPS signals in mobile phones help to assign liveable life indicators to individual areas, so that locations can be differentiated, and the local focus of liveable life perceptions is maintained.

In a second step, on the back-end of the app, liveable life indicators are collected and prioritised for a defined area. To eliminate the formulation of liveable life indicators within the LLI that are based on a single indicator or few reported ones, an indicator needs to reach a pre-defined number of votes. Each indicator entering the system (can be similar or different) is one vote. For example, only when 100 people report on adequate waste management in a defined area, this indicator will be considered as a liveable life indicator and added to the areas' LLI. As seen in Figure 28 and 29, this process happens, when slum residents share via app their “waste management” indicator. The indicator is first recognised and then stored in the server until the indicator is authorised (minimum of votes reached) to display a liveable life indicator within the LLI.

In a third step, the LLI is optimised, based on the results of the previous two steps. Once a pre-defined set of liveable life indicators is identified for a specific area, they can be added to the LLI. Algorithms relate the most eminent liveable life indicators to the four main-elements. At policy level, the locally adapted LLI can be used to deduce guidelines for upgrading orientation. With the addition of site-specific indicators to the LLI, upgrading

can be adjusted in respect to the very neighbourhood at stake. It is also reasonable to link indicators directly with suitable external stakeholders/specialists (e.g. municipality), who are specialised in a distinct indicator. A specialist can be notified via email/web app/mobile app about an indicator, its performance and its location that is generated via GPS signal in mobile phones. For example, the desire to improve waste management in Nala Muha Sahi Basti can be forwarded to the Bhubaneswar Municipal Corporation, as they are officially responsible for managing waste disposal. The specialist is then responsible for analysing the indicator at the specific location.

In conclusion, it can be stated that the use of an application to conduct surveys on liveable life perceptions in slum neighbourhoods can facilitate feedback to locally adapt the LLI. With ICT development in Smart Cities, increasingly more participation services can be offered online.¹⁰¹ ICT tools proved to optimise the efficiency and effectiveness of citizen participation compared to face-to-face discussions (ibid.). Especially smartphones are widespread and internet connections are in most urban slums available. Still, to verify the applicability potential of a digital LLI approach at a defined local scale, socio-demographic characteristics, and slum residents' engagement to participate online has to be analysed.¹⁹³ In Bhubaneswar it has been shown that it is most reasonable to communicate with residents via mobile phone app.

General citizen engagement via e-participation is already facing an upward trend (MyGov & Umang), as it has been recognised that it contributes to faster processes and places more priority on citizen demands. In terms of sustainable slum upgrading and greater proximity to slum residents it is about linking elements that most Smart Cities pursue – digital connectedness and socially conscious actions. Therefore, e-participation can prove to be a well-founded approach to locally adapt the LLI for a defined slum.

5.3.2 Non-Digital vs. Digital LLI Approach

Based on previous chapters, a non-digital and digital approach has been developed to establish a locally-rooted Liveable Life Index (Figure 30). The non-digital approach is simple to conduct yet more time consuming. The digital approach is more difficult in terms of conduction, but once adapted to a specific region it benefits from a wider reach and scope, as well as extended co-operation and communication potentials.^{72, 618} It is considered that in the long term, the advantages of the digital approach override those of the non-digital one, especially in the context of Smart Cities and their overarching focus on information and communication technology (ICT).^{193, 316} However, the general steps to conduct surveys on liveable life perceptions in slum neighbourhoods to develop a LLI do not vary between the non-digital or digital approach, as only physical contributions are digitalised (e.g. field work and data collection).

From the identification of individual sub-elements to a local Liveable Life Index (LLI), three essential steps are required within the non-digital and digital approach. That it is a simple, flexible, and adaptable procedure. To establish an understanding of a LLI formation process in a digital framework, a summary will be provided in the following. The summary establishes a direct connection to the non-digital approach and highlights corresponding differences. Firstly, each step is explained based on the non-digital approach (a) and in a second step based on the digital approach (b).

The digital approach relies on a LLI mobile phone application concept. It is anticipated that digital connectedness facilitates communication with slum residents for the purpose of identifying locally-rooted liveable life indicators in order to develop a LLI. Therefore, within the digital approach the scenario should be assumed that slum residents living in a defined area have downloaded the LLI mobile app and are aware of its applicability.

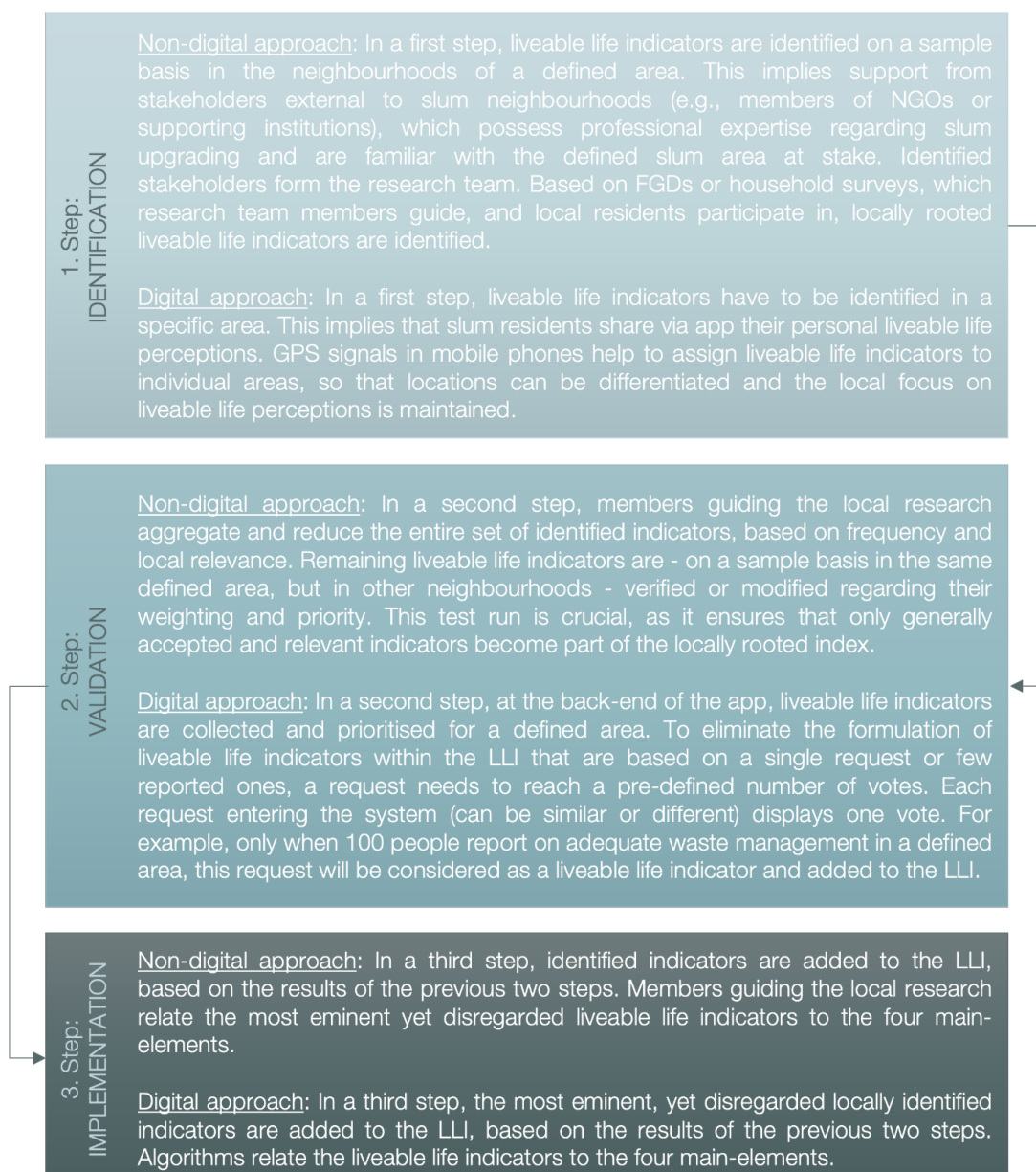


Figure 30: Non-Digital vs. Digital Feedback Approach to Locally Adapt the LLI (own representation).

It can be concluded that with the feedback approach to locally adapt the LLI, neighbourhood-specific individual factors can be added or subtracted to ensure better adaptation. Thus, irrelevant measures can be prevented, and specific themes can be highlighted in respect to the very neighbourhood at stake. The digital approach clearly features a more flexible and independent approach in terms of time, place and resources involved. A set of time-consuming physical contributions can be circumvented, and result analysis can immediately take place with artificial intelligence.

5.4 Third Research Phase

Preface of the Third Research Phase

The results of the first and second research phase led to the LLI conceptualisation. In order to check the key points analysed and evaluate the findings of the conceptualised LLI tool from an expert perspective, a third research phase was conducted. As this research phase took place remotely, a Power Point Presentation (Appendix E) including the key findings on slum development, needs and opportunities and the LLI concept with its location-specific applicability was presented during an online meeting. The key points analysed were laid out in a subsequent direct discussion with local development experts, followed by a short interview to receive feedback. Interviewees were asked to respond to the LLI concept, its comprehensiveness, ability to address the right priorities and correct identification of critical development aspects. Furthermore, Interviewees were asked to evaluate the practicality for the local implementation and usability of the participative approach, as well as the benefits and concerns underlying the LLI concept.

5.4.1 Expert Interviews – Third Research Phase

This section will introduce the findings of expert interviews conducted with slum upgrading specialists. In total, five expert interviews were conducted, of which all interviewees possessed extensive knowledge about and have been or still are integrated within Odisha's slum upgrading program "Odisha's Liveable Habitat Mission" (OLHM). For the interview a semi-structured questionnaire was developed (Appendix C). The questions one to six can be broken down into thematic fields, which are as follows: LLI Understanding, LLI Priorities, LLI Sub-Elements, LLI Usability, LLI Benefits, LLI Concerns. In the following, a summary of each thematic field is provided.

1. LLI Understanding

The first question aimed to ensure if the findings and conceptualised LLI tool were understandable to the interviewees. Four of five interviewees agreed to having no problem understanding the idea behind the LLI and its use. One interviewee had “difficulties to read the radar chart”³³⁶ initially, but a short introduction resolved uncertainties.

2. LLI Priorities

The second question aimed to ensure, if the priorities set within the LLI conceptualisation are compatible with the focal points of local upgrading, especially related to the case of OLHM. All experts agreed and praised the holistic overview of relevant measures of slum upgrading that were considered in the presented approach. A sub-question asking for additional potentially relevant priorities in slum upgrading confirmed that no priorities set within the LLI conceptualisation were left out.

3. LLI Sub-Elements

The third question aimed to ensure whether the aspects of slum upgrading represented within the sub-elements of the LLI tool were chosen and named correctly and understandable. All experts agreed. A sub question asking for additional sub-elements confirmed that no further sub-elements set within the LLI conceptualisation were left out.

4. LLI Usability

The fourth question aimed to ensure, if the LLI tool is expected to be helpful with regard to OLHM. All interviewees agreed that the local experts should be able to utilize the LLI following a short training. Especially the “quick overview and easy-to-understand analysis of KPIs [were pointed out to be] particularly helpful in practice”³³⁷.

5. LLI Benefits

The fifth question aimed to identify benefits related to the LLI. From all expert interviews emerged primarily positive feedback about the approach. In particular, the high level of detail coupled with easy-to-understand content and the realistic representation of key performance indicators to be considered within upgrading were praised. The most mentioned benefits are summarised in Figure 31.

6. LLI Concerns

The sixth question aimed to identify concerns and gaps related to the LLI. All experts emphasised that there exist no concerns for the instrument itself, only suggestions for optimising its application in local institutions. Several references were made on the procedure to certify upgrading specialists for leading LLI projects. In this context it was suggested to introduce LLI trainings as part of a general training programme for employees

³³⁶ Tripathy, B.; GIZ Technical Advisor (17.11.2022): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.

³³⁷ Dash, S.; Urban Habitat Lead at Tata Trusts (22.11.2022): Personal Communication, Expert Interview, Bhubaneswar.

involved in OLHM to optimise the application and communication with local residents. It has also been considered that the qualification of being certified to lead LLI projects can display a motivator from an employee perspective as it displays a rare professional qualification in the context of slum upgrading. Further, some experts suggested the addition of a financial framework, allowing an overview and a forecast of costs in projects. The introduction of a financial framework within the LLI can be a general extension option of the instrument in the future. The most mentioned concerns are summarised in Figure 31.

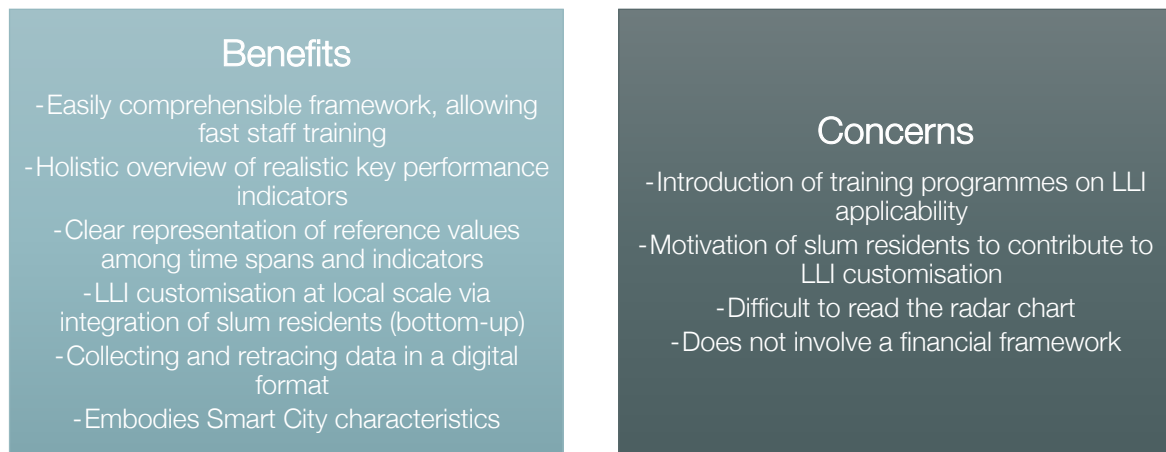


Figure 31: Expert Interviews – Benefits & Concerns of the LLI (own representation).

6 Conclusion & Outlook

6.1 Conclusion

The term “Liveability” is being used in a myriad of ways and as an umbrella for various indicators. However, in many cases, indicators are chosen first and then gathered under the “umbrella” of liveability, rather than following a distinct location specific conceptual framework. Considering the history of slums in Indian cities, they have long been identified as a concerning neighbourhood development that needs to be sustainably solved. Still, policies guiding upgrading rarely evolved gradually in accordance with sustainable solutions over time. Failure of top-down projects have promoted urban planners to think about alternative approaches, but the consideration of using locally-rooted liveable life perceptions as a guideline in upgrading has so far been absent. This can clearly be seen in general slum development practices since India’s independence. Moving with the times, lessons learnt in upgrading, innovations in urban networks, as well as sustainable global targets contributed to a shift in viewing and approaching urban slum upgrading in the Global South.

Currently, often discussed and partly controversial subjects associated with urban development in the Global South, Smart Cities, digital communication, and sustainable slum upgrading are compiled and interwoven in this thesis. Emphasis is placed on the importance of facing realistic upgrading approaches and narrow upgrading frames to local perspectives (bottom-up initiatives and public participation), rather than general ones. As a result, the Liveable Life Index (LLI) approach developed here aims to contribute to capacity building of local stakeholders and redirect attention to locally relevant topics when designing urban slum upgrading. Moving from a non-digital LLI approach to a digital one aligns opportunities regarding reach, scale, and participation in upgrading. Digital patterns contribute to reduced personal contact, enable remote management, and allow integrative solutions without being physically present in underserved neighbourhoods. Upgrading frameworks with a communication interface that reduces personal contact (imperative during the Covid-19 pandemic), while still supporting the design of a well-structured redress in informal neighbourhoods are required.^{338, 339} As mentioned in the beginning, focus is based on the creation of environments that people value and are more attractive to live in, which the LLI aims to achieve.

³³⁸ Ghosh, S.; Seth, P.; Tiwary, H. (2020): How does Covid-19 aggravate the multidimensional vulnerability of slums in India? A Commentary, in: *Social Sciences & Humanities Open*, Vol. 2, No. 1, p. 2.

³³⁹ Bertrand, M.; Krishnan, K.; Schofield, H. (2020): How are Indian households coping under the covid-19 lockdown? 8 key findings, retrieved from <https://www.chicagobooth.edu/research/rustandy/stories/indian-households-coping-with-covid19-lockdown-8-findings> (26.06.2020).

Local research has allowed the confrontation with and discussion of main ideals around slum upgrading and the understanding of a liveable life at local slum neighbourhood scales. The accompanying research on par with local pilot projects of Odisha's Liveable Habitat Mission (OLHM), the missions focus areas, implementation methods and lessons learnt were able to be closely followed and analysed. Additionally, focus group discussions in slums were conducted and liveability aspects for slums located in Bhubaneswar established. Comparing local upgrading measures under OLHM with the results of locally established liveability perceptions, deficiencies are noted.

The mission aims at a variety of physical improvements, still local perceptions of a liveable life - which are considered realistic components and contribute to sustainable upgrading - are rarely considered. Emphasis is placed on an underestimation of non-physical components, which, according to liveability principles display fundamental elements for sustainable slum upgrading. In this way an integral and inter-sectoral upgrading approach which emphasises participative components in projects is realised. In the following, the conclusion is extended and split into four main parts to summarise the thesis results from a holistic perspective, paying attention to the key findings of the research.

6.1.1 Lessons Learned

The first section discusses lessons learnt through the research and the implementation of appropriate countermeasures. Lessons were gleaned from primary data with those involved during interviews and secondary data based on thematic relevant research. The lessons learnt were validated in guided interviews with local development experts to ensure the veracity and conformity with daily practice.

1. Expand decision-making to those typically excluded.

The liveability approach views slum residents not as simple “beneficiaries”, but as decisive stakeholders with expert knowledge about their neighbourhood. Local upgrading decisions have a direct impact on the quality of life and cohabitation of communities. Therefore, residents' integration, information and contribution are necessary to reach the objective of implementing sustainable development goals. It is important during upgrading of informal areas to ensure that local communities display a central function in a meaningful decision-making process, making their voice and preferences more visible to legitimise and democratise the upgrading process for greater acceptance.

