Franz W. Gatzweiler   *Editor*

Urban Health and Wellbeing Programme

Policy Briefs: Volume 3

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Urban Health and Wellbeing

Systems Approaches

The Urban Health and Wellbeing: Systems Approaches series is based on a 10-year global interdisciplinary research program developed by International Council for Science (ICSU), and sponsored by the InterAcademy Partnership (IAP) and the United Nations University (UNU). It addresses up-to-date urban health issues from around the world and provides an appealing integrated urban development approach from a systems perspective. This series aims to propose a new conceptual framework for considering the multi-factorial and cross sectorial nature of both determinants and drivers of health and wellbeing in urban populations and takes a systems approach for improving the understanding of the interconnected nature of health in cities. The systems approach includes an engagement with urban communities in the process of creating and transferring knowledge. Further, it aims at generating knowledge and providing the evidence that is relevant to people and policy-makers for improving integrated decision making and governance for the health and wellbeing of urban dwellers. The methods applied, come from various epistemological domains in order to improve understanding of how the composition and functioning of urban environments impacts physical, mental and social heath and how inequalities can be reduced to improve the overall quality of urban life.

The systems approach is applied to science and society and defined by a deep investigation into disciplinary knowledge domains relevant for urban health and wellbeing, as well as an inter- and transdisciplinary dialogue and shared understanding of the issues between scientific communities, policy makers and societal stakeholders more broadly. It involves one or more of the following elements: 1) the development of new conceptual models that incorporate dynamic relations among variables which define urban health and wellbeing; 2) the use of systems tools, stimulation models and collaborative modelling methods; 3) the integration of various sources and types of data including spatial, visual, quantitative and qualitative data.

Like the first book, the coming books will all address the topic of urban health and wellbeing, specifically by taking a systems approach. The topics range across all urban sectors and can, for example, cover the following areas:

(1) transportation, urban planning and housing, urban water, energy and food, communication, resources and energy, urban food systems, public service provision, etc.
(2) the related health disorders in physical, social and mental health
(3) the methods and models used and the type of science applied to understand the complexity of urban health and wellbeing.

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Editor
Franz W. Gatzweiler
Institute of Urban Environment
Chinese Academy of Sciences
Xiamen, China

Preface

We live on an urban planet of increasing interconnectivity and complexity. Cities are the new melting pots of global development. Over half of the world's population lives in cities, and this number is increasing. More than two billion urban dwellers are expected to be added over the next three decades, a significant proportion of whom will be living in informal or slum settlements. Urban areas are extremely complex environments in which environmental, social, cultural and economic factors influence people's health and wellbeing and have an impact on planetary health. To cope with this complexity, understand it and find sustainable solutions, the Urban Health and Wellbeing (UHWB) programme has developed a systems approach and promotes systems thinking for improving health and wellbeing in and of cities worldwide.

The Urban Health and Wellbeing Programme (UHWB) is a global science programme and interdisciplinary body of the International Science Council (ISC, previously ICSU), supported by the International Society for Urban Health (ISUH), the InterAcademy Partnership (IAP). The overarching vision for UHWB are the people to develop aspired levels of wellbeing by living in healthy cities.

This book is a collection of policy briefs produced from research presented at the 16th Conference on Urban Health in Xiamen, China, November 4–8, 2019 under the theme "People Oriented Urbanisation: Transforming Cities for Health and wellbeing", co-organized by the Urban Health and Wellbeing (UHWB) programme of the International Science Council (ISC), and from research discussed at the 15th Annual Session of Global Forum on Human Settlements in Shenzhen, China, Oct 15–16, 2020 as well as presentations given at the Chinese Academy of Sciences & Technology (CAST) International Conference on "Digital economy and green development" held in November 2020.

The UHWB programme takes an interdisciplinary, cross-sectoral and systemic view on issues of health and wellbeing in cities which include the urban economy and finance systems, education, employment, mobility and transport, food, energy and water resources, access to public services, urban planning, public spaces and urban green, as well as social inclusion. Contributions to this book have been made by scientists from multidisciplinary research fields.

The policy briefs in this volume provide an interdisciplinary and cross-sectoral perspective on urban health and human wellbeing issues, primarily food security, urban infrastructure, public services, traffic and transportation, smart city building, urban health and safety, social cohesion sustainable development policies and urban planning. They present the background and context of an urban health issue, research findings and recommendations for policy/decision-makers and action-takers.

The book is intended for citizens and political decision-makers, who are interested in systems perspectives on urban health and wellbeing, examples of how to deal with the increasing complexity of cities and the accompanying environmental and social impacts of urbanization. Furthermore, it hopes to inspire decision-makers to facilitate finding solutions, in order to reach the goal of advancing global urban health and wellbeing. Many thanks to all the authors for their contributions and special thanks to Dr. Suraj Bhattarai for his help in reviewing the manuscript.

Xiamen, China   Franz W. Gatzweiler
June 2022   Yu Liu

Contents

A Smart Health Approach in Cities

Marianna Cavada and Rachel Cooper

1 Key Messages

Integrating health into a truly smart city agenda requires:

1. Assessing and measuring smart initiatives against a health goal;
2. Removing organization silos though a 'smart agenda' on health and SDGs;
3. Creating governance and community co-creation;
4. Focusing urban design on health and wellbeing

2 Introduction

Health is a priority in cities; especially large cities and following the COVID-19 outbreak more than any other time in history, we need to be smart in developing visions and making decisions for creating healthy living in cities.

This policy brief explores four policy considerations responding to the COVID-19 outbreak. This unprecedented condition has changed overnight the way we live. Contextual implications of the global pandemic are felt across all expressions of city living. Urban space has been compromised; the new normal has adopted health or health-related implications. The city context as we knew it, has changed and most likely will continue to change in the post-pandemic scenario.

Therefore, city decision-making needs to change, we require new modes of city leadership and personal behaviour response. This is critical for city living, people, and future urban health. Smartness, as described here offers a systematic approach in designing health policies for cities.

M. Cavada · R. Cooper (✉)
Lancaster University, Lancaster, UK
e-mail: r.cooper@lancaster.ac.uk

Today "Smartness" is at the core of city analysis as an aid to improving urban life, this includes using (but is not limited to) technological solutions. Research findings from the Liveable cities[1] study addressed smartness addressed what is *truly smart in cities.* By being *truly smart* we mean that decisions should provide benefits across all those who live, work, or visit cities, focused on how we can design solutions to become liveable (Cavada 2019; Cavada et al. 2019). The liveable cities research aimed to transform the engineering of cities for an alternative future and probably this has never been a more appropriate time to adopt, considering current challenges. This research explored smart cities, how they became smart by implementing initiatives that supported the smart vision (Cavada et al. 2017). Today, a smart initiative should address health and prioritize liveability according to the local context (Cavada et al. 2019). Urban and city decision-making when it comes to smartness ultimately must consider urban health.

This policy brief looks into the conceptualization of being truly smart and sets the foundations for assessing smart initiatives for overall health benefits in the urban realm. *Truly smart* approaches provide multiple benefits across the assessment of the societal, environmental, governance and economic benefits of any smart initiative in a truly smart city (Cavada 2019; Cavada et al. 2019).

3   A Truly Smart Agenda for Overall Health

City agendas often present themselves as the panacea for all urban challenges. Especially smart cities, these initiatives promised to improve our lives using digital solutions. However, cities can only be truly smart, if they deliver benefits to everyone (Cavada 2019). Research on truly smart cities showed that it is difficult to define smartness; however taking a wellbeing approach to smart solutions situates the agenda back on the liveability of cities. It is critical to look at all urban initiatives, goals and set of actions through the Societal, Sustainable, Economic and Governance wellbeing lenses, and to **ensure actions are linked to urban indicators**, which then provide evidence for city data across all dimensions of liveability. This approach, is part of the Smart Model Assessment Resilient Tool (SMART), an open, transparent quantifiable assessment for truly smart cities (Cavada 2019; Cavada et al. 2019). Furthermore, this evidence-based approach uses the technology and data to assist

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[1] "Liveable cities" is an Engineering and Physical Sciences Research Council (EPRSC) £6.3 million project which shows evidence of thinking about cities in a new way. It delivered an ambitious undertaking to create a holistic, integrated, truly multidisciplinary city analysis methodology. It provides evidence base scenarios to deliver a radical vision for health and wellbeing in cities (LC, 2019). Four UK Universities (University of Birmingham, University of Lancaster, UCL, University of Southampton) developed interdisciplinary research across five themes: City analysis, Wellbeing, Energy, Policy and Future Visions. The research outcomes are available in a long list of academic publications, conferences and peer review journals aimed at the academic environment. outcomes delivered in a series of a series of Little Books, city case studies, a suite of tools for city design engineering and reflective videos, evidence of our communication with extended collaborations.

decision-making by city leaders for smart cities. This system's approach means it is resilient; it can adapt to change. It also enables us to understand health holistically; meaning across the "*individual, societal, and planetary well-being*". This is a breakthrough which we all learned during the current pandemic, i.e. the relationship between individual health, public health and climate change.

To embed health in a *Truly Smart* city agenda it should

4 Assess and Measure Smart Initiatives Against a Health Goal

When a city initiative is proposed, consider how does it perform to the Goal of being and staying healthy? Actions can be measured using international health agendas and health key performance indicators (KPIs) to provide assessment regardless of sectoral and national silos.

A truly smart agenda must ensure action towards a city-goal related to global indicators to ensure benefits reach countries across borders. For example, the WHO indicates for the 20 years following 2030 deaths will be linked to climate change will reach 250,000 these linked to climate change.[2] According to the Climate Change Impact in the US are "Air pollution, Allergens, Wildfires, and Temperature extremes".[3] UN[4] notes increasing health risk due to climate change and this will expose how vulnerable the urban environment is which of course, puts people at great health risks both physical and mental impact. Response to mitigate the impact: WHO response: Partnerships, Awareness, Scientific Evidence, Support of Implementation of the public health response.[5] The Intergovernmental Panel on Climate Change[6] (IPCC) reached the international consensus on a scientific approach linking overall health to climate change. An overarching political agenda for health needs to embrace this. When a smart agenda implements initiatives, we are in a position to measure the impact on liveability. We are able to prioritize and adjust these initiatives with city leaders and make sure proposed solutions not only respond to the digital offerings but provide support for the overarching wellbeing. A similar practice is adopted to the health co-benefits developed by the UN[7] part of their assessment toolkit. Low-carbon practices offer health benefits[8] and input according to the Sustainable Development Goals[9] (SDGs) Although it is not explicitly shown in smart cities (Cavada et al. 2016),

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[2] https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health.

[3] https://nca2014.globalchange.gov/report/sectors/human-health.

[4] https://unfccc.int/news/climate-change-impacts-human-health.

[5] https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health.

[6] https://www.who.int/globalchange/summary/en/index2.html.

[7] https://www.who.int/globalchange/resources/toolkit/en/.

[8] https://ccacoalition.org/en/resources/climate-smart-healthcare-low-carbon-and-resilience-strategies-health-sector.

[9] https://www.un.org/sustainabledevelopment/sustainable-development-goals/.

however, the UK National Health Service (NHS) notes that digitalization is a plausible scenario for the low-carbon future health care—the other three being efficiency, redefining progress and environmental economy (NHS 2009).

5 Remove Organization Silos Though a "Smart Agenda" on Health and SDGs

While large organizations strive for international agreement on the personal health benefits of a healthy environment, the problem probably lies in our approach. It means agreements are met within some countries, while regions might act differently, and cities often follow their own agenda. As previously noted, a smart initiative needs to provide benefits also across the citizenry scale (Cavada et al. 2017). National and international organizations also need to overcome the silo approach and cooperate across all urban agendas for greater health benefit. A way of doing this is to embrace the Sustainable Development Goals[10] (SDGs) and to examine health as risk and benefit and how it is comprised in each of the 17 SGDs.

6 Create Governance and Community Co-creation for Truly Smart Healthy Initiatives

Prioritize health benefits in smart initiatives according to context. For this, good leadership is important. A truly smart city sustains its positive impacts of initiatives beyond political agendas; for example, a change in mayoral leadership will not affect the planned liveability benefits going forward (Cavada 2019). The current pandemic has exhibited community efforts and individual responses for smaller scale initiatives with a positive benefit to communities. These initiatives need to be recognized locally and empowered as the means of governing wider challenges in the urban realm. Post-COVID-19 governance lessons learned need to be formulated into policy.

7 Focus Urban Design on Health and Wellbeing

Truly smart cities are the ones taking ownership of their challenges and recognition of their achievements; this is done by exploration and assessment of their initiatives (Cavada et al. 2017). For example, since the pandemic, cities (and by cities, we mean their people) have increased the use of cycling as a mobility method, resulting in minimizing air pollution, accidents and overall improvement of city life, indeed Paris,

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[10] https://www.un.org/sustainabledevelopment/sustainable-development-goals/.

has continued this practice after relaxing the urban restrictions from COVID-19.[11] Similar practices such as local delivery systems, use of communication of technology and working from home practices have been formulated to change behaviours for the benefit of public health. These responses need to be evaluated post-pandemic, this enforced experimentation can be assessed to identify and support positive change in policy, and subsequently, the way we design policy for urban areas (Cooper 2019) for future health and wellbeing.

A "truly smart" city uses all the technology and data available to it, while it evaluates actions and initiatives at a governance and community level, it bridges organizational silos to make the best urban decisions that will make a place liveable for individual and planetary health and wellbeing.

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[11] https://www.forbes.com/sites/carltonreid/2020/04/22/paris-to-create-650-kilometers-of-pop-up-corona-cycleways-for-post-lockdown-travel/.

Why Health in Cities Matter: A Whole Systems Approach in Practice

Rowena Estwick

1 Key Messages

Cities are drivers of health. The COVID-19 pandemic has highlighted the disproportionate impact poor health has on disadvantaged communities within cities. Although a whole systems approach is the most effective way of reducing health inequalities in urban areas, it is all too often approached as a conceptual exercise, rather than a series of practical, action-orientated steps, supported by data and focused on impact.

Understanding the root causes of inequalities and how multiple disadvantages influence health outcomes is essential in redressing the balance between high- and low-income communities. This means starting with neighbourhoods facing worse health outcomes and focusing on reducing the gap so that they are in line with those from wealthier households.

Collaboration across all sectors—e.g. housing, education, health and those disproportionately affected by poor health—is needed to achieve sustainable health improvements in cities. Strong political leadership and commitment to address the disparities between and within differing populations, will ensure long-lasting health improvements for future generations.

Guy's and St Thomas' Charity is an independent, urban health foundation. We take a systematic approach to tackling health inequalities, focusing on Lambeth and Southwark, two areas in inner London, UK. These areas are characterized by densely populated built environments, high levels of deprivation and income inequality and cultural and ethnically diverse communities. Like many other neighbourhoods in cities across the developed world, they face similar challenges of health inequalities. These similarities allow us to implement potential solutions to urban health problems here and share our learning with similar cities and places internationally.

R. Estwick (✉)
Guy's and St Thomas' Charity, London, UK
e-mail: Rowena.estwick@gsttcharity.org.uk

We believe that a whole systems approach is the most effective way of achieving health equity in cities. In practice this means we focus on:

- 'Place' to understand the context in which poor health outcomes can arise in urban areas like ours.
- A small number of health issues that are locally and globally relevant: childhood obesity, health impacts of air pollution, adolescent mental health and multiple chronic conditions.
- Working in partnership with public bodies, corporate and private business, civil society and community organizations to deliver practical solutions in a defined geography.

This approach allows us to layer initiatives in a specific place to test and learn effective solutions to achieving health equity in cities.

2   Case Study: A Whole System Approach in Practice

In our programme on childhood obesity, we're taking a multi-layered, cross-sectoral approach to improve the food environments of one of our most disadvantaged neighbourhoods. This means using data to identify how and where we work, and developing partnerships that can help us create impact at each level, for example:

Neighbourhood: Our hyper-local work involves us growing partnerships and layering different initiatives within a small geography, sometimes covering a handful of streets. It means building a deep understanding of the communities living in that area and tailoring initiatives to address the need.

Borough: For a new idea to be viable and well evidenced, it may need to happen at a larger scale than a neighbourhood, therefore, we look at practice and policy-driven by statutory bodies and others at boroughs level. With the Consumer Goods Forums, we're testing ways to move consumers towards healthier shopping baskets by working with retailers responsible for over 200 grocery stores across our boroughs.

City: Responsibility for some environments often sits with the city's authority, for our boroughs, it's the Greater London Authority (GLA). We partnered with the GLA to help start London's Child Obesity Taskforce—an effort to ensure the city and its spaces support children to have a healthy weight.

National: Progress on local health may only be possible through influencing policy coming from central government or the NHS. By collaborating with the UK's largest medical charities and the Royal College of General Practitioners, we're contributing to national decision-making which impacts health care of people in our boroughs.

International: Some influences on our health are from international systems or organizations, understanding these can help us to create local impact. We partnered with charity ShareAction, encouraging investors to put pressure on large multinational

food and drink companies who could change practices that contribute to childhood obesity.

Our approach engages with policy solutions beyond health care, government institutions and beyond national boundaries. Working in collaboration with private, public, civil sectors and communities, we layer multiple, modest but meaningful interventions to identify opportunities to influence policy and practice. This requires a coordinated, collaborative, and concentric approach, starting with neighbourhoods who are disproportionately affected by poor health and focusing on closing the gap in health outcomes, so they are in line with wealthier ones.