2. Participatory planning improves communication on local details.

As research identified and the liveability approach pursues, communication and social outreach across a larger scale is imperative for the successful identification of upgrading components. Participation most importantly helps to gain a better understanding of the community's immediate and intermediate needs. It is in the nature of the process to iden-

tify realistic needs and aspirations which contribute to perpetual upgrading paths. Especially in neighbourhood development, participatory measures proved to positively impact project outcomes.^{94, 98, 101, 104} Following negotiated development enables residents to debate their rights and contributions and makes it easier to communicate local interests that need to be brought into the equation of social concerns.

3. Take advantage of existing institutions and networks inside and outside of slums.

Locally-rooted collaborations among decisive stakeholders are crucial for guiding priorities to source and analyse data on liveable life perceptions in slums. While transformative actions in slums require support from individuals beyond slum communities, cross-sectoral collaborations are decisive when linking different upgrading objectives. It is often the case that arrangements operate in sectoral silos. Attempts to pursue cross-sectoral goals have higher chances to succeed when communicating upgrading opportunities and general perspectives among various upgrading specialists. This reduces time to identify optimal countermeasure options to problems and sets a baseline to extend local collaborations, allowing the filling of important gaps when collecting, processing, translating and realising local concerns.

4. Political will and buy-in of residents contribute to improved results.

To meet local demands, a sense of partnership among all parties involved in upgrading needs to exist. Political will, leadership and the integration of set agendas are considered a prerequisite to make slum upgrading possible.⁶⁸ One example of the analysed case is the connection between informality, land rights and employment. The contribution of informal workers displays more often than not a valuable component of the overall urban economic condition. In many cities, 60% of employment is to be found in the informal sector of the urban population.³⁸ As most informal employment can be traced back to slum residents, their economic force is significant. For example, Odisha has the lowest slum-population compared to other Indian states and Odisha is also the only Indian state that grants land titles and develops slums under the pro-poor concept of Odisha's Liveable Habitat Mission. This indicates the potential for links between a reduction in the slum population proportion and strong political ambitions.

5. Establishment of a political agenda with concrete, local measures for implementation.

The variety of planning ideas and practices often lead cities to follow paths that might not be relevant to local conditions. Each city faces a different combination of challenges which need to be identified and addressed considering local development trajectories. Sustainable upgrading expands on local structures, by providing on the one hand a standardised framework for general implementation, but on the other hand a customised approach when being implemented at local scale. This facilitates communication and improves the monitoring and negotiation of upgrading measures.

6. Incorporate cross-sectoral expert insights in the decision-making processes.

Information needed to guide development paths requires expertise that is often not found within a single institutional framework. Diverse expert guidance is decisive to collect, process and translate data for slum upgrading. In particular the different kinds of support which the slum community cannot acquire itself, e.g. technical experts to ensure sustainable construction methods or banks to provide access to loans. Through the merger of different sectors and institutions, comprehensive expertise enhances planning, design and implementation of slum development and promotes co-operation's for upcoming projects in other areas. The networks among various experts involved in upgrading play an especially valuable role in realising substantial synergy benefits.

6.1.2 Answering the Research Questions

Having discussed lessons learnt, the upcoming section will focus on the contributions of this study to the existing literature. It does so by answering the research questions.

1. Which instruments for slum upgrading exist in India?

Instrumentally slum upgrading in India is top-down oriented. Only recently have communicative instruments found their way into practice to expand the purely infrastructural-based upgrading approaches and give justice to the existence and contribution in upgrading of slum residents. The most common instruments are eviction, ex-situ, and in-situ development. The first two options are associated with numerous and well documented deficiencies, disqualifying them to be considered for sustainable slum upgrading. In-situ development is usually structured exclusively through technical and infrastructural considerations, disregarding the local culture and underestimating the potential of expanding existing solutions. This aspect displays a main concern in the conceptualisation of the LLI.

2. What constitutes a liveable life in slums?

Perceptions of liveability features and their achievement vary among residents and developers, leading to misallocation and underscoring of potentials of informal instruments. Immaterial aspects, such as social belonging and networks beyond slum boundaries, have proved to play a far more important role than material aspects, such as paved streets and ATMs.^{200, 222} To include the locally variable nature of liveability, which is critical to upgrading project success, the LLI offers a customisation of key targets and associated measures to be considered in slum upgrading.

3. Which potentials exist in Smart Cities to leverage participation and communication for the design of slum upgrading?

With the growing Smart City sector the use of digital instruments facilitates participation and communication forms. Connecting digitally-led participatory processes with location

specific data supports the identification of locally relevant liveability perceptions and customises upgrading to a defined local level. As sustainable upgrading designs require holistic participation and communication forms, ensuring slum residents but also other key stakeholders' involvement and contribution, the communication tool should be easily comprehensible and clearly communicate goals and measures among key stakeholders.

6.1.3 Evaluating the Hypotheses

Having discussed the research questions, the upcoming section will focus on the hypotheses. It does so by verifying or falsifying the hypotheses.

1. Hypothesis: Current slum upgrading instruments in India disregard the integration of locally-rooted liveable life perceptions in slums.

Research verified the first hypothesis. Current slum upgrading approaches in India tend to follow top-down principles with a focus on general habitat services.¹⁰⁹ With the importance of sustainable upgrading results, current upgrading frameworks allow slums to easily revert back to old patterns. As emphasised in Chapter 4, focusing solely on general habitat services, which often include material aspects, the immaterial aspects in upgrading are overshadowed. The greatest potentials are identified within bottom-up approaches to allow dialogues with those for whom a solution is being sought and identify liveability perceptions which residents themselves consider most effective in upgrading.

2. Hypothesis: As liveable life perceptions differ among developers and residents communicative and locally-rooted instruments enhance sustainable slum upgrading.

Research verified the second hypothesis: Liveability perspectives and perceptions vary among locations, cultures, communities, etc. As upgrading tends to be initiated at expert level, experts' assumptions about optimal upgrading results dominate upgrading designs. Still, analysing experts' assumptions about slum residents' liveable life perceptions and comparing it against actual viewpoints from slum residents revealed a gap between assumptions and realities. The neglect of or assumptions about potential liveable life perceptions considered in upgrading contributes to insufficient upgrading effects. With the identification of realistic liveable life perceptions at local scales, advisable conclusions can be drawn to design sustainable slum upgrading concepts. Expert interviews revealed likewise that communicative work displays a multiplying factor for efficiency.

3. Location-based upgrading in combination with digitalisation facilitate instruments, which are responsive to societal trends and ease participation.

Research verified the third hypothesis. Given the increase of participation possibilities via ICT in the cause of Smart City movements it stands to reason that community engagement can be realised much more efficiently and effectively. To explore the potential of e-participation in promoting citizen engagement in slum upgrading processes, it is relevant to raise understanding on the determinants of e-participation. The design of upgrading

within a participative environment most suitably aligns with communication instruments that are convenient for slum residents and already display a high social value, such as the increased use of mobile phones.³¹⁶ This way the identified operational gap can be overcome. Optimally the instrument allows monitoring and feedback possibilities, as well as the selection of locally-rooted objects of development.

6.1.4 The Liveable Life Index – An instrument for Sustainable Slum Upgrading

This study analysed major liveability indices/quality-of-life rankings and counterchecked their applicability and deficiencies regarding slum upgrading and suitability to the analysed case. There exists an abundance of liveability indices/quality-of-life rankings which have been criticized in certain aspects.^{246, 247} Liveability indices are mostly used in the design of neighbourhoods to customise areas based on local demand and relevant requirements. However, existing liveability indices have in common that they do not concentrate in specific on slum residents or provide guidance for slum upgrading projects at local scale. To address this gap a liveable life index (LLI) was established to support developers in analysing local situations, preparing sustainable upgrading, communicating the status quo and progress, and gathering with residents.

The guiding principles can be summarised as displayed in Figure 32. To truly improve the conditions of informal urban areas, it is important to understand slum residents and reach diverse informal neighbourhoods to find out how to approach upgrading based on specified demands. The digital LLI offers a comprehensive instrument to facilitate communication and leverage the potentials of digital technologies for the common good of slum residents to view them as the true planners of their neighbourhoods.

Active integration of local communities contributes to skill development and personal ownership of established solutions. The operative and strategic LLI design, as well as its location specific perspective aims to develop customised upgrading concepts that follow the **holistic** principle of the local perception of a liveable life. For an optimal exchange of information among stakeholders and clearly defined project goals and scopes, a universally understandable low-threshold display of information is recommended (**simplicity**). In the context of many different stakeholders' **transparency** is particularly important. It is key to ensuring mutual trust and demonstrating the effectiveness of targets and actions, granting fairness of decision-making and public oversight. Especially in the context of slum upgrading, transparency gives citizens the opportunity for real democratic participation, increases the credibility of processes and improves relationships and trust among stakeholders. The described factors lead to the emergence of engagement-based **commitment**. This reduces the dependence on "external" commitments and actors, but can still be strategically agreed upon together.

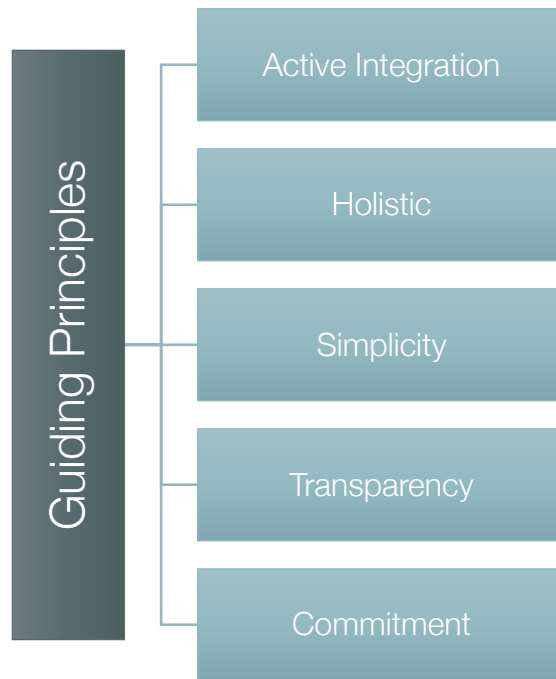


Figure 32: Guiding Principles (own representation).

This classification has no hierarchical significance and is organized alphabetically according to the main-elements. All indicators shall be compiled on demand in preparation for slum upgrading projects. For data interpretation purposes, it is important to take into consideration a contextual analysis when interpreting results. For example, the local environment or culture can affect the capacity to apply indicators. Additionally, it is important to review results of multiple indicator types across elements. Focusing on a single indicator can lead to a biased conclusion. Lastly, potential antagonistic effects (positive or negative) of particular indicator outcomes should also be recognised when analysing results.

Developers are responsible to weigh and measure indicators based on recent local data, as defined in Chapter 5.1. In case parametrisation of indicators is not possible, the KPIs can be qualitatively assumed, as exemplified within Table 5. To provide an overview of LLI results, the use of a radar chart (Figure 22) is suggested. It contributes to a simple and transparent representation of relevant and observed information making it particularly useful when comparing multiple data and time series, such as the actual status and the target status of measured KPIs. Mechanisms to display inputs, engagement, and optimal usage of information need further investigation.

For the identification of additional indicators within the LLI and since slum residents on site are not familiar with the set of pre-defined indicators, a participatory approach has been designed to add other relevant indicators to the LLI. From the identification of neighbourhood-specific indicators in addition to already existing indicators within the LLI, three essential steps are required (Figure 25). The approach developed here is a particularly good supplementary option to optimise the LLI, as further/underestimated liveable life indicators can be identified in neighbourhoods.

LLI results can be communicated and realised taking various options. For example, in a project life cycle, the index can serve both as a starting point and as an evaluation tool. Here a general method for developing a LLI is provided, but no generally applicable instructions for concrete slum upgrading. However, instructions can be derived, once a LLI is developed at local level for a defined area. With the LLIs major objective to improve management methods in and allow an integrative approach to slum upgrading, the strategic choice of sustainable development measures in slums is ensured.

6.2 Further research and application potentials

Governments and aid institutions undervalue participative strategies

Historically, governments and aid institutions undervalued participation in slum upgrading or reduced it to little more than a one-off meeting with the community.^{58, 8} However, building close relationships with slum residents helps to understand realistic and locally-rooted demands and reach a comprehensive dialogue through bottom-up communication streams.⁵¹ Carrying out research prior to upgrading addresses this deficit but requests a specified instrument to realistically display components that counteract local challenges.

Long-term engagement & maintenance

Even though the LLI was developed primarily for project formation and as project structuring instrument, it can be used for general communication and assessment beyond project duration. However, it cannot substitute the qualities of a full-scale communication process but rather offers an anchor point for discussion. To ensure the inclusion of conditions and benchmarks, the endpoint of the instrument should be regularly checked and updated. Digitally conducted status quo checks help to facilitate the localisation of problems post upgrading and consider, if necessary, the targeted deployment of countermeasures. Developing a concept that incorporates the optimal maintenance of already completed projects will address this research challenge.

From local to national stakeholder networks

The LLI is limited in its spatial capacity to display meaningful information at supra-local level. To formulate strategies on a bigger scale a systematic analysis of different LLI use cases or their spatial mapping could help to fill this gap. Resource efficiency and capacity building in upgrading approaches may not solely rely on a local institutional setup, but one that is influenced by external professionals reinforcing local practices in the spirit of open and honest co-operation. In general, the LLI should be adapted to location-specific use cases, for a general overview other instruments are more beneficial.

Capacity building for the digital LLI

The digital LLI approach developed within this thesis does not consider capacity building of local individuals for the technical customisation of the instrument. It is therefore important that experts are carefully chosen to customise the linkages associated with the app and interpret outputs. Developing a strategy that allows for supervision or training of application scientists and data analysts in the LLI context will address this research challenge and contribute to highly skilled expertise in slum upgrading.

Weighting of main-elements

The selection and weighing of indicators, as shown in Table 5, can be modified on a case-by-case basis. It is recommended to adopt the basic structure of four dimensions which have been shown to play an important role in all upgrading cases. Preferences in the importance given to indicators and the class-building-process (weighing) can lead individually to different outcomes and should therefore be negotiated collectively.

Suggestions for further development

During the validation interviews, aspects of further improvement or inclusion of additional functionalities were collected. One aspect raised was the conceptualisation of a technical training programme and certification to incentivise the use of the tool.³⁴⁰ By proving it, developers can authentically present the people-centred approach to residents, which increases their credibility and local expertise. This is expected to “create synergy potentials in the co-operation with the local population” (ibid.). Another aspect to be discussed is the consideration of a transparent financial framework. While on the one hand a high level of transparency is required to address the effectiveness of measures, the linking of financial support to the LLI indicators can lead to disincentives. In the interest of local residents, a “higher degree of transparency is presumably necessary to track actual improvements”.³⁴¹ How the negotiation process in the instrument design can be shaped through the choice of indicators and key figures in interaction with developers and investors has to be specified. Further research is needed to clarify the points raised.

6.3 Outlook

There is certainly no blueprint for optimal upgrading. Many slum upgrading projects and surveys have been conducted, considerable resources have been invested, and a range of participation concepts have been tested – many of which failed because assumed best practices and perceptions do not correspond with the very specific demands on-site. To resolve the discrepancy of assumed and actual perceptions, attention should focus on the interlinked potentials of bottom-up concepts. Approaches and strategies need to be

³⁴⁰ Paty, S.; Tata Trusts Consultant (04.12.2022): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.

³⁴¹ Mishra, S.; Tata Trusts Consultant (04.12.2022): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.

tailored to local conditions; they require iterative cycles of learning and feedback. It is well known that slum upgrading requires long periods until solutions are embedded locally. Rather than aiming for swift results, an incremental process that acknowledges local pace and perceptions is considered to ensure the sustainability of measures.

The LLI provides a holistic basis for defining and monitoring slum upgrading actions from a locally shaped viewpoint. Important is the collateral community process, which consists of small interdependent steps to define optimal solutions. The engagement, which follows when citizens are brought into the planning process from the beginning, facilitates constructive contributions, respect and positivity towards planning authorities and plans. With the highly flexible nature of the LLI approach to individual requirements and available resources, it also contributes to the location-independent applicability. Key is to consider participative community approaches to identifying individual liveable life perspectives that can be implemented at scale for a defined area and contribute to the sustained improvement in the quality of life in informal urban neighbourhoods.

It has been acknowledged that real and significant actions can be done, that resources can be raised, that institutions can be mobilized and above all that slum residents deserve to have the same rights as any other urban inhabitant. To maximise the potential of LLI as a just and effective instrument, it should be used cooperatively to communicate among key stakeholders involved in slum upgrading.

E-Participation as a Key LLI Component

It stands to reason that there exists a rise in citizens adopting ICT tools to engage in activities they believe to be more effective and efficient than conventional instruments. To explore the potential of e-participation in promoting citizen participation in LLI slum upgrading processes, it is relevant to raise understanding on the determinants of e-participation. Conducting research in the Smart City Bhubaneswar and discussing secondary research, this study has examined citizens' opportunities to participate online, thus contributing to a locally-rooted LLI and guiding upgrading designs at policy level. A crucial aspect of successful implementation is the simplicity and convenience for underrepresented groups and residents with limitations to articulate their inputs.

The LLI developed within the thesis is based on a framework that should be locally-adapted to serve as a slum upgrading guideline at policy level. Formulating a LLI for a defined area clearly illustrates how participatory approaches have the chance to identify realistic needs that can be considered in upgrading and contribute towards improved living standards in informal neighbourhoods. Achieving sustainable, resilient, and inclusive urban futures will involve less self-centred actions and far more co-creation and co-responsibility for a specific stage or situation in urban planning projects.³¹³

It can be stated that digital frameworks are decisive in bridging the gap between participation and customisation of operations. Especially e-participation leverages the impact of deliverables defined within the LLI to view and design slum upgrading projects. The flexible nature of the LLI makes it highly adaptable in Smart City contexts, where already established infrastructure for e-participation is formed and demand for mobile services in informal neighbourhoods exists.

Extending the LLI to a general Smart City scale, it must be considered that the intention to participate online varies by Smart City progress and socio-demographic characteristics. Still, different types of ICT tools such as applications, e-mail and online messaging provide citizens with more choices and allow planners and citizens to communicate. The present study helps in building strategic plans at policy level to design and implement sustainable informal urban upgrading projects based on the engagement of slum residents. Enabling participative community approaches in an e-participation format to guide slum upgrading can thereby contribute to the sustainable improvement of the quality of life in informal neighbourhoods. Embedded testing of the LLI will optimise performance over time to adjust the instrument for different cases and test it in different scenarios.