3 Why Cities Matter

Cities sit at the centre of modern life. According to the UN, by 2070, two-thirds of the world's population will be living in cities. In the UK alone, cities take up 9% of the landmass but contribute over 50% of the UK's population, jobs and high-level skills. It is the focus on the positive attributes of cities, that mask the inequalities that exist within it. Through their ability to generate wealth and opportunity, cities shape our health. This has never been more evident than during the COVID-19 pandemic, which has highlighted the undeniable health impacts of structural and racial inequalities.

For people facing disadvantages, their "health journey" from childhood to adulthood begins with the place and the context of their lives. A person's social context—their education, housing, employment and ability to cope with life events such as bereavement, debt, isolation—influences the likelihood and severity of their health outcomes. Poor health at a young age will likely have a negative impact on the quality of life for many years ahead. Poor health in working-age adults has a wider societal impact, not least on the health of a country's economy, as this pandemic has demonstrated.

Achieving health equity in the complex environments of cities and urban areas is not easy, it is not impossible either. Complexity should not be a barrier to addressing the challenge, what is important is getting started. The COVID-19 pandemic has shown us that the risks of starting somewhere, however, small, are far outweighed by the risks of doing nothing at all.

4 Implications for Policy

With learning from our programmes, we set out key considerations for policymakers to take away from our work:

Focus on preventing poor health in the first instance:

- Support local bodies to tailor interventions that support the needs of the community they serve. The emphasis of effort should be on practical coordinated programmes, moving away from targeting specific individuals to initiatives that target whole populations within deprived areas. For example, our work on childhood obesity focuses on the three environments where children spend most of their time: their homes, education settings and streets (including commercial and recreation settings).
- The context of the place in which people live, especially those on low incomes, has a huge impact on health. Socio-economic influences layered on top of a neighbourhood impacted by the removal of public services and years of disinvestment contribute to poor health outcomes. Therefore, review all current and new policy, e.g. planning, housing, social care, education—through the lens of health equity, or risk exacerbating existing inequalities.

    Rebalance environments to support health.

- Address the physical environment so that the health-promoting features of the more deprived environments cumulate to outweigh those that are health-destroying.
- The aim is to improve the availability of affordable healthy food options that makes every home, school, high street and green space an area that encourages nutritious diets and everyday activity. This requires the engagement of the owners of those spaces to buy into the business case for systemic changes and support in driving and financing the work needed. For example:

    - Address the commercial determinants—engage with supermarkets on regulatory risks of unhealthy food including advertising and promotion of unhealthy convenience food, especially to children and young people.
    - Engage with housing associations on the costs of poor health. Investments in suitable affordable and social housing for families can maintain social networks and avoid disenfranchisement. The positive impacts that family connections and social networks have on both physical and mental health support a family's ability to manage personal finances and reduce rent arrears.
    - Environments that support physical health, psychological wellbeing and cultural and social connections support the growth of thriving and productive people. Consider engaging with insurers on the economic benefit of healthy workforces.

Focus on the communities disproportionally affected by poor health outcomes and design interventions for maximum impact.

- Aggregate different data types:"big" data (quantitative data); lived experience (qualitative data); issue-specific insights (evidential data) to understand and drive targeted interventions.
- Ensure interventions are universal across the population but more intense for those from more disadvantaged communities.

- Reduce focus on education and make uptake and participation of any intervention easy. Purely educational interventions are less likely to be effective and have the potential to widen health inequalities.
- Invest in solutions with realistic expectations of the amount of spare time and cognitive effort people may have to engage, particularly amongst people living in deprived areas, for whom scarcity will have a disproportionate impact.

5   Conclusion

Our insights have shown that the context in which people live their lives matters. The COVID-19 pandemic has highlighted the disproportionate impact poor health has on disadvantaged communities and reinforced the fundamental underlying factors that drive poor health. Although cities are the centres of prosperity, culture and opportunity, right now cities across the world hold a disproportionate share of deaths due to COVID-19. This pandemic has exposed the fault lines of our unequal societies and our cities are at their epicentre. It has never been more important to take a collective effort to redress the balance of these systemic inequalities. This can only be achieved through future policy addressing the root causes of inequalities and understanding how multiple disadvantages as well as race, class and gender influence health outcomes.

There is no doubt that we live in an interconnected world, and this pandemic has fast-tracked the need for an international conversation on health, equity and the power of cities to drive change. Tackling this issue takes time and sustaining a collective effort will be hard without strong political leadership and commitment to address the disparities between and within differing populations. By better understanding inequalities and their impact across the life course, policymakers, leaders and decision-makers will be able to clearly define what needs to change, in what type of place, to advantage which group of people, for the benefit of our local and global community.

Co-creating FAIR Data for Healthy and Resilient Urban Development

Jieling Liu, Franz Gatzweiler, Simon Hodson, Stephen Passmore, Ibtihal El-Bastawissi, Mamello Thinyane, and Wang Lan

1 Key Messages

1. COVID-19 has underlined the importance and urgency to accelerate collective learning within and across cities to improve data- and science-driven policymaking and actions.
2. Urban intelligence for health includes the capabilities of policymakers, practitioners, planners, scholars and communities in cities to collectively learn and respond to health challenges with data.
3. Urban intelligence is created through continuous improvements of the data life cycles from data to knowledge and further to action.
4. Transformative participation of stakeholders from across sectors and domains should be encouraged to facilitate mutual learning, empowerment, trust-building and synergy fostering.

J. Liu (✉)
Institute of Social Sciences, University of Lisbon, Lisbon, Portugal
e-mail: jielingliu@campus.ul.pt

F. Gatzweiler
Urban Health and Wellbeing Programme, International Science Council, Xiamen, China

S. Hodson
CODATA, International Science Council, Paris, France

S. Passmore
Resilience Brokers, London, UK

I. El-Bastawissi
Beirut Arab University, Beirut, Lebanon

M. Thinyane
United Nations University (UNU) Institute Macau, Macau, China

W. Lan
Tongji University, Shanghai, China

5. Technology designs need to incorporate data justice principles for mitigating marginalization and proactively facilitating citizen engagement and participation in intelligence infrastructures, for example, through urban labs and collaborative systems modelling.
6. Policies and actions need to be assessed, and feedback on the data cycle needs to be monitored, to foster an effective learning process and truly improve urban intelligence over time.

2 Policy Context

Cities across the world are facing complex environmental, demographic and socio-economic changes and have been additionally burdened with climatic impacts. These issues are even more evident in developing countries as the speed of their urban growth often outpaces adequate planning. Knowledge and awareness of health have increased significantly in the last half a century, yet the pace and profundity of change in urban environments have been impeding continuous health improvement. In many cases, they have been jeopardizing existing human and environmental health conditions. COVID-19 and climate change provide compelling examples.

With increasing populations and changing environments, the risk landscapes are also changing towards more complex and interconnected systems, referred to by risk experts as "systemic risks" (IRGC 2018). Current institutional arrangements are not adequate to manage systemic risks as they are highly complex, uncertain and with spillover effects on the entire social-ecological systems. Similarly, current forms of data organization from science to policymaking to society are also inadequate; in addition to being unable to adapt fast enough to cope with the rapidly changing environments, they have been piecemeal, exclusive and siloed. Although city governments have been taking various measures to mitigate the impact of the COVID-19 pandemic, those interventions often came too late, were implemented too unassertive or only targeted downstream consequences of the impact of the virus, e.g. food provisions for the poorest and shelters for the homeless in Athens.[1]

Behavioural change across levels and sectors is urgently needed to improve the way urban societies have made use of data for decision-making, including the speed with which data are generated, how data is collected, how data is analysed and managed and how data is transformed into valuable insights to serve decision- and policymaking and implementation. COVID-19 has shown how the entire world has become an extended peer community—where all that have a stake should have a voice. The tendency seems to be that we are living with increasing systemic risks and we urgently need more systemic and effective models of governance to cope with them. What can these models of governance be? How do we organize data more wisely to inform these desired models of governance? Which one is more important,

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[1] https://www.vitalstrategies.org/covid-19-and-beyond-cities-on-the-front-lines-of-a-healthier-future/

the technical operability of data, or the ethics of it? How do we achieve both? How do we keep all communities in the loop in the urban development infrastructure?

The Chinese Academy of Sciences and Technology (CAST) International Conference on "Digital economy and green development" held in November 2020 provided a timely stage to explore some of these questions. The Conference was organized under the context of China's upcoming season of the 14th Five-Year socio-economic macrolevel planning, in which national leaders lay out their vision for a healthier and greener development for the post-COVID era. In addition to lessons learnt from coping with COVID-19, the country's quest for a healthier and greener development is rooted in the "Two Mountains" theory proposed by the current Chinese president Xi Jinping, which states that "lucid waters and lush mountains are invaluable assets". It is also framed within the national sustainable development framework "Ecological Civilization." Furthermore, the Conference also aligns the vision for a healthier and greener development with the country's newest climate commitment to reach zero carbon emissions by 2060, which President Xi Jinping announced at the recent United Nations General Assembly (UNGA). At this Conference, five urban and data experts were invited by the International Science Council's global science programme on Urban Health and Wellbeing: a Systems Approach" for a pre-recorded panel discussion on "Urban Intelligence for Healthy Urban Development".

3 Insights from the CAST International Conference "Digital Economy and Green Development"

Dr. Simon Hodson, the director of the CODATA program of the International Science Council based in Paris, addressed the cross-domain challenges of data and proposed the FAIR data principles (Wilkinson et al. 2016). Dr. Stephen Passmore, CEO of Resilience Brokers, a social enterprise based in London, shared lessons learnt from integrated systems modelling for co-creating urban intelligence for healthy and resilient cities. Dr. Ibtihal El-Bastawissi, dean of the Faculty of Architecture Design and Built Environment of Beirut Arab University (BAU), shared her experiences creating and running the BAU Urban Lab for urban innovation. She endorsed urban labs as a new collaborative knowledge generation approach. Dr. Mamello Thinyane advised that urban intelligence for a healthy and resilient city needs to go beyond the technical and data-centric considerations to embed data justice principles in urban data systems and to be proactively inclusive and participatory. Dr. Lan Wang, College of Architecture and Urban Planning and Director of the Healthy City Wlan Lab of Tongji University, shared recent studies by her team on healthy city planning based on multiple data sets.

4 Cities Need to Be Considered as Complex Social-Ecological Systems and Insights Need to Be Created Cross-Domain

Research needs to work across disciplines to understand cities as complex social-ecological systems to support better urban policies for tackling systemic risks such as global pandemics and climate change. One of the significant cross-domain challenges is that data definition and classification varies in different domains and little time or institutional effort has been invested in helping different disciplines to communicate, share and cross-verify data. The challenge is enhanced by the rapidly growing demand for more data to serve decision-making at all levels and sectors within a complex urban system context (see Fig. 1). A conservative estimate is that missing the opportunity could cost the European economy 10.2 billion euros every year (European Commission 2018) (Fig. 2).

However, the challenge goes in hand with an enormous opportunity for progress thanks to the rapid advancement in digitalization. To begin with, Open Science and the FAIR (Findable, Accessible, Interoperable, Reusable) data principles can facilitate cross-domain data generation. Under these principles, consensus and technical solutions must be sorted out first to ensure data interoperability, including but not
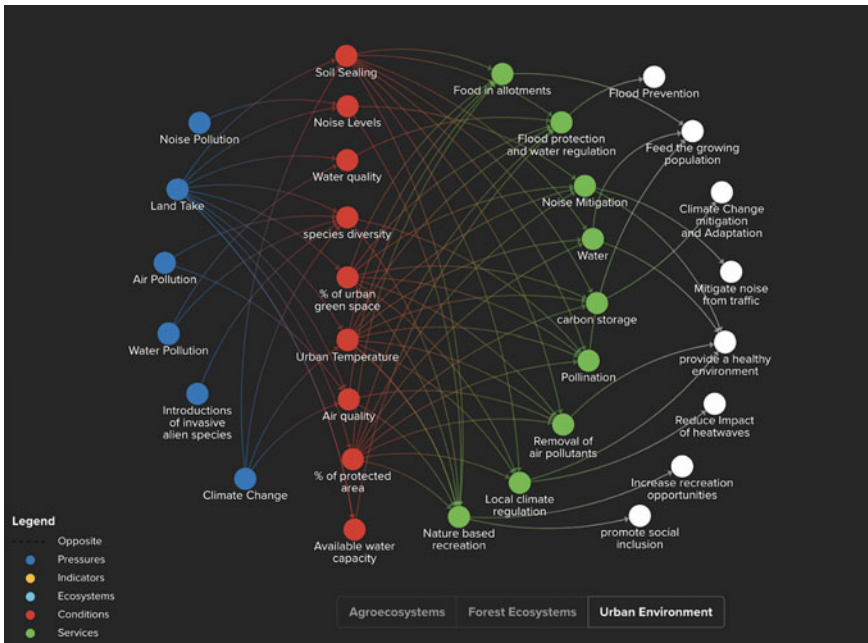
Fig. 1 Synthesis of the links between pressures, condition and ecosystem services in urban ecosystems. Adapted from EU's Mapping and Assessment of Ecosystems and their Services and visualized by Eirini Malliaraki (2020)

Fig. 2 A snapshot of an urban social-ecological system. *Photo* © Eirini Malliaraki ear (European Commission 2018).

limited to terminologies, ontologies, metadata and machine learning. The consensus and technical solutions could be achieved through mobilizing domains and breaking down silos, e.g. working with unions, associations and other domain organizations. Besides, cross-domain case studies can help accelerate the breaking down of silos and the hierarchy of scientific disciplines. Furthermore, the goal of addressing the cross-domain challenge should be to establish urban Data-Knowledge-Action Systems (Gatzweiler et al. 2020; see Fig. 3). In such systems, the entire lifecycle of data—
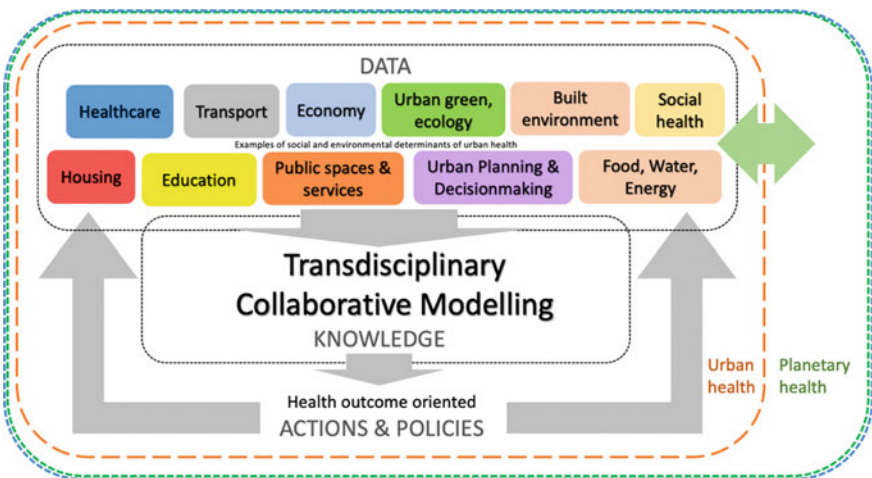
Fig. 3 Collaborative systems modelling catalyse data-knowledge-action systems

from which domains data is gathered, cross-domain synergies, how data is analysed and managed, how it informs policies and actions and how the outcome feeds back to the sectors across levels—is considered.

Establishing a functional DAKAS can be understood as establishing more systemic and effective models of governance. Depending on historical, cultural and political contexts, it could be one of the following forms or in combination: participatory, distributed, coordinated, networked or polycentric. While different countries/regions might choose various forms or combinations of governance depending on their preferences, effective governance in today's complex urban systems necessitate functional feedback and learning mechanisms. Such mechanisms are sometimes absent or not working, in most of the cases due to the following reasons:

(1)   lack of FAIR data,
(2)   lack of timely translation of data into knowledge and action and
(3)   neglect of data justice considerations in the data systems.

Functional DAKASs are capable of improving functional feedback and learning mechanisms and guarantee both high technical operability as well as high ethics of data. In addition, DAKAS can create reflexive institutions—institutions, actors or processes which have the capacity to change in the light of reflection on their own performance. High technical operability of data can ensure the scientific rigour of the policies, and high ethics of data can promote the willingness of all sectors and actors to participate. Together, they can improve urban intelligence.

## 5   Cross-Domain Insights Need Multiple Stakeholders Engaged, Especially Through Inclusive and Participatory Approaches

Urban intelligence comes from cross-domain aggregation of data and information, but it is only meaningful if multiple stakeholders are involved. Especially proactive inclusion of the "public concerned" is crucial for urban intelligence.[2] Lessons learnt from both the Resilience Brokers' collaborative systems modelling practices in city regions across the world, and the Beirut Arab University's Urban Lab show that the importance of a collaborative approach involving multiple stakeholders for collecting and analysing data and translating it into actionable policies with the support of data scientists, can never be overemphasized.

Since urban systems are complex, without collaborative systems modelling, policymakers have no way to "properly" understand the systemic consequences of their decision-making. In order to make decision-making more inclusive and comprehensive, we need to understand complexity better and incorporate it into policies.

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[2] Per the Aarhus Convention, the notion of the "public concerned" refers to "the public affected or likely to be affected by, or having an interest in, the decision-making".