Public participation is a fundamental prerequisite to view residents as the true planners of their neighbourhoods. With Smart Cities aiming for sustainability, the concept of a liveable life creates a realistic perspective for sustainable upgrading processes in slums.

References

- 6th Smart Cities India 2020 Expo (2020): Developing Smart Cities for our Citizens, retrieved from <https://www.smartcitiesindia.com/pdf/6th-Smart-Cities-India-2020-Brochure.pdf> (26.03.2020).
- Aditya, T.; Sugianto, A.; Sanjaya, A.; Susilo, A.; Zawani, H.; Widyawati, Y. S.; Amin, S. (2020): Channelling participation into useful representation: combining digital survey app and collaborative mapping for national slum-upgrading programme, *Applied Geomatics*, Vol. 12, p. 133-148.
- Adnal, M. (2018): Bhubaneswar, the only Indian city among World's top global smart city ranking, retrieved from <https://www.oneindia.com/india/bhubaneswar-the-only-indian-city-among-worlds-global-smart-city-ranking-2658436.html> (24.02.2020).
- Aerzteblatt (2017): Jedes Jahr sterben eine halbe Million Kinder durch infektiöse Durchfall-erkrankungen, retrieved from <https://www.aerzteblatt.de/nachrichten/76436/Jedes-Jahr-sterben-eine-halbe-Million-Kinder-durch-infektioese-Durchfallerkrankungen> (09.08.2019).
- Ahlström, R.; Gärling, T.; Thøgersen, J. (2020): Affluence and unsustainable consumption levels: The role of consumer credit, in: *Cleaner and Responsible Consumption*, Vol. 1, p. 1.
- Ahmedabad Municipal Corporation (2013): Slum Networking Project, retrieved from https://ahmedabadcity.gov.in/portal/jsp/Static_pages/slum_ntwk_project.jsp (30.09.2019).
- Aichholzer, G.; Kubicek, H.; Torres, L. (2016): *Evaluating e-Participation: Frameworks, Practice, Evidence*, Springer International Publishing, Switzerland, p. 109.
- Aichholzer, G.; Rose, G. (2020): Experience with digital tools in different types of e-participation, In: *European E-democracy in practice*, Springer, Cham, p. 93-140.
- Al-Sabbagh, A.; Alsabah, R. (2016): *Internet of Things and Big Data Analysis: Recent Trends and Challenges*, United Scholars Publications, Melbourne, USA, Preface.
- Alderton, A.; Davern, M.; Nitvimol, K.; Butterworth, I.; Higgs, C.; Ryan, E.; Badland, H. (2019): What is the meaning of urban liveability for a city in a low-to-middle-income country? Contextualising liveability for Bangkok, Thailand, in: *Globalization and Health*, Vol. 15, No. 1, p. 51.
- Amdavad Municipal Corporation (2013): Slum Networking Project, retrieved from https://ahmedabadcity.gov.in/portal/jsp/Static_pages/slum_ntwk_project.jsp (30.09.2019).
- Andreucci, M. B.; Marvuglia, A.; Baltov, M.; Hansen, P. (2021): *Rethinking Sustainability Towards a Regenerative Economy*, Springer, Switzerland, p. 80-131.
- Annamalai, T. R.; Devkar, G.; Mahalingam, A.; Benjamin, S.; Rajan, S.C.; Deep, A. (2016) What is the evidence on top-down and bottom-up approaches in improving

- access to water, sanitation and electricity services in low-income or informal settlements? London: EPPI-Centre, Social Science Research Unit, UCL Institute of Education, University College London, p. 122.
- Ansi Webstore (2022): ISO 37120:2018 - Sustainable Cities And Communities - Indicators For City Services And Quality Of Life, retrieved from <https://webstore.ansi.org/Standards/ISO/ISO371202018?source=blog> (11.06.2022).
- Ansi Webstore (2022): ISO 37122:2019 - Sustainable Cities And Communities - Indicators For Smart Cities, retrieved from <https://webstore.ansi.org/Standards/ISO/ISO371222019?source=blog> (11.06.2022).
- Ansi Webstore (2022): ISO 37123:2019 - Sustainable Cities And Communities - Indicators For Resilient Cities, retrieved from <https://webstore.ansi.org/Standards/ISO/ISO371232019?source=blog> (11.06.2022).
- AP News (2018): Lack of Data Literacy Hampers Business and Personal Performance, retrieved from <https://apnews.com/cd6c284e62c2440c852494d0c4d41a57> (09.02.2020).
- Arbury, J. (2006): From Urban Sprawl to Compact City: An analysis of urban growth management in Auckland, University of Auckland, Auckland, p. 240.
- Arnstein, S. R. (1969): A Ladder of Citizen Participation, in: Journal of the American Planning Association, Vol. 35, No. 4, p. 214– 216.
- Arpan, P.; Joy, S. (2020): A critical review of liveability approaches and their dimensions, in: Geoforum, Vol. 117, p. 90-92.
- ARUP (2020): Planning liveable cities, retrieved from <https://www.arup.com/perspectives/planning-liveable-cities> (22.06.2022).
- Ashwini, D.; Goel, D.; Khanna, S. (2018): Bad Karma or Discrimination? Male-Female Wage Gaps Among Salaried Workers in India, in: World Development, Vol. 102, p. 331–344.
- Authority Law Department (2017): The Odisha Land Rights to Slum Dwellers Act, The Odisha Gazette, Odisha, Cuttack, p. 5.
- Badland, H.; Pearce, J. (2019): Liveable for whom? Prospects of urban liveability to address health inequities, in: Social Science & Medicine, Vol. 232, p. 94-105.
- Baghdadi, Y.; Harfouche, A.; Musso, M. (2020): ICT for an Inclusive World - Industry 4.0–Towards the Smart Enterprise, Springer, Switzerland, p. 405-412.
- Bandsom, K. (2019): Indien, Drei Farben gegen Mangelernährung, retrieved from <https://www.welthungerhilfe.de/informieren/laender/indien/drei-farbigen-essen-gegen-mangelernaehrung/> (08.08.2019).
- Banerjee, D.; Mehta, M. G. (2017): Caste and capital in the remaking of Ahmedabad, in: Contemporary South Asia, No. 25, p. 182-195.
- Barkat, A.; Ur Rahman, M.; Bose, M. (1997): Family Planning Choice Behavior in Urban Slums of Bangladesh: An Econometric Approach, in: Asia-Pacific Population journal, Vol. 12, N. 1, p. 1.
- Baur, N.; Blasius, J. (2019): Handbuch Methoden der empirischen Sozialforschung, 2nd edition, Springer VS, Wiesbaden, p. 669-675.

- Bertrand, M.; Krishnan, K.; Schofield, H. (2020): How are Indian households coping under the covid-19 lockdown? 8 key findings, retrieved from <https://www.chicago-booth.edu/research/rustandy/stories/indian-households-coping-with-covid19-lockdown-8-findings> (26.06.2020).
- Birch, E. L. (2014): UN-Habitat Global Urban Lectures: Slums and Cities: Past, Present and Future, retrieved from https://www.youtube.com/watch?v=pFD7hPJ37lw&list=PLTQZbEc6Bv5-Hja_AppdM6gkXp98C01Ca (21.10.2021).
- Blokdyk, G. (2019): SWOT Analysis A Complete Guide - 2019 Edition, 5STARCOoks, Australia, p. 14.
- Boeing, G.; Higgs, C.; Liu, S.; Giles-Corti, B.; Sallis, J. F.; Cerin, E.; Lowe, M.; Adlakha, D.; Hinckson, E.; Vernez Moudon, A.; Salvo, D.; Adams, M. A.; Barrozo, L. V.; Bozovic, T.; Delclòs-Alió, X.; Dygrýn, J.; Ferguson, S.; Gebel, K.; Ho, T. P.; Lai, P. C.; Martori, J. C.; Nitvimol, K.; Queralt, A.; Roberts, J. D.; Sambo, G. H.; Schipperijn, J.; Vale, D.; Van de Weghe, N.; Vich, G.; Arundel, J. (2022): Using open data and open-source software to develop spatial indicators of urban design and transport features for achieving healthy and sustainable cities, in: *The Lancet Global Health*, Vol. 10, No. 6, p. e907-e918.
- Borchardt, A.; Göthlich, S.E. (2009): Erkenntnisgewinnung durch Fallstudien. In: Albers, S., Klapper, D., Konradt, U., Walter, A., Wolf, J. (eds) *Methodik der empirischen Forschung*, Gabler Verlag, Wiesbaden, p. 33-48.
- Brelsford, C.; Lobo, J.; Hand, J.; Bettencourt, L. M. A. (2017): Heterogeneity and scale of sustainable development in cities, in *Proceedings of the National Academy of Sciences*, Vol. 114, No. 34, retrieved from <https://doi.org/10.1073/pnas.1606033114> (21.12.2020).
- Business Standard (2019): Odisha awarded 'World Habitat Award' for Jaga Mission, retrieved from https://www.business-standard.com/article/news-ani/odisha-awarded-world-habitat-award-for-jaga-mission-119121000128_1.html (10.11.2020).
- Cambridge Dictionary (2014): Stakeholder, <https://dictionary.cambridge.org/de/worterbuch/englisch/stakeholder> (04.10.2021).
- Cardullo, P.; Di Felicianantonio, C.; Kitchin, R. (2019): *The Right to the Smart City*, Emerald Publishing Limited, Bingley, p. 1.
- Cavalcanti, A. R. C. (2017): Work, Slums, and Informal Settlement Traditions: Architecture of the Favela Do Telegrafo, in: *Traditional Dwellings and Settlements Review*, Vol. 28, No. 2, p. 71–81.
- Caves, R. W.; Wagner, F. (2018): *Livable Cities from a Global Perspective*, Routledge, New York, p. 120.
- Centre for Science and Environment (2020): Policy Brief On Pradhan Mantri Awas Yojana, Beyond The Four Walls Of PMAY: Resource efficiency, thermal comfort and liveability in the affordable housing sector, Centre for Science and Environment, New Delhi, p. 10-82.

- Chahatray, M.; Tata Trusts Consultant (16.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Chahatray, M.; Tata Trusts Consultant (17.03.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Chakrabarty, A. (2020): COVID-19, JAGA Mission and the value of already existing solutions, retrieved from <https://www.iiied.org/covid-19-jaga-mission-value-already-existing-solutions> (26.08.2020).
- Chakrabarty, A.; Urban Planner and Former Lead in the State Equity Cell in the government of Odisha's Department of Housing & Urban Development (11.10.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Chakrabarty, A.; Urban Planner and Former Lead in the State Equity Cell in the government of Odisha's Department of Housing & Urban Development (19.11.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Chandramouli, C. (2013): Slums In Chennai: A Profile, retrieved from http://www.yorku.ca/bunchmj/ICEH/proceedings/Chandramouli_C_ICEH_papers_82to88.pdf (24.02.2020).
- Chant, S.; McIlwaine, C. (2016): Cities, Slums and Gender in the Global South, Routledge, New York, p. 31.
- Chauhan, A. (2016): Gujarat ranks 3rd in largest non-notified slums' list, retrieved from <https://timesofindia.indiatimes.com/city/ahmedabad/Gujarat-ranks-3rd-in-largest-non-notified-slums-list/articleshow/52309243.cms> (24.02.2020).
- Chimankar, D. A. (2016): Urbanization and Condition of Urban Slums in India, The Indonesian Geographers Association, Vol. 48, No. 1, p. 29.
- Cidco Smartcity (2016): Smart Cities: Demand Driven Planning In Lighthouse cities, retrieved from <https://niua.org/cidco/category/research-page/articles/articles-smart-cities/page/3/> (04.03.2021).
- Cipra (2015): Ziel: Lebensqualität, retrieved from <https://www.cipra.org/de/alpmonitor/ziel> (17.07.2022).
- Cities Alliance (2019): Empowering the Urban Poor to Improve Their Communities, retrieved from <https://www.citiesalliance.org/newsroom/news/spotlight/empowering-urban-poor-improve-their-communities> (28.09.2020).
- Cities Alliance (2019): Promoting Land Rights for the Urban Poor with the Social Tenure Domain Model, received from <https://www.citiesalliance.org/resources/publications/project-case-studies/promoting-land-rights-urban-poor-social-tenure-domain> (24.06.2022).
- Cities Alliance (2020): About Slum Upgrading: What are some of the challenges in slum upgrading?, retrieved from <https://www.citiesalliance.org/about-slum-upgrading> (06.06.2020).

- Cities Alliance Cities Without Slums (2021): A Policy Framework for a Slum Upgrading Programme, retrieved from <https://www.citiesalliance.org/policy-framework-slum-upgrading-programme> (10.02.2021).
- Cities Alliance Cities Without Slums (2021): Slums and Slum Upgrading, retrieved from <https://www.citiesalliance.org/themes/slums-and-slum-upgrading> (10.02.2021).
- Cities Alliance Project Output (2019): Final Report on City Development and Slum Upgradation Strategy of Bengaluru, CDSUS Report, Bangalore, p. 29-32.
- Citizen, T. (2016): Urbanisation in India, retrieved from <http://lebendom.com/article/urbanisierung-in-indien> (06.06.2019).
- Clements-Croome, D.; Marson, M.; Yang, T.; Airaksinen, M. (2017): Planning and Design Scenarios for Liveable Cities, In: M. A. Abraham (Ed.), Encyclopedia of Sustainable Technologies, Elsevier, p. 81-97.
- Cleverism (2019): Six-parts to operation, retrieved from <https://www.cleverism.com/participative-leadership-guide/> (01.10.2019).
- Climate Action Tracker (2019): Pledges And Targets, retrieved from <https://climateaction-tracker.org/countries/india/pledges-and-targets/> (07.05.2020).
- Cohen, N.; Mönch, A. (2018): Bildungswesen in Indien, retrieved from https://www.bildungserver.de/Bildungswesen-in-Indien-7002_ger.html (06.08.2019).
- Conger, B. (2015): On Livability, Liveability and the Limited Utility of Quality-of-Life Rankings, in: SPP Research Paper, No. 7-4.
- Cutieru, A. (2020): Urban Acupuncture: Regenerating Public Space Through Hyper-Local Interventions, retrieved from <https://www.archdaily.com/948304/urban-acupuncture-regenerating-public-space-through-hyper-local-interventions> (17.03.2021).
- Daft, R. L.; Marcic, D. (2017): Understanding Management, 10th edition, Cengage Learning, Boston, p. 148.
- Daher, E.; Maktabifard, M.; Kubicki, S.; Decorme, R.; Pak, B.; Desmaris, R. (2021): Tools for Citizen Engagement in Urban Planning, in: Lazaroïu, G.C.; Roscia, M.; Dancu, V.S. (eds): Holistic Approach for Decision Making Towards Designing Smart Cities, Future City, Vol. 18, Springer, Chan, Switzerland, p. 115-145.
- Dahiya, B.; Das, A. (2020): New Urban Agenda in Asia-Pacific: Governance for Sustainable and Inclusive Cities, Springer Nature. Singapore Pte. Ltd., Singapore, p. 74.
- Darquennes, J.; Salmons, J. C.; Vandenbussche, W. (2019): Language Contact, De Gruyter Mouton, Berlin, p. 351.
- Das, A.; Saha, T.; Mazumder, A.; Sawla, J. (2019): Political Economy Perspectives in City-Making, International Symposium, in: Plan OK Please, New Delhi, India, p. 1.
- Das, M. N.; Huke, R. E. (2021): Odisha State, India, Encyclopedia Britannica, retrieved from <https://www.britannica.com/place/Odisha> (14.05.2022).

- Dash, S.; Urban Habitat Lead at Tata Trusts (21.09.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Dash, S.; Urban Habitat Lead at Tata Trusts (22.11.2022): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Datta, A. (2017): The digital turn in postcolonial urbanism: Smart citizenship in the making of India's 100 smart cities, in: *Trans Inst Br Geogr.*, Vol. 43, p. 405-419.
- Davis, M. (2006): *Planet of Slums*, Verso, London, p. 26-172.
- Dawodu, A.; Cheshmehzangi, A.; Akinwolemiwa, B. (2018): The systematic selection of headline sustainable indicators for the development of future neighbourhood sustainability assessment tools for Africa, in: *Sustainable Cities and Society*, Vol. 41, p. 760-776.
- De, I. (2017): Slum improvement in India: determinants and approaches, in: *Housing Studies*, Vol. 32, No. 7, p. 990-1013.
- Deaton, A. (2008): Income, health and wellbeing around the world: Evidence from the Gallup World Poll, In: *Journal of Economic Perspectives*, Vol. 22, No. 2, p. 1-8.
- Debnath, R., Bardhan, R., & Sunikka-Blank, M. (2019): Discomfort and distress in slum rehabilitation: Investigating a rebound phenomenon using a backcasting approach, in: *Habitat International*, Vol. 87, p. 75-90.
- Del Hoyo, R. P.; Visvizi, A.; Mora, H. (2021): Inclusiveness, safety, resilience, and sustainability in the smart city context, In: *Smart Cities and the UN SDGs*, Elsevier, p. 15-28.
- Dentinho, T. P.; Basu, K.; Bandyopadhyay, S.; Magsi, H.; Kundu, A. (2021): *Accessible Housing for South Asia - Needs, Implementation and Impacts*, Springer, Switzerland, p. 240-249.
- Devkar, G.; Annamalai, T.; Narayanan, S. MS, E. (2017): Provision of Basic Services in Slums: A review of the evidence on top-down and bottom-up approaches, in: *Development Policy Review*, Vo. 37, No. 3.
- Dhingra, M.; Singh, M. K.; Chattopadhyay, S. (2016): Rapid Assessment Tool for traditional Indian Neighbourhoods: A Case Study of Alwar Walled City in Rajasthan, in: *Sustainable Cities and Society*, Vol. 26, p. 364-382.
- Dictionary (2022): Vitality, retrieved from <https://www.dictionary.com/browse/vitality> (15.08.2022).
- District Ahmedabad (2020): Home (Website), retrieved from <https://ahmedabad.nic.in> (06.05.2020).
- Docplayer (2017): Epilogue - The City Development Index (CDI), retrieved from <https://docplayer.net/20883900-Epilogue-the-city-development-index-cdi.html> (06.04.2020).
- Doe, B.; Aboagye, P.D. (2022): The place of subsidy: affordable sanitation service delivery in slums of Kumasi, Ghana, in: *GeoJournal*, Vol. 87, p. 295-317.