Fig. 4 Components of a
collaborative laboratory.
Source Resilience Brokers
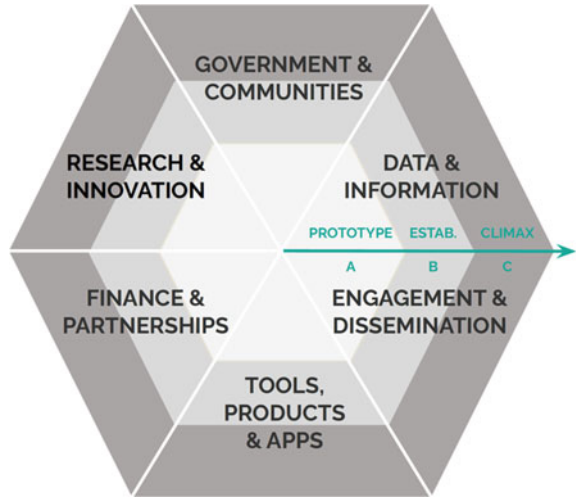
Otherwise, we are systematically leaving behind the same issues perpetuating socio-economic deprivation by design. In a complex context with high uncertainties, policymaking without complex systems modelling is like shooting in the dark or experimenting with population health (Fig. 4).

Marginalization in urban data systems not only has ramifications for the marginalized individuals but also for the urban collective. The ongoing COVID pandemic illustrates the grave consequences of and impacts on individuals who fail to get "counted" and tested, the inadvertent cascading community infections and the resulting lack of awareness that hampers effective decision-making. To make cities healthier and more resilient, it is imperative to address forms of marginalization and exclusion within the urban Data-Action-Knowledge systems—across the full data value chain. Proactively engaging marginalized stakeholders and the "public concerned" leverages their diverse insights and lived experiences, ensures that people are represented fairly in data and that their primary concerns, such as, with regards to access, ownership, control and privacy are respected in data systems.

6 Methodological Diversity for Better Data Interoperability[3] and Institutional Pioneers for Collaboration

The experiences of pioneering institutions, such as the Resilience Brokers from London, the Urban Lab from Beirut Arab University, the CODATA Program of the International Science Council from Paris, the Urban Health and Wellbeing—a

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[3] Interoperability—the ability of data or tools from non-cooperating resources to integrate or work together with minimal effort.

Systems Approach (UHWB) Programme, as well as the Healthy City Wlan Lab of Tongji University from Shanghai, have all highlighted the importance of having a diverse set of methodologies, including platforms and tools, for enhancing data communication, sharing and thereby data operability. Their experiences show that the results from a greater methodological diversity can support building more comprehensive policy and investment scenarios, and thereby support better urban health policies and actions. These pioneering institutions have not only played their roles as academic institutions or social enterprises but also gathered precious experiences in inclusive, transdisciplinary collaborative. These trailblazer institutions recommend public or private sectors, organizations and communities to collaborate for generating urban intelligence.

7   Conclusion and Recommendations

Lessons from dealing with health emergencies like COVID-19 and global existential crises like climate change tell us that we need to learn and act faster and earlier. Apart from direct emergency responses to reduce transmission rates, many cities took various measures to mitigate the negative consequences of the pandemic, like food provisions for the poor, shelter for the homeless or direct payments for small businesses. Those measures were taken with the best intentions but also with a lack of knowledge of their systemic effects and possible alternatives for creating longer lasting, possible co-benefit creating systemic change. To create such knowledge, collaborative systems modelling platforms need to be in place.

In order to co-create urban intelligence for post-COVID-19 healthy and resilient cities:

- Stakeholders across sectors, especially communities that are in socio-economically vulnerable positions, will need to be engaged to build trust and share data and knowledge among each other.
- FAIR data principles need to be embedded in technology designs that not only could mitigate socio-economic deprivation and exclusion in data systems but also proactively facilitate citizen engagement and participation in intelligence infrastructures.
- Collaborative systems modelling needs to be facilitated in urban labs and other suitable platforms.

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Global Assessments of Sexual and Reproductive Health Needs of Rural-Urban Migrants in an Urbanizing World

Leiwen Jiang and Timothy Thomas

1 Key Messages

- Rural to urban migration is increasing rapidly around the world, with wide regional variations.
- The pace of this migration varies under different Shared Socioeconomic Pathways (SSPs), which are scenarios designed to address climate change mitigation and adaptation challenges under the auspices of the Intergovernmental Panel on Climate Change.
- The majority of rural-urban migrants are girls and young women whose needs for sexual and reproductive health services are higher than the general population on average, but their knowledge of and access to comprehensive sexual and reproductive health is limited.
- Current policies supporting effective urban planning and urban management programmes do not adequately meet the sexual and reproductive health needs of rural-urban migrants.
- Quantitative assessments of trends in rural-urban migration flows and the demographic profiles of migrants are essential for effective policymaking and programme development.
- Future urbanization and population projections indicate that the next decades portend large flows of rural-urban migrants, representing a major challenge for cities to meet their SRH needs.

L. Jiang (✉)
Population Council's Poverty, Gender, and Youth Program, New York, NY, USA
e-mail: ljiang@popcouncil.org

Asian Demographic Research Institute (ADRI), Shanghai University, Shanghai, China

T. Thomas
Policy Analysis and Advocacy, Communications, and Strategic Planning for a Range of Global
Public Health and Development Initiatives, Shanghai, China

Sustainable Development Goal 3.7 is less likely to be achieved unless the sexual and reproductive health needs of rural-urban migrants are met.

We are living in a continuously urbanizing world (UN 2019a; Jiang and O'Neill 2017), and rural-urban migration is one of the key driving forces of urbanization. Studies show that rural-urban migrants are unable to access comprehensive sexual and reproductive health services. Compared to urban non-migrants, they are less knowledgeable of and useless sexual and reproductive health (SRH) services; are more likely to engage in risky sexual behaviour. Although urban migrants may have better access to modern contraceptives than rural non-migrants, a large proportion of migrants become slum dwellers in peri-urban areas where migrants lack social protection and information on rights and entitlements; and they are exposed to a range of social discriminations. Moreover, rural migrants are rarely covered by health insurance, which means greater out-of-pocket expenses thus higher costs of health care.

To achieve UN (2019b) Sustainable Development Goal 3.7, ("…ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes"), national governments and multi-national institutions must provide rural-urban migrants access to sexual and reproductive health services by fully integrating them into national development strategies and programmes (WHO 2016).

To meet the unmet needs of rural-urban migrants for SRH services, policy analysts and decision-makers require not only the qualitative data that describe vulnerability and risk factors but also quantitative assessments of the trends in rural-urban migration flows and the demographic profiles of migrants over the next decades. Statistical analyses indicate that most migrants in both India and Vietnam are of childbearing age; young women and girls (Vu et al. 2016) (Fig. 1) have the highest unmet need for sexual and reproductive health services. In fact, the age and gender profiles of rural-urban migrants are quite the same in almost all developing and developed countries, as are their SRH needs. The world cannot achieve SDG 3.7 unless the unmet needs of these migrants are met.

This brief aims to project the number of rural-urban migrants and their implied needs for SRH services under different urbanization scenarios. In our analysis, we use the plausible urbanization scenarios (Jiang and O'Neill 2017) under the Shared Socioeconomic Pathways (SSPs)—a widely used scenario framework for addressing societal and environmental issues (Kriegler et al. 2012). The SSP scenarios are designed to address climate change mitigation and adaptation challenges. Under each SSP, there are quantitative assumptions about future changes in population, urbanization, economic growth and education. For instance, SSP3 represents a world of high population growth but low urbanization; SSP5 is a scenario of low population growth but high urbanization; SSP2 is the middle-of-the-road scenario with both medium population growth and medium urbanization (Jiang 2014).

These SSP population projections (KC and Lutz 2017) and urbanization projections (Jiang and O'Neill 2017) are produced for each country and for the whole world. Figure 2 (left panel) shows the SSP urbanization projection results for selected
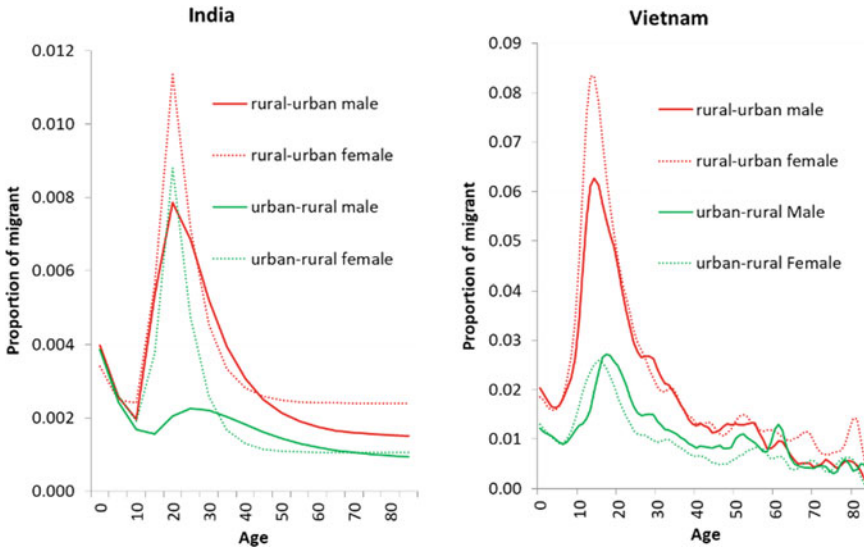
Fig. 1 Age and gender profiles of rural-urban migrants in India (year 2001) and Vietnam (year 2000)
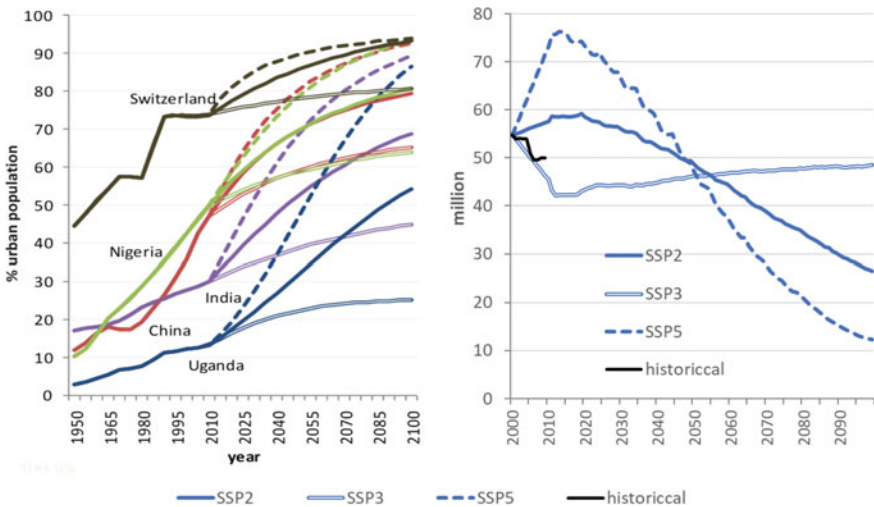
Fig. 2 Urbanization projections (left panel) under SSP2 (solid lines), SSP3 (hollow lines) and SSP5 (dashed lines) for selected countries, and the implied changes in rural-to-urban migration under three SSP scenarios (right panel) between 2000 and 2100

countries. Urbanization levels vary greatly across countries, but are projected to converge by the end of the century to about 90% urban under SSP5 (the fast urbanization scenario), or remain as divergent as today under SSP3 (the slow urbanization scenario). Using a multiregional population and urbanization model (Jiang and O'Neill 2018), we derive the implied quantity of rural-urban migrants under the population and urbanization projection scenarios for 31 global regions.

The projections reveal that under SSP5, the implied number of annual rural-urban migrants globally will increase up to as high as 80 million around 2020 (right panel); under SSP2 and SSP3, the figures will be 60 million and 40 million, respectively. The number of rural-urban migrants represent 1.3–2.2% of the total urban population, and will reduce under SSP5 and SSP2 after 2020, but will increase under the SSP3 scenario.

Moreover, these projections reveal large regional variations. Currently, industrialized countries, China and Latin America account for half of all global rural-urban migration, which is projected to rapidly decline under SSP2. In contrast, rural-urban migration in Africa and South Asia will increase considerably in the next decades under the same scenario. Under SSP5, the trends are similar, but the changes are much more rapid. Under SSP3, the smaller number of migrants currently will increase in the future. A closer look at the results in India (left panel, Fig. 3) and East Africa (right panel) shows the number of rural-urban migrants in both regions will continue to grow for another 20–30 years under SSP5 and SSP2, and under SSP3 the numbers will grow over the century. And the changes are more substantial in East Africa than in India.
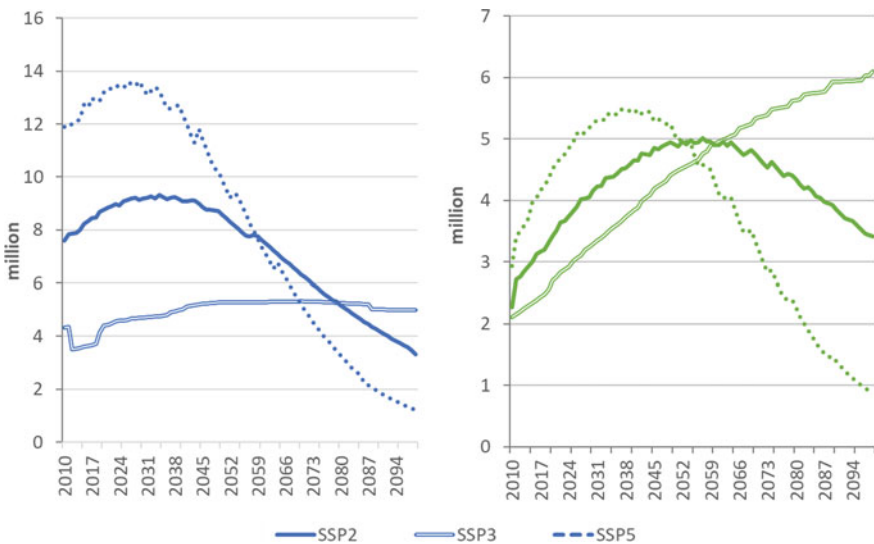
Fig. 3 Implied changes in rural-urban migration under different urbanization scenarios in year 2010-2100 for India (left panel) and the East Africa (right panel)

2 Conclusions

Our conclusion is that globally there will be 40–80 million rural-urban migrants annually under different urbanization scenarios, which will gradually converge to 50 million by the middle of the century, and account for 1% of urban total population. The number of rural-urban migrants vary substantially across global regions, but they are mostly concentrated in Africa and Asia. The next decades portend large flows of rural-to-urban migrants, representing a major challenge for meeting their needs for comprehensive sexual and reproductive health services.

Although there is no empirical evidence showing the exact costs for meeting the SRH needs of rural-urban migrants, a study by Guttmacher Institute (2017) suggests that an investment of $8.56 per year is needed for a woman of childbearing age in a developing country to meet her needs of modern contraception and maternal/newborn care. Assuming a female rural-urban migrant has the same costs as any woman on average, cities must invest an additional $170–$350 million to ensure that female rural migrants receive essential sexual and reproductive health services. This is actually an underestimate because female migrants in urban areas constitute the most sexually active and highest fertility rate age groups than the general female population. A more complete assessment of the SRH needs of female rural-urban migrants requires data on service delivery costs for female migrants by age. Empirical evidence on the SRH needs of both male migrants and the male population in general does not exist, which impedes estimates of the costs for meeting the SRH needs of male rural-urban migrants.

The policy challenges that these projections suggest are significant and largely they have not been addressed. Urbanization policies and programmes must specifically address the sexual and reproductive health needs that these migrants require. Financing estimates that include both the indirect and direct costs for expanding high-quality and comprehensive sexual and reproductive health services to meet these needs need to be calculated and integrated into urban planning and management policies at all levels. Such policies and the programmes they mandate are essential for achieving SDG 3.7 by 2030.

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Sound Alliance: A Participatory Management and Systems Approach to Co-Create Healthy Urban Soundscapes and Procure Sustainable Development Goals and the New Urban Agenda

Georgina Echániz-Pellicer and Alfonso Govela

1 Key Messages

1. Noise pollution is an underestimated threat that can cause hearing loss, cardiovascular problems, cognitive impairment, stress and depression.
2. Participatory management, coupled with the use of technology, under a systems approach can lead to the co-creation of innovative solutions to reduce urban noise and integrate valuable sound into healthy urban soundscapes.
3. Healthy urban soundscapes can contribute to the environment and health improvement, promoting public health, wellbeing and sustainable cities.
4. The UN Sustainable Development Goals recognize that good health and wellbeing at all ages in sustainable cities and communities are essential to sustainable development.
5. The UN New Urban Agenda commits towards sustainable and efficient transport, sustainable management of resources and promoting networks of open, safe, inclusive, accessible, green and quality public spaces, to reducing noise and promoting attractive and livable cities.

G. Echániz-Pellicer (✉)
Massachusetts Institute of Technology (MIT), Cambridge, MA, USA
e-mail: cedeamb@gmail.com

CeDEAmb Center for Environmental Law and Education, Mexico City, Mexico

A. Govela
DigitalCivix, Mexico City, Mexico

2   Positioning Noise as an Environmental Threat

Economic activities, urban sprawl and motorized transportation, among other elements, have contributed to an increase in noise in cities all over the world. The World Health Organization (WHO) considers that noise is not only a nuance but also represents a real threat to public health. Since 1999, WHO has gathered enough scientific evidence that relates exposure to environmental noise with health impacts; such as hearing loss, difficulty to comprehend and concentrate, sleep disturbances, sleep alterations, cardiovascular diseases, as well as mental alterations derived from stress and anxiety. Therefore, it published environmental noise guidelines with recommended levels of noise to protect public health (Berglund et al. 1999; WHO 2011, 2018).

Several countries have followed the WHO guide and have implemented noise standards. Nevertheless, large urban areas around the world, such as Delhi, Cairo, Shanghai, Tokyo, New York, Buenos Aires, Madrid and Mexico City, are still among the loudest cities in the world. In Mexico City, noise complaints increased almost four times in 10 years.