- Dovey, K.; Shafique, T.; van Oostrum, M.; Chatterjee, I. (2020): Informal settlement is not a euphemism for 'slum': what's at stake beyond the language?, in: International Development Planning Review, p. 1-12.
- Dutta, S. (2018): Swachh Bharat Abhiyan Integral For The Success Of Smart Cities Mission, Says Union Minister Hardeep Singh Puri, retrieved from <https://swachhindia.ndtv.com/hardeep-singh-puri-swachh-bharat-abhiyan-smart-cities-21561/> (10.10.2020).
- Ekta Consultant (2020): About us, retrieved from <http://ektaconsultant.in> (08.01.2020).
- Elgizawy, S.M.; El-Haggar, S.M.; Nassar, K. (2016): Slum Development Using Zero Waste Concepts: Construction Waste Case Study, in: Procedia Engineering, Vol. 145, p. 1306-1313.
- El-Haggar, S.; Samaha, A. (2019): Roadmap for Global Sustainability — Rise of the Green Communities, Springer, Switzerland, p. 159-167.
- Emmanuelle Laurinda Godjo, S. (2019): Smart Cities and Slum Resilience, retrieved from <https://www.urbanet.info/smart-cities-and-slum-resilience/> (04.04.2022).
- Estevez, E.; Scholl, H. J.; Pardo, T. A. (2021): Smart Cities and Smart Governance - Towards the 22nd Century Sustainable City, Springer, Switzerland, p. 77.
- ET Government (2021): Smart City Mission: India sets big goals, gears up for 4,000 cities expansion in 2 years, retrieved from <https://government.economictimes.indiatimes.com/news/smart-infra/smart-city-mission-india-sets-big-goals-gears-up-for-4000-cities-expansion-in-2-years/83831631> (03.12.2021).
- Ettling, S.; Integrated Expert for Environmental Education and International Relations (06.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Experten Report (2020): Der Wohlstand und seine Folgen, retrieved from <https://www.experten.de/2020/06/der-wohlstand-und-seine-folgen/> (17.07.2022).
- Ezeh, A.; Oyeboode, O.; Satterthwaite, D.; Chen, Y.; Ndugwa, R.; Sartori, J.; Mberu, B.; Melendez-Torres, G. J.; Haregu, T.; Watson, S. I.; Caiaffa, W.; Capon, A.; Lilford, R. J. (2017): The health of people who live in slums: The history, geography, and sociology of slums and the health problems of people who live in slums, in: The Lancet, Vol. 389, No. 10068, p. 547–558.
- Fayehun, O.; Ajisola, M.; Uthman, O.; Oyeboode, O.; Oladejo, A.; et al. (2022) A contextual exploration of healthcare service use in urban slums in Nigeria, in: PLOS ONE, Vol. 17, No. 2.
- Financial Inclusion Insights (2019): India, Aave 6 Report, Sixth Annual Fii Tracker Survey, retrieved from http://finclusion.org/uploads/file/india-wave-6_final-5-28-19.pdf (18.07.2020).
- Fleming, E. (2020): What is Urban Upgrading?, retrieved from <https://www.sidmartinbio.org/what-is-urban-upgrading/> (09.12.2020).
- Ganguly, N. (2015): Slums of India, MJP Publishers, Chennai, p. 33.
- Gassmann, O.; Böhm, J.; Palmié, M. (2018): Smart City: Innovationen für die vernetzte Stadt – Geschäftsmodelle und Management, Carl Hanser Publisher, Munich, p.17.

- Gelb, A.; Mukherjee, A. (2019): Building on Digital ID for Inclusive Services: Lessons from India, in: Global Center for Development, p. 1-4.
- Gerginov, D. (2021): Index – Definition, Arten & der DAX als Beispiel, retrieved from <https://www.gevestor.de/finanzwissen/aktien/indizes/indizes-definition-was-einen-index-auszeichnet-642771.html>.
- Ghatge, S. (2018): Mission Sauberes Indien, retrieved from <https://www.zeit.de/entdecken/2018-08/indien-toiletten-hygiene-mission-narendra-modi> (03.10.2019).
- Ghorpade, K. R.; Urbanist & Researcher (05.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Ghosh, S.; Seth, P.; Tiwary, H. (2020): How does Covid-19 aggravate the multidimensional vulnerability of slums in India? A Commentary, in: Social Sciences & Humanities Open, Vol. 2, No. 1, p. 2.
- Giap, T. K.; Thye, W. W.; Aw, G. (2014): A new approach to measuring the liveability of cities: the Global Liveable Cities Index, in: World Review of Science, Technology and Sustainable Development, Vol. 11, No. 2, p. 176-196.
- Gishti, M. (2017): Citizen participation in urban and landscape planning, International Master of Landscape Architecture, Hochschule für Wirtschaft und Umwelt Nürtingen-Geislingen, p. 14.
- GIZ (2020): About GIZ, retrieved from <https://www.giz.de/en/aboutgiz/profile.html> (12.01.2020).
- Gläser, J.; Laudel, G. (2010): Experteninterviews und qualitative Inhaltsanalyse: als Instrumente rekonstruierender Untersuchungen, 4th edition, VS Verlag für Sozialwissenschaften, Wiesbaden, p. 150.
- Global Finance (2019): The World's Richest and Poorest Countries 2019, retrieved from <https://www.gfmag.com/global-data/economic-data/worlds-richest-and-poorest-countries> (04.08.2019).
- Global Housing Technology Challenge India (2019): About Pradhan Mantri Awas Yojana (Urban), retrieved from <https://ghhc-india.gov.in/Content/About-PMAY.html> (28.03.2021).
- Global Platform for Sustainable Cities (2020): Global Responses to COVID-19 in slums and cities, retrieved from <https://www.thegpsc.org/knowledge-products/urban-poverty-and-housing/global-responses-covid-19-slums> (07.12.2021).
- Goethert, R.; Hamdi, N. (1988): A Community Based Process in Programming and Development, Intermediate Technology Development, London, p. 24.
- Goethert, R.; Hamdi, N. (1997) Action Planning for Cities: A Guide for Community Practices, John Wiley and Sons, New York, p 8-70.
- Gopinath, G. (2020): Reopening from the great lockdown: uneven and uncertain recovery, retrieved from <https://blogs.imf.org/2020/06/24/reopening-from-the-great-lockdown-uneven-and-uncertain-recovery/> (26.01.2022).
- GovLab (2021): MyGov India: Poll, Discuss, Do, Briefing Note, retrieved from <https://congress.crowd.law/files/mygov-india-briefing-note.pdf> (04.10.2021).

- Greiving, S. (2018): Resilienz/Robustheit, ARL – Akademie für Raumforschung und Landesplanung, Hannover, p. 2063.
- Grosse, K. (2019): Lernen in anderen Ländern: Indien – Bildung als Statussymbol, retrieved from <https://magazin.sofatutor.com/lehrer/lernen-in-anderen-laendern-indien-bildung-als-statussymbol/> (06.08.2019).
- Gründerszene (2019): Internet of Things, retrieved from <https://www.gruenderszene.de/lexikon/begriffe/internet-of-things> (27.09.2019).
- GSM Association (2017): Triggering mobile internet use among men and women in South Asia, retrieved from https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/11/GSMA-Triggering-Mobile-Internet-Use_Web.pdf (24.01.2020).
- Gulati, M.; Becqué, R.; Godfrey, N.; Akhmouch, A.; Cartwright, A.; Eis, J.; Huq, S.; Jacobs, M.; King, R.; Rode, P. (2020): The Economic Case for Greening the Global Recovery through Cities: Seven priorities for national governments, Coalition for Urban Transitions, London and Washington, p. 6.
- Gupta, A.; Professor at India's National Disaster Management Institute, under Ministry of Home Affairs, also in charge of health and climate issues (05.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Haag, P. (2014): Auswahl von Instrumenten & Maßnahmen der Live-Kommunikation: Modellbasierte und zielorientierte Auswahl von Live-Kommunikation für Start-Ups und KMU, Akademische Verlagsgemeinschaft München, Munich, p. 36.
- Hachmann, S.; Jokar Arsanjani, J.; Vaz, E. (2018): Spatial Data for Slum Upgrading: Volunteered Geographic Information and the Role of Citizen Science, in: *Habitat Int.*, Vol. 72, p. 18–26.
- Hadzik, T. (2016): Smart cities: An inventory of Smart City concepts in practice, Epubli, Berlin, p. 4.
- Haque, I. (2016): Infrastructure Development and Access to Basic Amenities in Class-I Cities of West Bengal, India: Insights from Census Data, in: *Journal of Infrastructure Development*, Vol. 8, No. 1, p. 36-84.
- Harijan Sahi, Maa Mangala Lumbini Vihar Basti, Maa Mangala Sahi Basti, Nala Muha Sahi, Niladri Vihar Harekrushna Nagar, Omkar Kinner Basti; Slum Residents (15.11.2019 – 21.11.2019): Personal Communication, Focus Group Discussion, Bhubaneswar.
- Heller, P. (2016): Making Slums Liveable, in: *Sociological Insights for Development Policy*, Vol. 1, No. 5, p. 2.
- Hemmersam, P.; Martin, N.; Westvang, E.; Aspen, J.; Morrison, A. (2015): Exploring Urban Data Visualization and Public Participation in Planning, in: *Journal of Urban Technology*, Vol. 22, No. 4, p. 45-64.
- Hick, D.; Urban, A.; Noennig, J. R. (2019): A Pattern Logic for a Citizen-Generated Subjective Quality of Life Index in Neighborhoods, in: 2019 IEEE 2nd Ukraine Conference on Electrical and Computer Engineering (UKRCON), pp. 1282-1286.

- Higgs, C.; Badland, H.; Simons, K.; Knibbs, L. D.; Giles-Corti, B. (2019): The Urban Liveability Index: Developing a policy-relevant urban liveability composite measure and evaluating associations with transport mode choice. *International Journal of Health Geographics*, Vol. 18, No. 1, p. 1–25.
- Hillger, D. (2019): Expansion, Qualität, Gerechtigkeit: Herausforderungen des indischen Bildungssystems, retrieved from <http://www.bpb.de/internationales/asien/indien/44534/indiens-bildungssystem> (06.08.2019).
- Hirvonen, J.; Lilius, J. (2019): Do neighbour relationships still matter?, in: *Journal of Housing and the Built Environment*, Vol. 34.
- Hjorth, L.; Khoo, O. (2016): *Routledge Handbook of New Media in Asia*, Routledge, New York, p. 183.
- Hoelscher, K. (2016): The evolution of the smart cities agenda in India, in: *International Area Studies Review*, Vol. 19, No. 1, p. 28–44.
- Hole-in-the-Wall Education Project (2016): Solution: Nothing is more powerful than an idea whose time has come., retrieved from <http://www.hole-in-the-wall.com/Solution.html> (06.08.2019).
- Horlings, L.G.; Lamker, C.; Puerari, E.; Rauws, W.; van der Vaart, G. (2021): Citizen Engagement in Spatial Planning, Shaping Places Together, in: *Sustainability*, Vol. 13, No. 19, p. 11006.
- Hotel Manager (07.11.2019): Personal Communication, Chance Encounter, Delhi.
- Housing and Urban Development Department Odisha (2018): Participatory Slum Upgrading and Delisting Standard Operating Procedure, retrieved from <http://www.urbanodisha.gov.in/pdf/SOP-Slum-Upgradation.pdf> (10.07.2021).
- IEEE Standards Association (2020): IEEE Future Networks – Enabling 5G and Beyond, retrieved from https://futurenetworks.ieee.org/images/files/pdf/INGRVirtual-Workshop2020/5_Standardization_Building_Blocks_June_2020_Virtual-WorkshopWG-_V41.pdf (12.04.2022).
- IEEE Standards Association (2020): IEEE Standards for Smart Cities - Helping Enable Smart City Technologies for Humanity, retrieved from <https://engagestandards.ieee.org/smart-cities.html> (12.04.2022).
- IEEE Standards Association (2020): P1950.1 - Standard for Communications Architectural Functional Framework for Smart Cities, retrieved from <https://standards.ieee.org/ieee/1950.1/10176/> (12.04.2022).
- IEEE Standards Association (2021): A Transdisciplinary Framework for 5G and Future Networks Applications and Services Industry Connections Activity Initiation Document (ICAID), retrieved from <https://engagestandards.ieee.org/smart-cities.html> (12.04.2022).
- IGI Global (2022): What is Digital Networks, retrieved from <https://www.igi-global.com/dictionary/creating-analytical-lens-understanding-digital/7676> (15.08.2022).

- Imparato, I.; Ruster, J. (2003): Slum Upgrading and Participation: Lessons from Latin America, The World Bank, Washington, p. 18-378.
- India Brand Equity Foundation (2020): Smart Cities Mission, retrieved from <https://www.ibef.org/government-schemes/smart-cities-mission> (10.03.2020).
- Indian Institute of Human Settlements (2017): Planning, 'Violations', and Urban Inclusion: A Study of Bhubaneswar, retrieved from <http://iihs.co.in/knowledge-gateway/wp-content/uploads/2017/11/Bhubaneswar-Final.pdf> (10.02.2020).
- Indian Institute of Technology Roorkee (2019): About the Institute, retrieved from <https://iitr.ac.in/Institute/About%20the%20Institute/index.html> (11.12.2019).
- Indian Women and Child Welfare Trust (2021): Self Help Group, retrieved from <https://www.iwcwtministry.org/donations/self-help-group/> (25.06.2022).
- Infrastructure Australia (2018): Planning Liveable Cities - A place-based approach to sequencing infrastructure and growth, retrieved from https://www.infrastructureaustralia.gov.au/sites/default/files/2019-06/ifa_225232_planning_liveable_cities_report_2018_fa_web_hr.pdf (22.06.2022).
- International Association of Public Transport (UITP) (2019): List of Smart Cities in India, retrieved from <https://india.uitp.org/list-smart-cities-india> (26.03.2020).
- International Institute for Environment and Development (2021): Citizen participation in planning: from the neighbourhood to the city, retrieved from <https://www.iied.org/qa-citizen-participation-planning-neighbourhood-city> (12.12.2021).
- Investment Banker (12.11.2019): Personal Communication, Chance Encounter, Chennai.
- IRIS Smart City (2020): Objectives & Ambition, retrieved from <https://irissmartcities.eu/content/objectives-ambition> (18.05.2020).
- ISO (2010): Indicators for resilient cities, retrieved from https://transparencia.caubr.gov.br/arquivos/ISO_DIS_37123.pdf (10.05.2022).
- ISO (2018): ISO 37120:2018(en) Sustainable cities and communities - Indicators for city services and quality of life, retrieved from <https://www.iso.org/obp/ui/#iso:std:iso:37120:ed-2:v1:en> (10.05.2022).
- ISO (2019): ISO 37123:2019(en) Sustainable cities and communities - Indicators for resilient cities, retrieved from <https://www.iso.org/obp/ui/#iso:std:iso:37123:ed-1:v1:en> (10.05.2022).
- Jaga Mission (2020): About Jaga Mission, retrieved from <http://www.jagamission.org/about-us.html> (08.01.2020).
- Jai, S. (2019): Govt to ease land acquisition, finance for renewables to meet 450 GW target, retrieved from https://www.business-standard.com/article/economy-policy/govt-to-ease-land-acquisition-finance-for-renewables-to-meet-450-gw-target-119092501326_1.html (07.05.2020).
- Jain, V.; Chennuri, S.; Karamchandani, A. (2016): Informal Housing, Inadequate Property Rights: Understanding the Needs of India's Informal Housing Dwellers, in Reimagining Social Change, p. 10.

- Jayakar, D.; GIZ Architect (11.11.2019): Personal Communication, Expert Interview, Chennai.
- Jeffrey, R and Doron, A. (2013): *The Great Indian Phone Book: How Cheap Mobile Phones Change Business*, C. Hurst and Co., London, p. 39.
- Jorgenson, A. (2015): *Slum Prevalence and Health in Developing Countries: Sustainable Development Challenges in the Urban Context*, In: *Sustainable Development Forthcoming*, Vol. 10, No. 1002, p. 1606.
- Joulaei, H.; Bhuiyan, A. R.; Sayadi, M.; Morady, F.; Afsar Kazerooni, P. (2014): *Slums' access to and coverage of primary health care services: a cross-sectional study in shiraz, a metropolis in southern iran*, in: *Iranian journal of medical sciences*, Vol. 39, No. 2, p. 184–190.
- Justus, A. (2017): *Self Help Groups Empower Women Living in Indian Slum*, retrieved from <https://www.worldvisionphilanthropy.org/news/self-help-groups> (25.06.2022).
- Karaca, Y.; Gervasi, O.; Garau, C.; Murgante, B.; Blečić, I.; Tarantino, E.; Taniar, D.; Apduhan, B. O.; Misra, S.; Rocha, A. M. A. C.; Torre, C. (2020): *Computational Science and Its Applications – ICCSA 2020*, Springer, Switzerland, p. 794-800.
- Karnataka Slum Development Board (2016): *Slum Details at Glance*, retrieved from <https://www.karnataka.gov.in/ksdb/Pages/Slum-Statistics.aspx> (24.02.2020).
- Katil, S. (2020): *Measuring Expatriate Quality of Living*, retrieved from <https://mobilityexchange.mercer.com/Insights/article/Measuring-Expatriate-Quality-of-Living> (19.11.2020).
- Kaur, N.; Kaur, M.; Padhi, S. S.; Singh, K. K. (2021): *Geospatial analysis of the distribution of urban green spaces: a study of four Indian cities*, in: *Cities & Health*.
- Keelery, S. (2021): *Digital population across India as of February 2021*, retrieved from <https://www.statista.com/statistics/309866/india-digital-population/> (09.10.2021).
- Keelery, S. (2021): *Internet usage in India - statistics & facts*, retrieved from <https://www.statista.com/topics/2157/internet-usage-in-india/> (09.10.2021).
- Kelechava, B. (2020): *ISO 37123:2019 – Indicators for Resilient Cities*, retrieved from <https://blog.ansi.org/2020/01/iso-37123-2019-indicators-resilient-cities/#gref> (11.06.2022).
- Kempner, R. (2017): *Dharavi, India: The Most Entrepreneurial Slum In The World?*, retrieved from https://www.huffpost.com/entry/dharavi-the-most-entrepre_b_834300?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLnNvbS8&guce_referrer_sig=AQAAAGqhShsMbRryRpxo_mDaPU6_4OzaaolLLCxT_rm2fHWd3tOdjFbmPkBZ4wq-zX1nlyn_isyL4BELZ6Ncssy3g5kgwqs_LhV85Nd5LT63YZvIVZKssz3NUdNPlTWgc98XgIvjKdpcl0ieXzOevoM20vZ7tUso1csEzHnRUI3HTH9 (26.05.2020).