An acoustic environment with noise levels higher than the recommended values results not only in sick and stressed organisms, tired minds and indifferent people but also generates habits. Inadvertence of excessive noise indicates that people have reached severe levels: metropolis dwellers have accustomed to noise levels that prevent them from appreciating pleasant sound and even useful sounds to live and enjoy the cities (Domínguez 2014).

In light of this situation, WHO also concludes that governments should protect the population from community noise and consider it an integral part of their policy of environmental protection and recommends the implementation of action plans with short-term, medium-term and long-term objectives for reducing noise levels (Berglund et al. 1999). Such programmes demand convergence with mobility, urban planning, housing, health and other public agendas, as well participation of several disciplines (law, architecture, engineering, etc.) and the Government, Academy, Social and Private (GASP) sectors.

Noise complaints in Mexico City 2008 – 2018

(Developed by the authors with data from PAOT)
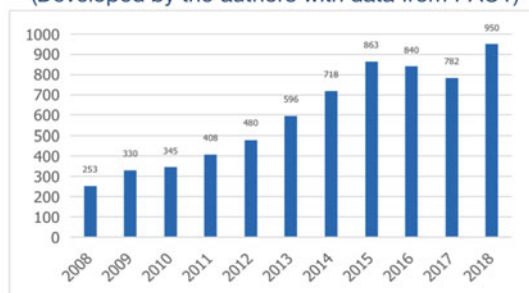
3   Effectively Addressing Urban Noise Pollution

A participatory management systems approach based on regarding environmental noise as a social and health problem, coupled with multisectoral empowerment through the use of technology, potentiated by organized and innovative co-creation by the GASP sectors, and enhanced by strategic alliances, can generate a significant change (https://thequietcoalition.org/). This change contributes to achieve the Sustainable Development Goals (SDG, https://www.un.org/sustainabledevelopment/), that recognize that good health and wellbeing in sustainable cities and communities are essential for sustainable development; and the New Urban Agenda (NUA, http://habitat3.org/the-new-urban-agenda/), that commits to sustainable management of resources, energy and transport, as well as networks of open, multipurpose, safe, inclusive, accessible, green and quality public spaces to reducing noise and promoting attractive and livable cities.

The proposed methodology for this approach is based on five continuous steps:

1. Construction of understanding, using technology, for awareness and multisectoral empowerment (Echániz-Pellicer 2003).
2. Characterization of the local soundscape to generate useful data and validated databases for decision-making (Govela 2018).
3. GASP co-creation of actions and solutions to reduce noise and integrate valuable sound in the local area (AMS 2017).
4. Implementation, monitoring and evaluation and optimization of the co-created actions and solutions (UNDP 2009).
5. Scaling and replica through strategic alliances, to foster exchange, spread ideas and reach long-term impacts.

Methodology for participatory noise management systems approach

(Developed by the authors)

This cycle contributes to reduce noise, control propagation and avoid people's exposure. It promotes acoustic ecology and potentiates the use of sound as a way to understand the interrelation among humans, nature and the environment in order to design and build healthy urban soundscapes (MIT CoLab et al. 2018; https://www.thenatureofcities.com/2013/08/25/designing-the-urban-soundscape/). Moreover, actions and solutions designed to reduce urban noise have potential co-benefits due to the fact that some of the main noise sources of noise in large cities are the same as local sources of air pollution and greenhouse gases.

4 Rendering the Approach to Public Policy

4.1 Clear and Common Objective

Each local GASP working group should focus on the implementation of a participatory noise management systems approach to co-create innovative actions and solutions to reduce noise and integrate valuable sound to make urban areas quiet, healthy and sustainable.

4.2 Local Action for Global Impact

To effectively address widespread urban problems—such as noise pollution—it is advisable to initiate from the local level. Therefore, each local working group should:

(a) Strengthen multisectoral capacities to address environmental issues[1];
(b) Generate local data and information to support decision-making[2];
(c) Co-create innovative local noise and sound management actions and solutions;
(d) Build alliances, scale and replicate to create a Sound Alliance and a digital toolbox;
(e) Procure the achievement of SDGs and the NUA commitments.

4.3 Policy Analysis for Problem-Solving

After co-creating actions and solutions, the local GASP working group should evaluate each proposal in light of public policy analysis to select those with the highest potential to tackle urban noise problems, to be implemented and to produce co-benefits (Bardach 2012).

4.4 Results-Based Management

According to the theory of change and based on results-based management, this approach should generate specific short-term products that can, in turn, end in medium-term results that unlock the potential to generate long-term impact, as shown in the following table (Rogers 2014; UN Habitat 2017):

Participatory noise management systems approach: products, results and impacts			
Step	Products	Results	Impacts
1. Construction of understanding	• Workshops • Collaborative maps, etc.	• Understanding • Empowerment	(a) Strengthen multisectoral capacities
2. Characterization of local soundscape	• Legal framework • Health assessments, etc.	• Local data and information	(b) Generate input for decision-making

(continued)

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[1] The proposed methodology suggests doing this through the use of technology; such as sensors, collaborative maps, apps, etc.

[2] Valuable data and information regarding noise in urban areas include legal framework, health impact assessments, soundscape characterization, blockchain technology, etc.

(continued)

Participatory noise management systems approach: products, results and impacts			
Step	Products	Results	Impacts
3. Co-creation of actions and solutions 4. Implementation, M&E, optimization	• Working sessions • Analysis and selection of actions and solutions to address urban noise • Implementation • Monitoring and evaluation	• Quieter and healthier local urban spaces	(c) Innovate on local noise and sound management
5. Scaling and replica -strategic alliances	• Digital platform (sound alliance) • Digital toolbox for noise management	• Healthy urban soundscapes	(d) Build alliances (e) Pursue SDG and NUA

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Post-pandemic Recovery and Transformation: Resilient Cities, Healthy Planet "Will Healthy and Anti-Fragile Cities Emerge from the Crisis?"

Yu Liu, Franz Gatzweiler, Philippa Howden-Chapman, Charlotte Marchandise, Zhang Shaohua, Yonette Thomas, Virginia Murray, and Wang Lan

1 Key Messages

- Various measures and strategies have been taken to slow or prevent the transmission of COVID-19. For example: (1) acting collectively, trust and cooperation for

Y. Liu (✉) · F. Gatzweiler
International Science Council Programme on A Systems Approach to Urban Health and Wellbeing, IUE, CAS, Xiamen, China
e-mail: yliu@iue.ac.cn

P. Howden-Chapman
Public Health, University of Otago, Dunedin, New Zealand

New Zealand Centre for Sustainable Cities, Wellington, New Zealand

C. Marchandise
WHO, Geneva, Switzerland

Health, City of Rennes, France

WHO Healthy Cities French Network, Quzhou, China

Z. Shaohua
Changshan County, Quzhou, China

Y. Thomas
International Society for Urban Health, New York, NY, USA

Urban Health 360, College Park, MD, USA

V. Murray
Public Health England, London, UK

W. Lan
Department of Urban Planning, College of Architecture and Urban Planning, Tongji University, Shanghai, China

achieving health as a public good; (2) empowering stakeholders; (3) making data available and accessible; (4) making decisions based on scientific knowledge; (5) a "going hard and early" strategy; (6) allocating financial resources for health; (7) maintaining leadership and good governance.
- Effective leadership maintains trust between the government and the people despite the trade-off for some personal freedoms.
- Integrating health into all policies and applying a systems approach to urban health could prevent the appearance of a systemic disease, like COVID-19
- Data, transparency, trust, communication and cooperation are essential ingredients across all urban sectors and stakeholders.
- Cities and neighbourhoods can cooperate and learn better from one another about successful measures, despite cultural differences.

2 Introduction

The Global Forum on Human Settlements (GFHS) organized its 15th annual Session on October 15–16, 2020. These are the results of a panel discussion under the theme: "Post-Pandemic Recovery and Transformation: Resilient Cities, Healthy Planet".

The new Coronavirus pandemic has pushed cities to the limits of their economic, social and political systems and the capacities of their healthcare systems and some more intelligent cities will have learnt more from the crisis than others. Obviously, the learning process for many cities, during the COVID-19 pandemic, has not been very smooth and not fast enough. Even though data and experiences from other cities had been available. Various political, economic and socio-cultural factors stood in the way of an early and rapid response to the health emergency. Not only across countries but also within countries, from federal to local levels, flows of information and the process of creating knowledge and implementing it into action; that systemic learning process wasn't smooth and showed us the limits of our ability to think and act together. It is striking to realize, e.g. that countries, like the UK and the USA, which rank highest on the *Global Health Security Index* are not among those countries most successful in containing the pandemic, which may indicate that successful responses to the pandemic do not only depend on well-functioning healthcare infrastructure but also on overall governance for health.