- Kennedy, R. J.; Buys, L. (2010): Dimensions of liveability: a tool for sustainable cities, retrieved from <https://eprints.qut.edu.au/38526/1/38526.pdf> (10.06.2020).
- Khan, K. A. (2021): Previous to Present Policies and Approaches for Slum and their Limitations: In Search of Sustainable Slum Upgrading Process in Developing Countries, in: *International Journal of Research and Innovation in Social Science (IJRISS)*, Vol. 5, No. 8, p. 356-361.
- Konieczek-Woger, M.; Naeth, A. (2020): Achtung: Smart! – Möglichkeiten und Grenzen der Idee der "Smart City" für deutsche Kommunen, Universitätsverlag der TU Berlin, Berlin, p. 42.
- Kopf, J. (2017): Konzeption, Durchführung und Operationalisierung des Experiments, In: *Evolution von Kollusion*, Springer Gabler, Wiesbaden.
- Kovacs-Györi, A.; Cabrera-Barona, P.; Resch, B.; Mehaffy, M.; Blaschke, T. (2019): Assessing and Representing Livability through the Analysis of Residential Preference. *Sustainability*, Vol. 11, No. 18, p. 4934.
- Kuddus, M. A.; Tynan, E.; McBryde, E. (2020): Urbanization: a problem for the rich and the poor?, in: *Public Health Reviews*, Vol. 41, No. 1, p. 1-2.
- Kuffer, M.; Pfeffer, K.; Sliuzas, R. (2016): Slums from Space— 15 Years of Slum Mapping Using Remote Sensing. *Remote Sens.*, Vol. 8, No. 6, p. 455.
- Kumari, T. (2020): Smart Cities and eGovernance Trends in India, retrieved from <https://www.analyticsinsight.net/smart-cities-and-egovernance-trends-in-india/> (01.06.2020).
- Lauria, M.; Slotterback, C. S. (2020): Learning from Arnstein's Ladder: From Citizen Participation to Public Engagement, Taylor & Francis, New York, p. 32.
- Leby, J.; Hashim, A. H. (2010): Liveability Dimensions and Attributes: Their Relative Importance in the Eyes of Neighbourhood Residents, in: *Journal of Construction in Developing Countries*, Vol. 15, No. 1, p. 67–91.
- Lexikon der Nachhaltigkeit (2015): Gründe warum wir Wachstum „angeblich“ brauchen, retrieved from https://www.nachhaltigkeit.info/artikel/gruende_warum_wir_wachstum_angeblich_brauchen_1824.htm (17.07.2022).
- Li, W.; Feng, T.; Timmermans, H. J.P.; Zhang, M. (2020): The Public's Acceptance of and Intention to Use ICTs when Participating in Urban Planning Processes, in: *Journal of Urban Technology*, Vol. 27, No. 3, p. 55-73.
- Lines, K.; Mitlin, D.; Mwelu, J.; Njenga Maina, J.P.; Okoyo, O.; Otibine, E.; Wakesho, T.; Wambui, M. (2020): Bridging the affordability gap: towards a financing mechanism for slum upgrading at scale in Nairobi – analysing NGO experiences with local-level finance, in: *GDI Working Paper*, The University of Manchester, Manchester.
- Linking the SDGs with the New Urban Agenda (2020): SDG11: Sustainable Cities & Communities, retrieved from <https://www.sdgnewurbanagenda.com/sdg11--sustainable-cities---communities.html> (10.01.2020).

- Live Mint (2018): Opinion | India's failure to address its urban slum problem, retrieved from <https://www.livemint.com/Opinion/Ah-wjNLTtMS8GK7i1RBqnSI/Opinion--Indias-failure-to-address-its-urban-slum-problem.html> (12.02.2020).
- Lombord, H. (2018): What is considered a rural area?, retrieved from <http://statchatva.org/2018/05/30/what-is-considered-a-rural-area/> (18.09.2019).
- Lowe, M.; Arundel, J.; Hooper, P.; Rozek, J.; Higgs, C.; Roberts, R.; Giles-Corti, B. (2020): Liveability aspirations and realities: Implementation of urban policies designed to create healthy cities in Australia, in: *Social Science & Medicine*, Vol. 245, p. 112713.
- Maa Mangala Sahi Basti; Slum Residents (16.11.2019): Personal Communication, Focus Group Discussion, Bhubaneswar.
- Macro Trends (2020): Bhubaneswar, India Metro Area Population 1950-2020, retrieved from <https://www.macrotrends.net/cities/21196/bhubaneswar/population> (26.06.2020).
- Magalhães, F. (2016): Slum Upgrading and Housing in Latin America, Inter-American Development Bank, New York, p. 13.
- MagicMaps GmbH (2019): Wie funktioniert Satellitennavigation?, retrieved from <https://www.magicmaps.de/produktinfo/gps-grundlagen/wie-funktioniert-gps.html> (16.09.2019).
- Mahabir, R.; Agouris, P.; Stefanidis, A.; Croitoru, A.; Crooks, A. T. (2020): Detecting and mapping slums using open data: a case study in Kenya, in: *International Journal of Digital Earth*, Vol. 13, No. 6, p. 683-707.
- Maiervidorno (2016): Erschwinglicher Wohnraum für Indien, retrieved from <https://www.maiervidorno.de/erschwinglicher-wohnraum-fuer-indien/> (05.08.2019).
- Manimekalai, U.; Senior Planner at Tamil Nadu Slum Clearance Board (12.11.2019): Personal Communication, Expert Interview, Chennai.
- Marino, G. (2021): The Slum Economy: An Alliance Between Circular and Informal, retrieved from <https://www.renewablematter.eu/articles/article/the-slum-economy-an-alliance-between-circular-and-informal> (24.06.2022).
- Marx, B.; Stoker, T.; Suri, T. (2013): The Economics of Slum in the Developing World, in: *Journal of Economic Perspectives*, Vol. 27, No. 4, p. 187-210.
- MaSCA (2018): Rebuilding the Mathare 3a Community Centre, retrieved from <http://mathare.org/communitycentre/> (26.06.2022).
- Mayring, P. (2015): *Qualitative Inhaltsanalyse: Grundlagen und Techniken*, 12th edition, Beltz Verlag, Weinheim und Basel, p. 11.
- McDonald, D. A. (2016): *Making Public in a Privatized World: The Struggle for Essential Services*, Zed Books Ltd., London, p. 82.

- McKinsey Global Institute (2019): Digital India: Technology to transform a connected nation, retrieved from <https://www.mckinsey.com/~media/mckinsey/business%20functions/mckinsey%20digital/our%20insights/digital%20india%20technology%20to%20transform%20a%20connected%20nation/digital-india-technology-to-transform-a-connected-nation-full-report.ashx> (03.06.2019).
- Mehra, C. (2020): From Dharavi to Sao Paulo's favelas, a Covid-19 response must engage the communities that live there, retrieved from <https://scroll.in/article/960980/from-dharavi-to-sao-paulos-favelas-a-covid-19-response-must-engage-the-communities-that-live-there> (09.05.2020).
- Menon, S.; Hartz-Karp, J. (2019): Linking Traditional 'Organic' and 'Induced' Public Participation with Deliberative Democracy: Experiments in Pune, India, in: *Journal of Education for Sustainable Development*, Vol. 13, No. 2, p. 193-214.
- Meuser, M.; Nagel, U. (1991): ExpertInneninterviews - vielfach erprobt, wenig bedacht: ein Beitrag zur qualitativen Methodendiskussion, In: D. Garz, & K. Kraimer (Hrsg.), *Qualitativ-empirische Sozialforschung: Konzepte, Methoden, Analysen*, Westdeutscher Verlag, Opladen, p. 441-471.
- Midor, K.; Plaza, G. (2020): Moving to Smart Cities Through the Standard Indicators ISO 37120, in: *Multidisciplinary Aspects of Production Engineering*, Vol. 3, p. 617-630.
- Ministry of Urban Development Government of India (2017) *Methodology for Collection and Computation of liveability Standards in Cities*, retrieved from <http://164.100.161.224/upload/uploadfiles/files/MethodologicalReport-Final.pdf> (24.04.2020).
- Mishra, S.; Mohapatra, M.; Padhi, A.; Paty, S.; Sahoo, M.; Tata Trusts Consultant (14.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Mishra, S.; Tata Trusts Consultant (04.12.2022): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Mitlin, D.; Colenbrander, S.; Satterthwaite, D. (2018): Editorial: Finance for community-led local, city and national development, in: *Environment and Urbanization*, Vol. 30, No. 1, p. 3-14, retrieved from <https://doi.org/10.1177/0956247818758251> (17.01.2021).
- Mohamed, A. A.; Ubarevičienė, R.; van Ham, M. (2022): Morphological evaluation and regeneration of informal settlements: An experience-based urban design approach, in: *Cities*, Vol. 128, p. 103798.
- Mohanty, M. (2018): Odisha government rolls out "world's largest" slum land rights project, retrieved from <https://economictimes.indiatimes.com/news/politics-and-nation/odisha-government-roll-out-worlds-largest-slum-land-rights-project/articleshow/64068035.cms?from=mdr> (16.10.2020).
- Mukama, T.; Ndejjo, R.; Musoke, D.; Musinguzi, G.; Halage, A. A.; Carpenter, D. O.; Ssempebwa, J. C. (2016): *Practices, Concerns, and Willingness to Participate*

- in Solid Waste Management in Two Urban Slums in Central Uganda, in: *Journal of Environmental and Public Health*.
- Mukherjee, J.; Sen, A. (2020): From SMART to sustainable cities: Is COVID19 an opportunity?, retrieved from <https://www.orfonline.org/expert-speak/from-smart-to-sustainable-cities-is-covid19-an-opportunity-66363/> (14.04.2020).
- Münster, S.; Georgi, C.; Heijne, K.; Klamert, K.; Noennig, J.; Pump, M.; Stelzle, B.; Meer, H. (2017): How to involve inhabitants in urban design planning by using digital tools? An overview on a state of the art, key challenges and promising approaches, in: *Procedia Computer Science*, Vol. 112, p. 2391-2405.
- Musakwa, W.; Tshesane, R. M.; Kangethe, M. (2017): The strategically located land index support system for human settlements land reform in South Africa, in: *Cities*, Vol. 60, Part A, p. 91-101.
- MyGov (2021): Government of India, retrieved from <https://www.mygov.in/groups/> (10.12.2021).
- MyGov (2022): MyGov: An Overview, retrieved from <https://www.mygov.in/overview/> (10.06.2022).
- Nakagate Chala Sahi; Slum Residents (17.11.2019): Personal Communication, Slum Visit, Bhubaneswar.
- Nejad, F. N.; Ghamari, M. R.; Mohaqeqi Kamal, S. H.; Tabatabaee, S. S.; Ganjali, R. (2021): The Most Important Social Determinants of Slum Dwellers' Health: A Scoping Review, in: *Journal of preventive medicine and public health*, Vol. 54, No. 4, p. 265-274.
- Niladri Vihar Harekrushna Nagar; Slum Residents (20.11.2019): Personal Communication, Focus Group Discussion, Bhubaneswar.
- Noennig, J.R.; Hick, D.; Doll, K.; Holmer, T.; Wiesenhuetter, S.; Sha, C.; Mahanot, P.; Arya, C. (2020): Upgrading the Megacity. Piloting a Co-design and Decision Support Environment for Urban Development in India. In: Czarnowski, I.; Howlett, R.J.; Jain, L.C. (eds.) *Proceedings of the 12th KES International Conference on Intelligent Decision Technologies (KES-IDT 2020)* pp.533-544.
- Nolan, L. B.; Bloom D. E.; Subbaraman, R. (2017): Legal Status and Deprivation in India's Urban Slums: An Analysis of Two Decades of National Sample Survey Data, IZA Institute of Labor Economics, Bonn, p. 3.
- OECD (2001): *Citizens as Partners OECD Handbook on Information, Consultation and Public Participation in Policy-Making*, OECD Publications Service, France, p. 27-38.
- OECD (2020): *Innovative Citizen Participation and New Democratic Institutions: Catching The Deliberative Wave*, retrieved from <https://www.oecd.org/gov/open-government/innovative-citizen-participation-new-democratic-institutions-catching-the-deliberative-wave-highlights.pdf> (20.10.2021).
- OECD/European Commission (2020): *Cities in the World: A New Perspective on Urbanisation*, OECD Urban Studies, OECD Publishing, Paris, p. 26.

- Ogburn, J. (2018): Research on Bengaluru Slums Receiving National Attention in India, retrieved from <https://sanford.duke.edu/articles/research-bengaluru-slums-receiving-national-attention-india> (11.02.2020).
- Okulicz-Kozaryn, A. (2013): City Life: Rankings (Livability) Versus Perceptions (Satisfaction), in: *Social Indicators Research*, Springer Verlag, Cham, Vol. 110, No. 2, p. 433–451.
- Olanrewaju, A.; Shari, Z.; Gou, Z. (2019): *Greening Affordable Housing: An Interactive Approach*, CRC Press, Taylor & Francis Group, Boca Raton, p. 191.
- Olumuyiwa Bayode, A. (2021): Green Infrastructure Can Improve the Lives of Slum Dwellers in African Cities, in: *Frontiers in Sustainable Cities*, Vol. 3.
- O'Neill, D.W.; Fanning, A.L.; Lamb, W.F.; Steinberger, J.K. (2018): A good life for all within planetary boundaries, in: *Nature Sustainability*, Vol. 1, p. 88–95.
- Onnom, W.; Tripathi, N.; Nitivattananon, V.; Ninsawat, S. (2018): Development of a Liveable City Index (LCI) Using Multi Criteria Geospatial Modelling for Medium Class Cities in Developing Countries, in: *Sustainability*, Vol. 10, No. 2, p. 520.
- Parsons, A. W. (2010): The Seven Myths of 'Slums' Challenging popular prejudices about the world's urban poor, in: *Share The World's Resources*, p. 58.
- Patki, S. Y.; Shah, M. G.; Kale, C. M. (2020): *Building Drawing with an integrated approach to Built Environment*, 6th edition, McGraw-Hill Education, New York, p. 110.
- Patro, A.; GLZ Technical Advisor (07.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Paty, S.; Tata Trusts Consultant (04.12.2022): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Paty, S.; Tata Trusts Consultant (19.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Paty, S.; Tata Trusts Consultant (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Paty, S.; Tata Trusts Consultant (21.09.2020): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Paul, S. M.; Prabhakaran, K.; Vidhya, K.; Manishankar S.; Mohan S. (2021): Composite slum performance index: A methodology to make city slum free, in: *AIP Conference Proceedings* Vol. 2396.
- Peng, M. W. (2021): *Global Strategy*, 5th edition, South-Western Cengage Learning, Mason, p. 3.
- Perkins, N. D. (2008): Livability, Regional Equity, and Capability: Closing in on Sustainable Land Use, in: *University of Baltimore Law Review*, Vol. 37, No. 2, p. 157-202.
- Pharmacist (12.11.2019): Personal Communication, Chance Encounter, Chennai.
- Philip, C. M. (2016): Slums in Chennai increase by 50% in a single decade, retrieved from <https://timesofindia.indiatimes.com/city/chennai/Slums-in-Chennai-increase-by-50-in-a-single-decade/articleshow/50618951.cms> (24.02.2020).

- Planning and Convergence Department Government of Odisha (2020): Odisha Economic Survey 2019-20, Odisha Government Press, Madhupatna, Cuttack, p. 115-184.
- Praharaj, S.; Han, J. H.; Hawken, S. (2018): Urban innovation through policy integration: Critical perspectives from 100 smart cities mission in India, in: City, Culture and Society, Vol. 12, p. 35-43.
- Prasad, D.; Alizadeh, T. (2020): What Makes Indian Cities Smart? A Policy Analysis of Smart Cities Mission, Telematics and Informatics, Vol. 55.
- Prieur-Richard, A. H.; Walsh, B.; Craig, M.; Pathak, M.; Connors, S.; Bai, X.; Barau, A. S. (2019): Global Research and Action Agenda on Cities and Climate Change Science, World Climate Research Programme, No. 13/2019, p. 20.
- Product Manager (08.11.2019): Personal Communication, Chance Encounter, Bhubaneswar.
- Project Management Institute (2017): A Guide to the Project Management Body of Knowledge, 6th edition, Independent Publishers Group, Chicago, p. 121.
- Pune Municipal Corporation (2015): Smart Pune Creation of a Vision Community, retrieved from <https://smarnet.niua.org/sites/default/files/resources/Smart%20Pune-Citizen%20Engagement%20Case%20Study.pdf> (18.06.2021).
- PWC (2022): A New Urban Agenda: Accommodating 2 billion new urban citizens, retrieved from <https://www.pwc.co.uk/issues/megatrends/rapid-urbanisation.html> (04.03.2022).
- Randolph, G. F.; Gandhi, S. (2020): Covid-19 is a wake-up call for India's cities, where radical improvements in sanitation and planning are needed, retrieved from <https://www.washingtonpost.com/opinions/2020/04/20/covid-19-is-wake-up-call-indias-cities-where-radical-improvements-sanitation-planning-are-needed/> (11.05.2020).
- Rao, S. P.; Royo-Orlido, J.; Turkstra, J. (2022): Tenure security and property rights: the case of land titling for 'slum' dwellers in Odisha, India, in: International Journal of Urban Sustainable Development.
- Rebelo, J. (2015): Access to mobility for slum dwellers with easy low-cost solutions, retrieved from <https://blogs.worldbank.org/transport/access-mobility-slum-dwellers-easy-low-cost-solutions> (22.06.2022).
- Reuters (2016): Gangs, crime and slums: growing cities present new challenges for aid agencies, retrieved from <https://www.reuters.com/article/us-humanitarian-summit-urban-crisis-idUSKCN0Y80GA> (24.04.2022).
- Ritchie, H.; Roser, M. (2018): Urbanisation, retrieved from <https://ourworldindata.org/urbanization> (17.02.2020).
- Roy, D.; Palavalli, B.; Menon, N.; King, R.; Pfeffer, K.; Lees, P.; Sloot, P. M. A. (2018): Survey-based socio-economic data from slums in Bangalore, India, retrieved from <https://www.nature.com/articles/sdata2017200> (11.02.2020).

- Royuela, V.; Castells-Quintana, D. (2014): International migrations and urbanisation: 1960-2010, in: *International Journal of Global Environmental Issues*, Inderscience Enterprises Ltd, Vol. 13, No. 2/3/4, p. 150-169.
- Ruonavaara, H. (2022): The Anatomy of Neighbour Relations, in: *Sociological Research Online*, Vol. 27, No. 2, p. 379–395.
- Santamaría-Philco, A.; Canós Cerdá, J. H.; Penadés Gramaje, M. C. (2019): Advances in e-Participation: A perspective of Last Years, in: *IEEE Access*, Vol. 7, p. 155894-155916.
- Sarbeswar, P.; Hoon, H.; Scott, H. (2017): Innovative Civic Engagement and Digital Urban Infrastructure: Lessons from 100 Smart Cities Mission in India. In: *Procedia Engineering*. Vol. 180, p. 1423-1432.
- Sarkar, A.; Bardhan, R. (2020): Socio-physical liveability through socio-spatiality in low-income resettlement archetypes - A case of slum rehabilitation housing in Mumbai, India, in: *Cities*, Vol. 105, p. 102840.
- Satterthwaite, D.; Archer, D.; Colenbrander, S.; Dodman, D.; Hardoy, J.; Mitlin, D.; Patel, S. (2020): Building resilience to climate change in informal settlements, in: *One Earth*, Vol. 2, No. 2, p. 143-156.
- Saxena, A.; Gupta, V.; Shrivastava, B. (2021): An Assessment of Public Transport Accessibility Levels for Slums in Bhopal, in: *International Journal of Engineering and Advanced Technology (IJEAT)*, Vol. 10, No. 5.
- Schenk, H.; Dewitt, M. (2001): The Fringe Habitat of Bangalore, in: *Living in India's Slums: A Case Study of Bangalore, Delhi*, p. 131.
- Schröder, J. (2016): *GESIS Survey Guidelines: Face-to-Face Surveys*, Mannheim, Germany, GESIS – Leibniz Institute for the Social Sciences, p. 2.
- Seabrook, J. (1997): *In the Cities of the South: Scenes from a Developing World*, Verso Books, New York, Verso Books, London, p. 63.
- Shrivastava, V. P.; Singh, J. (2019): Review of Performance Indicators of Smart Cities in India – Ease of Living Index: A Case of Jabalpur Smart City, in: *International Journal of Scientific & Technology Research*, Vol. 8, No. 10.
- Singh, K. (2016): Strengthening community-based organizations for Slum Development, in: *International Journal for Research Publication & Seminar*, Vol. 7, No. 1.
- Singh, M. A.; Singha, K. (2020): *Understanding Urbanisation in Northeast India: Issues and Challenges*, Routledge, New York, p. 155.
- Slum Lead at Nala Muha Sahi; Slum Lead (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Slum Resident at Maa Mangala Lumbini Vihar Basti; Slum Resident (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Slum Resident at Maa Mangala Sahi Basti; Slum Resident (16.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Smart Cities (2021): About Smart Cities Mission, retrieved from <https://smartcities.gov.in/about-the-mission> (10.08.2021).

- Smile Foundation (2021): Improving Education of Slum Children, retrieved from <https://www.smilefoundationindia.org/blog/improving-education-of-slum-children/> (22.06.2022).
- Social Services India (2018): Jaga Fellows for World's largest slum land titling Programme, retrieved from <https://socialservicesindia.com/wp-content/uploads/2019/06/Jaga.pdf> (27.03.2020).
- Social Worker at Maa Mangala Lumbini Vihar Basti; Social Worker (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Social Worker at Niladri Vihar Harekrushna Nagar; Social Worker (20.11.2019): Personal Communication, Expert Interview, Bhubaneswar.
- Sowińska-Świerkosz, B.; Soszyński, D. (2022): Spatial indicators as a tool to support the decision-making process in relation to different goals of rural planning, in: Land Use Policy, Vol. 119, p. 106180.
- Sparc a Change Foundation (2019): What Drives Us, retrieved from <https://www.sparka-changefoundation.org/what-drive-us.php> (12.10.2020).
- Spohr, F. (2016): IT-Metropole Bangalore im Ausnahmezustand, retrieved from <https://www.handelsblatt.com/politik/international/wasserkrieg-in-indien-eine-der-schlimmsten-duerren-der-vergangenen-jahrzehnte/14541786-2.html> (04.08.2019).
- Sumner, A.; Ortiz-Juarez, E.; Hoy, C. (2020): COVID-19 could drive global poverty back over one billion people as the world's poorest face up to US\$500 million per day in lost income, United Nations University World Institute for Development Economics Research, Helsinki, retrieved from <https://www.wider.unu.edu/sites/default/files/Publications/Working-paper/PDF/wp2020-77.pdf> (23.01.2022).
- Sur, P.; Mitra, E. (2020): Social distancing is a privilege of the middle class. For India's slum dwellers, it will be impossible, retrieved from <https://edition.cnn.com/2020/03/30/india/india-coronavirus-social-distancing-intl-hnk/index.html> (10.12.2020).
- Sustainable Development Goals (2020): Sustainable Development Goals, retrieved from <https://sustainabledevelopment.un.org/?menu=1300> (25.05.2020).
- Sutyarsi, T.; Koestoer, R. H.; Susiloningtyas, D. (2019): The challenge of slums toward a sustainable city, in: IOP Conf. Ser.: Earth Environ. Sci., Vol. 338.
- Swachh Bharat Mission (2019): Index, retrieved from <https://swachhbharatmission.gov.in/sbmcms/index.htm> (04.10.2019).
- Syngellakis, S.; Hernández, S. (2020): WIT Transactions on Ecology and the Environment - Sustainable Development and Planning 2020, WIT Press, United Kingdom, p. 80-85.
- Tamil Nadu Slum Clearance Board (2019): About us, retrieved from <http://www.tnscb.org/about-us/> (11.12.2019).
- Tamil Nadu Slum Clearance Board (2020): Home (Website), retrieved from <http://www.tnscb.org> (02.10.2020).

- Tan, S. Y.; Taeihagh, A. (2020): Smart City Governance in Developing Countries: A Systematic Literature Review, in: Sustainability, Vol. 12, No. 3, p. 899.
- Tata Group (2020): We are the Tata group, retrieved from <https://www.tata.com/about-us> (27.03.2020).
- Tata Trusts (2019): About Tata Trusts, retrieved from <https://www.tatatrusts.org/about-tatatrusts> (27.03.2020).
- Tata Trusts (2019): Odisha: Land Rights to Slum Dwellers, Observations on detailed work flow process maps, p. 6-10, retrieved from <http://www.jagamission.org/pdf/Compendium%20Land%20Rights.pdf> (19.09.2020).
- Tenhunen, S. (2018): A Village goes Mobile: Telephony, Mediation, and Social Change in Rural India, Oxford University Press, New York, p. 515.
- The Global Statistics (2022): Poverty in India Statistics 2021-2022, Poorest State in India, retrieved from <https://www.theglobalstatistics.com/poverty-in-india-statistics-2021/> (01.05.2022).
- The Odisha Gazette (2017): The Odisha Rights to Slum Dwellers Act, 2017, Cuttack, p. 3, retrieved from <http://govtpress.odisha.gov.in/pdf/2017/1652.pdf> (10.09.2019).
- The Times of India (2020): Odisha has lowest slum population in the country, retrieved from <https://timesofindia.indiatimes.com/city/bhubaneswar/state-has-lowest-slum-population-in-the-country/articleshow/74181288.cms> (24.02.2020).
- The World Bank (2018): Population living in slums (% of urban population) – India, retrieved from <https://data.worldbank.org/indicator/EN.POP.SLUM.UR.ZS?locations=IN> (01.10.2020).
- The World Bank (2020): Urban Development, retrieved from <https://www.worldbank.org/en/topic/urbandevelopment/overview> (20.05.2020).
- The World Bank (2021): The World Bank in India, retrieved from <https://www.worldbank.org/en/country/india/overview#1> (20.12.2021).
- Thomas, F. C. (1997): Calcutta Poor: Elegies on a City Above Pretense, M. E. Sharpe, Armonk, p. 41.
- TIBC (2022): What is a Radar Chart?, retrieved from <https://www.tibco.com/reference-center/what-is-a-radar-chart> (18.02.2022).
- Times Now News (2018): Bhubaneswar enters top 20 in global smart city index; Singapore tops list, retrieved from <https://www.timesnownews.com/business-economy/world-news/article/bhubaneswar-enters-top-20-in-global-smart-city-index-singapore-pips-us-uk-cities/207564> (24.02.2020).
- Tippy Tap (2019): The tippy tap!, retrieved from <http://www.tippytap.org/the-tippy-tap> (08.08.2019).
- Trindade, T. C.G.; Heather, L.; MacLean, I.; Posen, D. (2021): Slum infrastructure: Quantitative measures and scenarios for universal access to basic services in 2030, in: Cities, Vol. 110.

- Tripathy, B.; GIZ Technical Advisor (10.02.2021): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Tripathy, B.; GIZ Technical Advisor (17.11.2022): Personal Communication, Expert Interview, Online Interview, Bhubaneswar & Hamburg.
- Tsui, J. B.-Y. (2005): *Fundamentals of Global Positioning System Receivers: A Software Approach*, 2nd edition, John Wiley & Sons, Inc., Publication, New Jersey, p. 7.
- TWI (2022): What is a Smart City? - Definition and Examples, retrieved from <https://www.twi-global.com/technical-knowledge/faqs/what-is-a-smart-city> (04.05.2022).
- UCLA (2022): Sustainability, retrieved from <https://www.sustain.ucla.edu/what-is-sustainability/> (23.01.2022).
- Umang (2020): About Umang, retrieved from <https://web.umang.gov.in/web/#> (08.05.2020).
- UNDRR (2022): About UNDRR, retrieved from <https://www.undrr.org/about-undrr> (22.06.2022).
- UNDRR (2022): What is the Sendai Framework for Disaster Risk Reduction?, retrieved from <https://www.undrr.org/implementing-sendai-framework/what-sendai-framework> (22.06.2022).
- UN E-Government Knowledgebase (2022): E-Participation Index, retrieved from <https://publicadministration.un.org/egovkb/en-us/About/Overview/E-Participation-Index> (29.01.2022).
- UN-Habitat (2002): Global Urban Indicators Database, retrieved from <https://unhabitat.org/sites/default/files/download-manager-files/Global%20Urban%20Indicators%20Database.pdf> (14.06.2022).
- UN-Habitat (2003): *The Challenge of Slums: Global Report on Human Settlements*, in: United Nations Human Settlements Programme, Earthscan Publications Ltd., London and Sterling, p. 5-131.
- UN-Habitat (2012): Public Spaces for All, retrieved from <https://unhabitat.org/public-spaces-for-all> (22.06.2022).
- UN-Habitat (2015): UNHABITAT Habitat III Issue Papers-22: Informal Settlements, New York, USA.
- UN-Habitat (2016): *Slum Almanac 2015/2016: Tracking Improvement in the Lives of Slum Dwellers*, UNON Publishing Services Section, Nairobi, p. 2.
- UN-Habitat (2018): SDG Indicator 11.1.1 Training Module: Adequate Housing and Slum Upgrading, in: United Nations Human Settlement Programme (UN-Habitat), Nairobi, Kenya, p. 8.
- UN-Habitat (2020): First COVID-19 Urban Thinkers Campus discusses putting communities at the centre of the crisis response, retrieved from <https://unhabitat.org/first-covid-19-urban-thinkers-campus-discusses-putting-communities-at-the-centre-of-the-crisis> (12.05.2020).
- UN-Habitat (2020): People-Centered Smart Cities, retrieved from <https://unhabitat.org/programme/beta/people-centered-smart-cities> (06.04.2020).

- UNEP-IRP (2018): The weight of cities. Resource requirements of future urbanization, in: United Nations Environment Programme, International Resource Panel, p. 21.
- Unicef (2017): Sanitation, retrieved from https://www.unicef.org/wash/3942_43084.html (27.04.2020).
- Unicef (2019): Über uns: Das ist UNICEF, retrieved from <https://www.unicef.de/informieren/ueber-uns> (05.08.2019).
- United Nations (2017): NEW URBAN AGENDA, retrieved from <https://uploads.habitat3.org/hb3/NUA-English.pdf> (09.10.2021).
- United Nations (2018): 68% of the world population projected to live in urban areas by 2050, says UN, retrieved from <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html> (24.05.2020).
- United Nations (2016): 11 Make cities and human settlements inclusive, safe, resilient and sustainable, retrieved from <https://sdgs.un.org/goals/goal11> (10.01.2020).
- United Nations Environment Programme (2020): Integrated Guidelines for Sustainable Neighbourhood Design, retrieved from <https://www.neighbourhoodguidelines.org> (12.11.2020).
- United Nations (2020): Policy Brief: The World of Work and COVID-19, retrieved from https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/genericdocument/wcms_748428.pdf (24.01.2022).
- United Nations (2022): Transforming our world: the 2030 Agenda for Sustainable Development, retrieved from <https://sdgs.un.org/2030agenda> (22.06.2022).
- United Nations University (2010): Greater Access to Cell Phones Than Toilets in India: UN, retrieved from <https://unu.edu/media-relations/releases/greater-access-to-cell-phones-than-toilets-in-india.html> (24.01.2020).
- United Nations, Department of Economic and Social Affairs, Population Division (2019): World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420), United Nations, New York, p. xix.
- Urban Hub (2018): Challenges and opportunities for urban development in India, retrieved from <http://www.urban-hub.com/de/urbanization/challenges-mean-opportunities-for-urban-development-in-india/> (13.12.2018).
- Urban Management Centre (2018): Slum Networking Project (SNP) Ahmedabad Municipal Corporation, retrieved from <https://pas.org.in/Portal/document/ResourcesFiles/GoodPracticeDocs/Slum%20Networking%20Project.pdf> (07.02.2020).
- Vahan (2019): How it works, retrieved from <https://vahan.co/#how-it-works> (06.08.2019).
- Vale, R. (2016): Effects of Urbanization On Poverty, retrieved from <https://richmondvale.org/en/blog/effects-of-urbanization-on-poverty> (20.05.2020).
- Valentini, R.; Calfapietra, C.; Vasenev, V.; Cheng, Z.; Dovletyarova, E. (2019): Green Technologies and Infrastructure to Enhance Urban Ecosystem Services - Proceedings of the Smart and Sustainable Cities Conference 2018, Springer Geography, Switzerland, p. 253-265.

- Van Voorst, R. (2016): *Natural Hazards, Risk and Vulnerability - Floods and slum life in Indonesia*, Routledge, New York, p. 25-35.
- Vardoulakis, S.; Kinney, P. (2019): Grand Challenges in Sustainable Cities and Health, in: *Frontiers in Sustainable Cities - Health and Cities*, Vol. 1, No. 7, p. 1.
- Vision Rescue (2022): *Community Centers - Stationary hubs based within the poorest communities of India*, retrieved from <https://visionrescue.us/projects/community-centers/> (26.06.2022).
- Wagner, F. (2018): *Livable Cities from a Global Perspective*, Taylor & Francis, London, p. 69.
- Wagner, F.; Caves, R. W. (2019): *Community Livability: Issues and Approaches to Sustaining the Well-Being of People and Communities*, 2nd edition, Taylor & Francis, London, p. 45.
- Walloth, C.; Gebetsroither-Geringer, E.; Atun, F.; Werne, L. C. (2016): *Understanding Complex Urban Systems: Integrating Multidisciplinary Data in Urban Models*, Springer International Publishing Switzerland, Basel, p. 4.
- Waseem, S. (2017): *Health Solutions That Work for Indian Slums*, retrieved from <https://blogs.adb.org/blog/health-solutions-work-indian-slums> (01.03.2020).
- Wellman, B.; Wortley, S. (1990): Different Strokes from Different Folks: Community Ties and Social Support, in: *American Journal of Sociology*, Vol. 96, No. 3, p. 558–588.
- Welthungerhilfe (2019): *Informieren*, retrieved from <https://www.welthungerhilfe.de/informieren/> (05.08.2019).
- Werna, E.; Blue, I.; Harpham, T. (1996): The Changing Agenda for Urban Health, in: Cohen, *Preparing for the Urban Future Global Pressures and Local Forces*, Woodrow Wilson Center Press, Washington, D.C., p.201.
- Wirehive (2021): *7 benefits of digital communication in the workplace*, retrieved from <https://www.wirehive.com/thoughts/benefits-of-digital-communication-in-the-workplace> (20.07.2022).
- World Population Review (2020): *London Population 2020*, retrieved from <https://worldpopulationreview.com/world-cities/london-population/> (12.05.2020).
- World Urban Campaign (2020): *COVID19 - Urban Thinkers Campus - Facing Urban Vulnerabilities In The Covid-19 Crisis: What Is Needed To Address Hot Spots And Build Resilience*, retrieved from <https://www.worldurbancampaign.org/covid19-urban-thinkers-campus-facing-urban-vulnerabilities-covid-19-crisis-what-needed-address-hot> (14.05.2020).
- Yu, J.; Shannonb, H.; Baumannb, A.; Schwartzb, L.; Bhattc, M. (2016): Slum Upgrading Programs and Disaster Resilience: A Case Study of an Indian ‘Smart City’, in: *Procedia Environmental Sciences*, Vol. 36, p. 154-161.
- Zheng, Y. (2017): Explaining Citizens’ Usage: Functionality of E-Participation Applications, in: *Administration and Society*, Vol. 49, No. 3, p. 423-442.

Appendix

A. Brief Overview of Speaker Statements at the “COVID-19 Urban Thinkers Campus (UTC)”

Prof. Marie Huchzermeyer from Wits University, South Africa emphasized the importance of structures of communication and decision-making within slums to build resilience. She also acknowledged within this context that “many structural issues that have not been addressed in the past need to be faced now”³¹². Smruti Jukur from the Society for the Promotion of Area Resource Centres, based in India mentioned that “many dense settlements have been lacking access to water for decades and have very poor primary and secondary healthcare systems. These structural issues are just now revealed with the Covid-19 crisis and will have to be addressed if we want to address future pandemics.”³¹² Additionally, Kerstin Sommer, Coordinator at UN-Habitat, emphasized the strong combination of “immediate responses with the long term recovery strategies, particularly through partnerships between people, private sector, informal sector.”⁸⁴ She also referred to intense measures in persuading governments to focus more on slums and their individual needs, ensuring that communities are involved in the design of national policies and protocols (ibid.).

The conclusion of the Urban Thinkers Campus session was:

“In times of pandemics, social cohesion becomes key to survival and resilience in the most vulnerable urban hot spots. Rather than pointing at urban informality as a problem, decision-makers need to put communities at the center of their response. The role of community leaders has proven essential in many contexts. They have the intimate knowledge of communities and without them, little can be achieved effectively to face the challenges of the pandemic.”³¹²

B. Advantages of Slums

Worldwide slums, favelas, ghettos, shanty towns or cabbage towns are prone to unhygienic conditions, diseases, suffer from poor governmental support and stand in a negative relation to the remaining urban neighbourhoods.³⁴² But there are also positive aspects about slums, as they display an optimal solution for providing shelter for immigrants or low-income people and feature dwelling places for needed labour force.

From a productivity perspective their economic contribution is highly demanded by the formal economy outside the slums in many ways, such as housekeepers, waitresses, street workers, dish washers, cleaners, etc. Taking a look at the commercial success of Dharavi, the biggest slum in India, Dharavi's residents account for more than 642.64€

³⁴² Citizen, T. (2016): Urbanisation in India, retrieved from <http://lebendom.com/article/urbanisierung-in-indien> (06.06.2019).

million in revenue per year.³⁴³ A widespread believe is that “slums are a physical and spatial manifestation of urban poverty and intra-city inequality”⁶⁴, but it has been acknowledged that “slums do not accommodate all of the urban poor, nor are all slum residents always poor” (ibid.). Despite the various positive attributes, there is no justification for the existence of slums.

C. Interview Guidelines

Figure 33 displays the entirety of the interview guidelines, including the introduction phase, questionnaire part and closing phase. The guide was not previously sent to the expert interviewees and participants in focus group discussions. Only the interview topic and an overview of the course were described to the interviewees/participants in advance. The interviewer wants to receive ad hoc answers that are not prepared in advance - raw, unfiltered, and honest. This makes it possible that the interview can take over a different, than planned, direction. If that is the case and still value is added, then a new direction may add valuable content. The main purpose of the guide is to make sure that all required questions are covered and everything that goes beyond the required information, will display added value that can be further analysed if needed.

³⁴³ Kempner, R. (2017): Dharavi, India: The Most Entrepreneurial Slum In The World?, retrieved from [https://www.huffpost.com/entry/dharavi-the-most-entrepre_b_834300?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xLmNvbS8&guce_referrer_sig=AQAAAGq-hShsMbR-ryRpxo_mDdPU6_4OzaaoLLCXT_rm2fHWd3tOdjFbmPkBZ4wq-zX1nlyn_isyL4BELZ6Ncssy3g5kgwqs_LhV85Nd5LT63YZvIVZKssz3NUDnPITWgc98XglvjKdpclcieXzOevoM20vZ7tUs o1csEzHnRUi3H9](https://www.huffpost.com/entry/dharavi-the-most-entrepre_b_834300?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xLmNvbS8&guce_referrer_sig=AQAAAGq-hShsMbR-ryRpxo_mDdPU6_4OzaaoLLCXT_rm2fHWd3tOdjFbmPkBZ4wq-zX1nlyn_isyL4BELZ6Ncssy3g5kgwqs_LhV85Nd5LT63YZvIVZKssz3NUDnPITWgc98XglvjKdpclcieXzOevoM20vZ7tUs o1csEzHnRUi3H9 (26.05.2020).) (26.05.2020).

	Questionnaire Expert Interviews I	Questionnaire Expert Interviews II	Questionnaire Expert Interviews III	Questionnaire Focus Group Discussions
	2019 <u>Questions asked within Expert Interviews</u>	2021 <u>Questions asked within Expert Interviews</u>	2022 <u>Questions asked within Expert Interviews</u>	2019 <u>Questions asked within Focus Group Discussions</u>
1. Personal/ Slum Data	Name Questionnaire ID Location Gender Age Organisation Position Time in Organisation Email Interview Duration Date Time	Name Questionnaire ID Location Gender Age Organisation Position Time in Organisation Email Interview Duration Date Time	Name Questionnaire ID Location Gender Age Organisation Position Time in Organisation Email Interview Duration Date Time	Slum Name Questionnaire ID Experts Participating Date Time Slum Age Slum Facts
2. Project Introduction	Hello, my name is Neele, I am from Germany and today I am here to get to know you and your expertise as an expert (EI) OR your community, as well as living environment (FGD). My goal is it to develop an approach, which aims to improve sustainable upgrading in informal areas. Please let me know, in case you have any questions. In case you do not have any questions, I would like to start with my questions.			
3. Interview Questions	1. Informal settlement evolution and government actions a. What are informal settlements regarding your definition? b. How have informal settlements been addressed in the past? c. Which issues are less cared for by local authorities in the past, which are now a focal point? 2. Actual & Future Management of Informal Settlements a. Have you worked with informal settlements during your professional career? a.1. If YES: What type of collaboration was it? b. Would you say that current methods of informal settlement upgrading are enough or is anything missing? c. Do you think India's Smart City Mission has an effect on informal settlements? d. Do you think participative strategies should be empowered more? e. How shall informal settlements be addressed in the future? 3. Liveable Life a. What is a liveable life for you? b. What do you think is a liveable life for informal settlers? 4. Current status of informal settlement potential areas a. What are informal settlement strengths? b. What are informal settlement weaknesses? c. What are informal settlement opportunities? d. What are informal settlement issues/ threats? 5. Stakeholder Identification a. Which stakeholders are regarding your opinion related to an informal settlement? b. How do you think can these stakeholders contribute to the development of informal settlements c. Do you think a closer collaboration between inhabitants and key stakeholders would bring about change? 6. HLSC in Informal Settlements a. What does smart city mean for you? b. Do smart solutions bring forward/ throw back the progress of informal settlements? c. Do you think modern technology could support the local population to facilitate traditional management of problem areas? d. If there shall be implemented a new smart solution, which one do you recommend and why? e. Could you imagine that dwellers share data via mobile phones to get in contact with authorities and support onsite development processes?	1. Participatory Approaches a. How have participatory approaches been realised within the upgrading of slum areas? b. Have social structures been identified prior to participatory approaches within upgrading? If so, which ones & how did social structures change during participative upgrading? ⁴ Social structures: Social relationships & hierarchies c. Did dwellers personal ownership to upgraded areas increase, as areas change with participatory approaches? d. Which further changes did you note while striving for participative upgrading approaches? 2. Responsiveness & Risk Awareness a. How did you ensure that development objectives are responsive to society? b. Did similar development objectives at different slum locations varied, due to distinct local social structures? c. What are the project stages and how is community engagement ensured at each stage? d. What risks are considered prior to upgrading and which ones are most likely to occur? 3. Stakeholder Network a. Which stakeholders have been involved within upgrading? (Jaga Mission, NGOs, local dwellers, governmental authorities, etc.) b. What went well/ wrong, during the cooperation with various stakeholders? Hierarchal structures? c. Which stakeholder was involved at what project stage of the upgrading process? d. What would you change within the level of involvement? 4. Liveable Life & Slum Habitat a. How would you define a liveable life for yourself & for slum dwellers? b. During upgrading, it might be important to not only consider the slum, but also the surrounding neighbourhood. Did upgrading approaches, next to experts, also involved the local neighbourhood? c. What role do public spaces play in slums and how do they determine local life? d. For which upgrading topics is it important to consider/ not consider local characteristics or values and how does this guarantee sustainability post upgrading?	1. Liveable Life Index a. Were the findings and conceptualised LLJ tool understandable? b. Did the LLJ set the right priorities? c. Are the problems named correctly and realistic within the sub-elements of the tool? d. Do you think the tool can be helpful in slum upgrading? e. What are major benefits related to the LLJ? f. What are major concerns related to the LLJ?	1. Liveable Life a. What are the things you like most about your neighbourhood? (Personal/ house based/ neighbourhood based) b. What are the things you like least about your neighbourhood? (Personal/ house based/ neighbourhood based) c. What does it mean for you to live a liveable life? 2. Current status of local problem areas & existing measures for challenges a. What are your strengths? b. What are your weaknesses? c. What are your opportunities? d. What are major issues/ threats in your neighbourhood? 3. Conventional management of problem areas a. What are existing methods used to take care of waste management? b. What are existing methods used to take care of hygiene/ sanitary facilities/ clean water? c. What are existing methods used to take care of daily food? d. What are existing methods used to take care of education? e. What are existing methods used to take care of health/ medical care? f. What are existing methods used to take care of transportation? 4. Stakeholder Identification a. Is there someone in your area you can approach for any kind of help and support? b. Does there exist a community center, where you meet and discuss issues? c. Are you involved in decision making processes in your area? d. Are their issues which are less cared for by local authorities? e. Would you wish the existing system of help to be improved? f. Which support would be needed? 5. Hyperlocal Smart City Strategy a. Do you have a smartphone? b. For what do you use your smartphone?
	Did I forget anything? Please share any ideas with that might arose? (Contribution of interviewees/ participants)			
4. Q&A	Question & answer session (questions of interviewees/ participants)			
5. Conclusion	Conclusion (say thank you and end the EI/ FGD)			

Figure 33: Expert Interview I, Expert Interview II, Expert Interview III & Focus Group Discussion Guide (own representation).

Interview Guide Test Phase

Before each survey took place, the questionnaires for the expert interviews (I, II & III) and focus group discussions were tested, each with two till four test persons. The test persons are similar to both target groups (expert interviewees and focus group discussion participants) and conducted under same conditions (e.g. time frame, location). During the test runs, particular consideration was given to the following criteria:³⁴⁴

- Are questions easy to understand?
- Do the questions allow long answers?
- Exists a red thread in the structure of the questions asked?
- Do the answers to specific questions help to draw conclusions about the research topic?
- Are the interview instructions understandable for everyone?
- Are components of the questions superfluous?

Overall, the interview guide consists in the expert interview as well as in the focus group discussion of 5 phases: Personal Data, Project Description, Interview Process, Question & Answer, Conclusion. Throughout the process, only handwritten notes were made.³⁴⁵ A voice recorder has deliberately been avoided, since during expert interviews, the Indian-English was difficult to understand and background noises drowned the word of experts. The focus group discussions were supported by instant translations of the translating team, which was again difficult to understand and background noises within the slums drowned each word.

D. First Research Phase – India Schedule

Table 11 is an overview of the schedule during research conducted in India.

	Title	Name of Expert/Slum/Team	Location	Date	Time
1.	Plan OK Please Symposium	GlZ Team, international participants	Bhubaneswar	04.11.2019	09:00 AM
2.	Plan OK Please Symposium	GlZ Team, international participants	Bhubaneswar	05.11.2019	09:00 AM
3.	Expert Interview	Pedro B. Ortiz	Bhubaneswar	05.11.2019	10:00 AM

³⁴⁴ Haag, P. (2014): Auswahl von Instrumenten & Maßnahmen der Live-Kommunikation: Modellbasierte und zielorientierte Auswahl von Live-Kommunikation für Start-Ups und KMU, Akademische Verlagsgemeinschaft München, Munich, p. 36.

³⁴⁵ Gläser, J.; Laudel, G. (2010): Experteninterviews und qualitative Inhaltsanalyse: als Instrumente rekonstruierender Untersuchungen, 4th edition, VS Verlag für Sozialwissenschaften, Wiesbaden, p. 150.

		(Senior Fellow, NYU Marron Institute of Urban Management, USA)			
4.	Expert Interview	Anil Gupta (Professor at India's National Disaster Management Institute, under Ministry of Home Affairs, also in charge of health and climate issues)	Bhubaneswar	05.11.2019	11:30 AM
5.	Expert Interview	Kedarnath Rao Ghorpade (Urbanist & Researcher, Mumbai)	Bhubaneswar	05.11.2019	01:00 PM
6.	Expert Interview	Stefanie Ettling (Integrated Expert for Environmental Education and International Relations)	Bhubaneswar	06.11.2019	08:00 PM
7.	GIZ Workshop	GIZ Team	Delhi	07.11.2019	09:00 AM
8.	GIZ Workshop	GIZ Team	Delhi	08.11.2019	09:00 AM
9.	Expert Interview	Gaurav Raheja (Department of Architecture and Planning, Roorkee)	Delhi	09.11.2019	12:00 PM
10.	Expert Interview	Deeptha Jayakar, Babu Natesan, Suhakar (GIZ Architects)	Chennai	11.11.2019	12:00 PM
11.	Expert Interview	Ms. Manimekhalai (Senior Planner at Tamil Nadu Slum Clearance Board)	Chennai	12.11.2019	01:00 PM
12.	Slum Visit	Isaneswar Basti Tata Trusts (Sradhanjali, Meghna, Shreyashee, Monalisa, Ashalata)	Bhubaneswar	14.11.2019	11:00 AM
13.	Slum Visit	Omkar Kinner Basti/Transgender Slum Tata Trusts (Sradhanjali, Meghna)	Bhubaneswar	15.11.2019	02:00 PM
14.	Slum Visit	Maa Mangala Sahi Basti Tata Trusts (Manoja, Shreyashee)	Bhubaneswar	16.11.2019	12:30 PM
15.	Expert Interview	Manoja Chahatray (Tata Trusts, Jaga Mission, Slum Expert)	Bhubaneswar	16.11.2019	02:30 PM
16.	Slum Visit	Maa Mangala Lumbini Vihar Basti Ekta Consultancy	Bhubaneswar	18.11.2019	10:00 AM
17.	Slum Visit	Maa Mangala Lumbini Vihar Basti	Bhubaneswar	19.11.2019	11:30 AM

		Ekta Consultancy			
18.	Expert Interview	Antarin Chakrabarty (Urban Planner and Former Lead in the State Equity Cell in the government of Odisha's Department of Housing & Urban Development)	Bhubaneswar	19.11.2019	02:30 PM
19.	Slum Visit	Harijan Sahi Tata Trusts (Ashalata, Manoj)	Bhubaneswar	19.11.2019	04:00 PM
	Expert Interview	Adwitiya Patro (Technical Advisor in Smart City Projects)	Bhubaneswar	19.11.2019	07:00 PM
	Expert Interview	Sradhanjali Paty (Slum Development Expert)	Bhubaneswar	19.11.2019	08:00 PM
20.	Slum Visit	Niladri Vihar Ha-rekrushna Nagar Ekta Consultancy	Bhubaneswar	20.11.2019	12:00 PM
21.	Slum Visit	Nala Muha Sahi Tata Trusts (Sradhanjali, Shreyashee)	Bhubaneswar	20.11.2019	16:00 PM
22.	Slum Visit	Niladri Vihar Ha-rekrushna Nagar Ekta Consultancy	Bhubaneswar	21.11.2019	12:00 PM

Table 11: India Schedule (own representation).

E. Third Research Phase – LLI Power Point Presentation

As the third research phase took place remote, a Power Point Presentation (Figure 34) including the key findings on slum development, needs and opportunities and the LLI concept with its location-specific applicability was presented during an online meeting. The key points analysed were laid out in a subsequent direct discussion with local development experts, followed by a short interview (Figure 33) to receive feedback.



Figure 34: Third Research Phase – LLI Power Point Presentation (own representation).

F. Case Study – Upgrading Projects in Ahmedabad, Gujarat

Ahmedabad is the largest city of the Indian state Gujarat, with a total population of 7.486.573 and an area of 8087 km².³⁴⁶ The slum population, as per Census 2011 is 1.680.000, whereby Housing demand, as of 1st July 2019 is 449,000.⁶² In the following, two programs conducted in Ahmedabad are presented. First, the programme “Ahmedabad Slum Networking” from 1995-2006 is presented that worked on transforming the urban environment through a partnership between the Ahmedabad Municipal Corporation (AMC), non-governmental organizations (NGOs) and local communities.³⁴⁷ Second, the Indian wide policy scheme “Pradhan Mantri Awas Yojana” (PMAY) from 2015 – 2022 is introduced that aims to provide serviced dwelling units to every Indian citizen through a variety of partnerships and subsidy schemes.

The Ahmedabad Slum Networking aimed to provide affordable, sustainable, and physical infrastructure and social services (e.g. water supply, street lightening, individual toilets) for a better quality of live in local slum households.³⁴⁸ Financial resources were based on a

³⁴⁶ District Ahmedabad (2020): Home (Website), retrieved from <https://ahmedabad.nic.in> (06.05.2020).

³⁴⁷ Urban Management Centre (2018): Slum Networking Project (SNP) Ahmedabad Municipal Corporation, retrieved from <https://pas.org.in/Portal/document/ResourcesFiles/GoodPracticeDocs/Slum%20Networking%20Project.pdf> (07.02.2020).

³⁴⁸ Ahmedabad Municipal Corporation (2013): Slum Networking Project, retrieved from https://ahmedabadcity.gov.in/portal/jsp/Static_pages/slum_ntwk_project.jsp (30.09.2019).

partnership concept. Hence, all partners shared the cost of the physical services and community development in the projects.³⁴⁸ AMC beard 80% of the physical infrastructure costs and residents participating 20%. Instead of only providing development costs, the AMC actively engaged in the project and took over the role of supervising the project's local implementation, checking of design plans, and monitoring the overall progress of work done. The NGO's involved, were responsible for motivating the local inhabitants to participate in the project, facilitating the collection of savings to bear the remaining costs and planning, designing, implementing, and mobilizing resources for infrastructure works in slums. The NGOs were also responsible to enable access of communities to health and education services. For each household agreement the NGOs received 12.77€.³⁴⁹

Actively involving the local population into development work and distributing the costs for the same reduced the perceived risk, as the exposure and opportunities for managing savings and accessing loans empowered local households. For safety reasons and optimal performance of installations, a team of technical personnel was constituted.

As per the NGOs project teams, the most difficult task was motivating residents to avail benefits and become a project partner. Coaching and changing mindset were required, as residents were accustomed to free, but late and limited services. In total, slum residents contributed 275,527€ towards development services within their local habitat. At that time, the extent of residents' financial contribution has never been done in any other Indian slum upgrading project.³⁴⁸

To ensure structured and transparent processes in all sectors of operations, several procedures were included throughout the development work. On a monthly basis, monitoring meetings between AMC and NGO partners took place for reviewing the work progress and share views to facilitate the implementation of the program. Accordingly, planning was done in a shared manner with all partners and necessary amendments made. To educate the local community of technical aspects and ensure community consent for smooth program implementation, jointly trainings were conducted. The local community and partners had the chance to meet AMC officials for open interactions and queries during the AMC post lunch office hours.

As of November 2006, the slum networking program has made a significant contribution in the lives of 43,515 people in 41 slums of Ahmedabad. The program has shown that government bodies willing to enter strong partnerships with various stakeholders enable the opportunity to provide a better quality of life for their poor fellow citizens. One of the most valuable lessons learnt from the project, is that slum residents are willing to contribute for the services and do not want everything granted for free. Additionally, having slum residents as partners in the project made them more responsive and evoked a feeling of

³⁴⁹ McDonald, D. A. (2016): Making Public in a Privatized World: The Struggle for Essential Services, Zed Books Ltd., London, p. 82.

creator in them. This is an important insight for the LLI, which aims to build on participative structures and enhance the co-operation of a variety of local stakeholders for upgrading purposes. Key is the participatory process initiating a dialogue between municipality, aid co-operation's and slums.

Next to the integrative approach displayed in the Ahmedabad Slum Networking program, PMAY-U followed a similar manner within upgrading contexts. One mandatory condition under PMAY-U was the identification of land for affordable housing in master plans. It is important to choose suitable locations that consider usability and liveability perspectives. As criticized in the policy brief of PMAY, the majority of local governments place little emphasis on identifying land for affordable housing close to the economic centres in master plans under PMAY-U.⁶² It is considered best to move households not more than 3 km beyond their existing residence.⁶² A few cities resettled slums at a distance of 25–33 km beyond their existing residence.⁶² Inappropriate locations for housing directly influence income, expenses, the liveability of habitats, public transport connections and access to social amenities. All these points do not apply to the Ahmedabad case. To identify suitable locations for affordable housing, the Ahmedabad Urban Development Authority created a “residential affordable housing zone”. This zone is a kilometre-wide buffer space along the outer ring and was created to ensure housing projects located close to the economic centres, including active public transport to a variety of destination.⁶² As of 1st July 2019, Gujarat is one of the states with the largest progress in completing housing demand, with more than 350.000 units.⁶²

Although the local government of Gujarat undertook a variety of positive and exemplary upgrading measures, downturns in construction planning were also noted. Regarding building structures under PMAY-U, it is recommended to prevent the construction of high-rise buildings. Gujarat has focused in a variety of housing projects on G+7 buildings.⁶² As already mentioned, high-rise buildings display no sustainable solution for lower income groups and India's sustainability goals. On the one hand, high-rise buildings help to increase housing units vertically, without expanding horizontally, saving valuable land. On the other hand, high-rise buildings underperform on affordability, adaptive comfort and have tremendous consequences on sustainability aspects, such as the environment, due to an increase in CO₂ emissions and the requirement of extra services that are high in maintenance costs, such as lifts.⁶² Based on the research of an Indian architect, Ashok B. Lall, whose housing projects are committed to an architectural practice of environmental sustainability and social responsibility, buildings above G+4 increase CO₂ emissions up to 35%.⁶² In 2015, as part of the Paris Agreement targets, the government of India stated to reduce CO₂ emissions by 33-35% until 2030, compared to 2005 levels.³⁵⁰ Four years later, in 2019, India's prime minister announced at the Secretary General's

³⁵⁰ Climate Action Tracker (2019): Pledges And Targets, retrieved from <https://climateactiontracker.org/countries/india/pledges-and-targets/> (07.05.2020).

summit in New York, to reach 2030 the target of 450 gigawatt of renewable energies.³⁵¹ Reaching intentions, requires constructions of sustainable and environmental friendly housing structures. Focus on reduced emissions and renewable energies should display a key component for projects under PMAY-U.

With a high response to local needs under a variety of programs, the government of Ahmedabad assured a common interest towards sustainable rehabilitation in slum neighbourhoods. Paying attention to in-situ rehabilitation structures, Ahmedabad is a good example on how the dealing with the topics of human beings and the environment enable a solution suitable for everyone. At the same time, the advanced progress involved with ex-situ upgrading displayed valuable lessons learnt for future actions. Moving people to new locations not only disrupts their way of life, but when planned carefully, creates better living conditions and opens new opportunities for economic activities. Both processes require a strong co-operation between the government, aid organisations and beneficiaries that is built on confidence instead of power.

G. Case Study – Ex-Situ Slum Development Strategy in Tamil Nadu

The state Tamil Nadu has many active projects that are concerned with ex-situ development. Still local ex-situ implementation measures have not yet achieved best practice standards, as lessons learnt contribute to continuous changes in approaches. In the past, most relocations took place to the outskirts of cities, far away from the former slum location. Based on lessons learnt and for ex-situ development to be more successfully implemented in the future, the state plans to minimize relocation distances of slums. One expert interview within the thesis took place with a member of the ‘Tamil Nadu Slum Clearance Board’. She reported that 10-12 km moving distance are avoided, as 2-3 km result in higher resident acceptance. It is important to move people close enough, to be not teared out of their home zone, where they work, and children go to school; but far enough to prevent life close to threatening conditions or unauthorised land. An agreement with the population is the basic prerequisite for relocation, as the biggest problems arise when riots start. For the future, the ‘Tamil Nadu Slum Clearance Board’ not only plans, to provide residents with the opportunity to choose from various locations, but also have a stake in the type of accommodation at the new location.

Currently all housing units are built according to a standardized template. “It would be great if one could enable the people to select the type of accommodation they need and customize their houses towards family sizes. A single household does not need to receive a 4-bedroom house and a family with ten people can neither live in a 4-bedroom house. People should be able to choose from a 2-, 4- till 6-bedroom house”.¹⁵⁰ The interviewee

³⁵¹ Jai, S. (2019): Govt to ease land acquisition, finance for renewables to meet 450 GW target, retrieved from https://www.business-standard.com/article/economy-policy/govt-to-ease-land-acquisition-finance-for-renewables-to-meet-450-gw-target-119092501326_1.html (07.05.2020).

reported that currently there are no options offered to the people and any family size gets a 40m² house, which is intended for four people. Apart from unit size, is the commission of house constructing orders. It takes one year to build houses. Enabling residents to choose their size of house, needs prior investigation to develop according plans and provide the customized house simultaneously with relocation. Hence, the time span from the point the local government knows that a slum needs to be resettled and unit size customisation should be realised, until the point when residents are in fact resettled, will exceed one year. The interviewee reported that the 'Tamil Nadu Slum Clearance Board' aims to raise attention on respecting local needs and increase resettlement operations to realise countermeasures that aim at sustainable solutions.¹⁵⁰

H. Case Study – Implementation & Consequences of Smart City Strategies in Tamil Nadu

To promote Smart City progress in India, every year the state and the central government provides cities under the Smart City Mission with financial resources, to develop the city structure.²⁰⁹ 20% of the budget goes to the entire city, e.g. basic infrastructure, roads, electric light, cctv monitoring cameras. The remaining 80% goes into the ABD (area-based development). The ABD displays an area of a city, where smart solutions are to be integrated. As it is not possible to develop an entire city into a Smart City at once, the Smart City Mission focuses on various areas that are consecutively upgraded and redeveloped. The SPV (special purpose vehicle) is a committee (private people, civic society & governmental members) who collect Smart City proposals to navigate funds from the state government into optimal realisation purposes. However, the SPV only suggests areas within a city, the final decision of changes and the specific area of an ABD project to be chosen, makes exclusively the state government. In some cases, next to proposal collection, the SPV also monitors the implementation of smart projects in a city. The reason, why SPVs and not local governments are chosen to make proposals has one fundamental reasons. SPVs are due to their multi-faceted and hierarchal diverse team considered to be more citizens focused and perceived to represent the same values, as the general public. The interviewee revealed that "you need to find something that works and sells for the community, as the community needs someone they can trust and there exists only little trust in governments in general"²⁰⁹.

In Chennai the area-based development project at Pondy Bazaar in the famous shopping area Thyagaraja Nagar, turned one of Chennai's most busy and well attended shopping streets into an empty and silent zone. Prior to the Smart City redevelopment program, the street used to be full of many small shop sellers, selling various products from their vehicles. Since the area has been developed, all small shops have been cleared and instead a high-rise shopping mall was built. The new mall aims to sell all products previously sold in the small street shops in a more structured and organised manner. People have no possibility to look around and search for the lowest price or occasionally meet and greet on the streets. Street sellers are abandoned, and individuals are obliged to do

shopping at the new mall. The SPV considered the large amount of street shops to be a mess and too much informality on the streets.

Smart City areas shall among other things display tourist attractions and as the state government “feels ashamed by letting tourists see the vast amount of poor people selling produce”²⁰⁹, it seemed reasonable to clear streets. Abandoning poor social classes from districts results also in neighbourhoods aimed for higher social classes. “Land is once again used to benefit the formal sector, instead for development measures, addressing the poor ones”(ibid.). With the area-based development project at Pondy Bazaar, street sellers lost their jobs and essential income sources. The interviewee from Chennai states that “when it is assumed that something is a mess and people intervene in the belief of creating a better situation, sometimes the interventions display the mess and change a functioning system into a messy system” (ibid.). Chennai’s intended approach of clearing streets to appear neater and display a tourist attraction, impaired in a variety of ways cultural habits and economic existences. It can be concluded that the experts interviewed, critically evaluate the projects under India’s Smart City Mission. Smart implementations tend to benefit the formal sector, rather than following pro-poor developing elements, which should be equally important.

I. Approach to identify additional locally-relevant liveable life indicators (Detailed)

As highlighted, the identification of additional liveable life indicators within a defined area can be essential to optimise a locally-rooted LLI. This section goes into greater detail of the different components associated to the LLI optimisation process. In the following, a precise description of the prerequisites to collect additional indicators is given, such as who, how often, wherewith, and when indicators are identified; as well as prerequisites that form indicators, such as how they are defined, filtered out and with which method.

Indicator Identification

Starting point for the identification of further liveable life indicators to optimise a locally rooted LLI, is the formulation of a LLI based on the already pre-defined KPIs. For the execution of research in slums to optimise a LLI, slum upgrading experts, such as members belonging to NGOs or other supporting institutions are incorporated into the process. These members should be familiar with the defined slum area at stake and possess professional expertise regarding slum upgrading.

In a first step, the research team members specialised in the defined area and trained on the LLI framework plan and conduct local research. On the basis of focus group discussions or household surveys, which research team members guide, and local residents participate in, locally-rooted liveable life indicators are identified. Depending on the size of the defined area and number of slum neighbourhoods present, research takes place in

20-40% of the areas' slum neighbourhoods to identify liveable life indicators, covering at least 50% of each slum's households. For example (Figure 35 – fictive example): An area/city is composed of 5 slums, with each 36 households. For the local analysis, 1-2 slum neighbourhoods are selected in the area and in each slum at least 18 households are invited for focus group discussions or are individually interviewed (household surveys) on their interpretation of a liveable life.

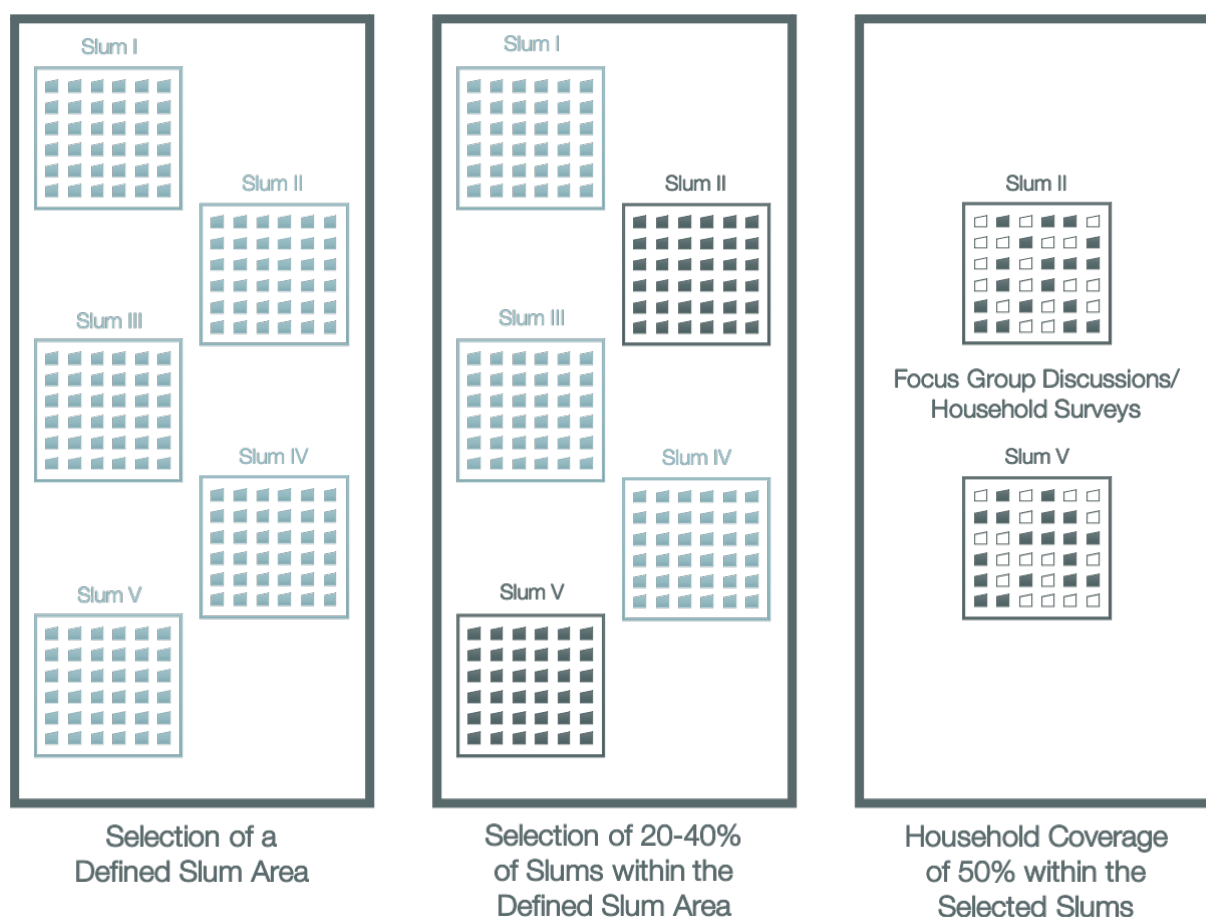


Figure 35: Slum Selection Process for the Identification of liveable life indicators (own representation).

The research team members are trained prior to the conduction of local research in slums. It is important that each research team member is aware of the four main-elements (safety/service/society/space) for which so far disregarded sub-elements (liveable life indicators) are aimed to be identified. The training also involves an example scenario to improve practical experiences of research team members. FGDs and household surveys are imitated, and members become acquainted with the type of questions to be asked and decisive statements to be noted.

As research identified, it is recommended to consider local NGOs for local research, which have already worked with or origin from the slum at stake. This ensures that topics are discussed in a familiar environment and issues can be openly addressed without being biased. Biased opinions can lead to discrepancies in statements. Each indicator, the

local slum community considers a liveable life indicator automatically implies a liveable life indicator that should be noted.

Subsequent to the research in the defined slum area, identified liveable life indicators are aggregated, sorted, and reduced. This results from a meeting (“Identification Meeting”), which research team members arrange with upgrading experts and governmental authorities. Aggregation implies the pooling of all indicators within the 10-20% of neighbourhoods in the selected area. Sorting implies the correct distribution of indicators among the four main-elements. Reduction implies the decrease in further considered indicators among the main-elements to the ones that display high relevance from a general perspective. Indicator relevance is based on frequency and determined importance within the neighbourhoods. With the final set of reduced indicators, a test run can be conducted for indicator refinement.

Indicator Refinement

Having identified, aggregated, sorted and reduced indicators to the essential ones, in a next step, a general adaption of indicators needs to be ensured. The general adaptation displays a test run of identified liveable life indicators for refinement. Indicator refinement increases the probability that only generally accepted and relevant indicators become part of the LLI in a last step. The research team members conducting fieldwork in the first step (“indicator identification”), will also be involved within the second step (“indicator refinement”). This is important, as during visits not only the answers to questions are noted, but also the body language and side conversations among and with slum residents recognized. It is difficult to replicate or transmit these insights to other specialists, as they might be a decisive factor for the selection of final indicators.

For the indicator test run, research takes place in 20% of the areas’ slum neighbourhoods (ref. Figure 35, 20% = 1 slum neighbourhood). At this point only individuals, which represent slum heads or display slum resident representatives are considered. This reduces complexity and keeps attention on a general agreement. The research team members invite slum heads/slum resident representatives to a meeting (“Specification Meeting”), where the set of reduced indicators are discussed. The meeting ends, once indicators have been selected and related to the four main-elements, which have so far been disregarded within the LLI. With the additional indicators, the LLI is finalised.

Indicator Implementation

With the formulation of a locally-rooted Liveable Life Index, a key figure is established from which liveable life indicators can be clearly identified to guide decision making in slum upgrading of a defined area. Research team members arrange an “Implementation Meeting” with the same set of upgrading experts and governmental authorities, as in the

“Identification Meeting”. It is aimed to facilitate LLI application at policy level for the guidance of upgrading measures. The final set of prioritised indicators are presented and for each indicator realisation projects planned. Planned projects continue with the participative nature, by focussing on an equal involvement in technical experts (e.g. engineers), social workers and local slum residents. Engineers’ technical expertise ensures a qualitative implementation of construction measures. Social workers’ advocacy ensures the representation of local interests and empowers residents during upgrading. Based on technical experts’ and social workers’ educational background, they are aware of supportive actions in various scenarios. Integrating local residents into planned procedures, allows for personal skill development and ownership of established solutions.

In a project life cycle, the index can serve both as a starting point and as an evaluation tool. The positioning of internal and external stakeholders can be crucial for the strategic choice of development measures. Conversely, the index serves as an information tool for the respective stakeholders. In general, the LLI has two objectives: It enables better management methods, and it is an integrative approach to slum upgrading.