On the other hand, there does not always seem to be a trade-off between health and the economy. Countries with the worst economic downturns during the pandemic—like Peru, Spain, the USA and the UK—are also among the countries with the highest COVID-19 death rates. And countries where the economic impact has been modest—like South Korea and Lithuania—have also managed to keep the death rates low. We could also observe political and scientific tribalism emerging and hindering the learning process: strong biases towards politically correct countries from which one should learn, others from which more could have been learnt, like China or African countries which "need to be helped".

Leadership and trust in political decision-makers proved to be critical. For example, German politicians and their selected experts at times gave inappropriate advice about masks being ineffective or even not necessary. Such advice was not intended to protect people but rather to cover up shortcomings of governments in providing personal protective equipment. On top of all that, a debate is being fought on questions of democracy and freedoms and rights which the individual needed to sacrifice for the larger good of public health.

The panel on *Post-Pandemic Recovery and Transformation: Resilient Cities, Healthy Planet* invited experts from different countries and organizations to discuss:

- How are cities learning and are they learning fast enough?
- What have been successful measures in cities to contain the transmission of the virus?
- What needs to be done better today so that healthy and anti-fragile cities will emerge in future?

3 Cities Are at the Forefront of Tackling Global Health Issues

Rapid urbanization worldwide is raising new social, economic, public health, environmental and health systems challenges. By the year 2050, 70% of the world's population will reside in cities, and more than 90% of urban population growth will take place in low- and middle-income countries. Therefore, Dr. Yonette Thomas, former executive director of the International Society for Urban Health and founder of Urban Health 360, argues that cities must be at the forefront of tackling critical global health issues and development goals by 2030 and beyond. In order to reach the goals, leadership in urban health planning and implementation is needed and be taken more seriously to improve urban health and address the broad determinants of health to achieve the UN Sustainable Development Goals and the New Urban Agenda in this last decade. The COVID-19 crisis has revealed the limits of our knowledgeability to predict and prepare for a pandemic. When data are lacking, decision stakes are high and values are in dispute, precautionary decisions should be made. Therefore, data, transparency, trust, communication and cooperation among stakeholders are essential ingredients for effective urban health policies. Dr. Thomas also emphasized the importance of collaboration of interdisciplinary and multi-disciplinary urban health leaders and stakeholders in research, policy and practice. Particularly, new partnerships at sub-national and national levels.

4   Mainstreaming Health in All Policies: Empowering New Politicians, Stakeholders and Communities

Charlotte Marchandise, urban health expert at WHO, former deputy Mayor for Health, City of Rennes, France and president of WHO Healthy Cities French Network, expressed that health is also a political choice. It is time to empower new politicians, stakeholders and communities for a healthy planet. Health needs to be considered at global, national and local levels. Especially policies released by local governments create opportunities to reach out to communities, assist cities to test, learn and adapt actions, and also help to scale up policies. The political process and decision-making for health is a complex dynamic network connecting and influenced by multiple factors (Fig. 1). Currently, factors that are being considered by public and government include public health, culture, education, solidarity, economy, environment and green spaces, urbanism and transportation.

Health also has economic value because healthy populations are economically productive. That requires health ministries to be on equal footing with planning and finance. The global outbreak of COVID-19 should not only be considered a risk. It also provides opportunities to learn how to respond to the epidemic effectively. For instance, Charlotte Marchandise pointed out that due to the robust development of networks and data technologies, cities engaged in solidarity with necessary finance departments and were able to fight health inequalities during the crisis and reach out to the poorest. Under the unexpected epidemic disease background, existing local partnerships may change the way cities are able to react, which requires the engagement of municipal and community leaders and public-private collaborative engagement.

Dr. Franz Gatzweiler, executive director of the global science programme on Urban Health and Wellbeing: a Systems Approach, remarked that also citizens and non-governmental organizations need to be involved in risk and disaster management, not merely governments, scientists and epidemiologists. Social scientists with
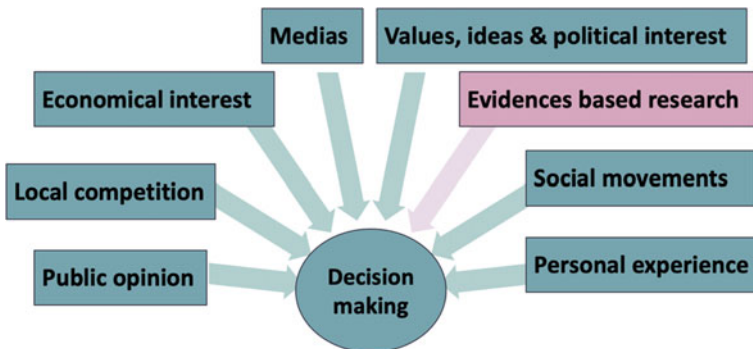
Fig. 1 The political process and decision-making: complex dynamics, multiple factors (Lacouture et al. 2015)

knowledge of the social, political and economic aspects of the crisis are essential to avoid resistance, revolt and conspiracy against necessary measures which safeguard health. In Nancy, France, the partnership with the urban health unit allowed the city to identify and respond to the needs of precarious families, in particular through the distribution of parcels of basic necessities in collaboration with nongovernmental organizations. Many simple hygiene measures, like washing hands, which have been propagated for years, now receive renewed attention from the public in many developing countries.

5 Effective Urban Planning on Health Requires Cross-Sector Collaboration

Effective urban planning for cities means to build healthy, equitable and sustainable cities that promote physical and mental health and wellbeing, which is important for social and economic development. The WHO housing and health guidelines released in 2018 mention that health sectors should be able to inform housing, energy, community development, urban development policies at the national, regional and local levels. Thus, collaboration, networking, political leadership and scientific knowledge are important for prevention and health promotion. Dr. Wang Lan, from Tongji University, introduced the healthy city movement in China and shared the healthy city planning for the post-COVID era. While the focus of healthy city planning has mainly been non-communicable diseases in the past 40 years under the concept of a healthy city proposed by WHO, it is time to pay attention to the possible spatial intervention for emerging infectious diseases. She introduced several approaches to better integrate the consideration of health into urban planning in order to promote the capacity for prevention and recovery from a public health emergency. A theoretical framework of chronic non-communicable diseases for healthy city planning is presented in Fig. 2. Recommendations for healthy urban planning include:

Fig. 2 Theoretical framework for healthy city planning: chronic non-communicable diseases (Wang 2019)

(1)   strengthen the connections and improve cross-sector collaboration among stakeholders and governments to solve urban health challenges together;
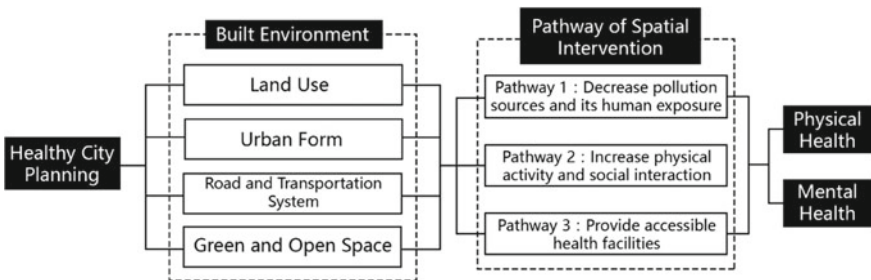(2)   collect and analyse data from various departments and prioritize localized operational change;
(3)   evidence-based policies, programmes and governance that develop healthy and sustainable urban environments and eliminate health disparities.

6 Strong and Effective Governance Result in Effective Urban Health

Dr. Philippa Howden-Chapman, a professor from the University of Otago, indicated that effective leadership maintains trust between the government and the people and persuades them to sacrifice some personal freedoms. The scale of COVID-19 and the variety of national responses are dramatic natural experiments of the effective role of government, as well as the limits of fundamental individual freedoms, such as the freedom to move and congregate. Effectively enforcing public health messages during a pandemic requires a high level of trust in the leadership and high levels of social capital. This is particularly the case in a highly, urbanized country like New Zealand, which has opted to control the borders and limit movement in an attempt to extinguish the virus. Reducing the economic impacts of these controls requires major policies to maintain demand through economic subsidies. To retain the ongoing support of the population, existing partnerships are critical to convey and reinforce these messages. Populations with lower levels of homeownership, such as the Maori, the indigenous population and migrant communities from the Pacific, who live in more crowded rental properties, remain particularly at risk when community transmission requires isolation and employment is more precarious. Dr. Virginia Murray shared the story of COVID-19 in the UK, which is not encouraging because of the miscalculation of the epidemic early and the government's failure to take strong control in time.

On the other hand, China has successfully managed and will continue to control the spread of the new coronavirus pandemic by strong and effective governance. Mr. Fu Yibin, from China Tourism Resources Integration Alliance, briefly introduced the influences of COVID-19 on the tourism industry and the importance of economic recovery. He also presented the concept of internal and external double circulation of the economy, which is an innovative circular economy model advocated by the Chinese government for ensuring steady development. Mr. Zhang Shaohua, Head of Changshan County, shared the pandemic conditions and the development of Changshan county from four dimensions: (1) Green Changshan, (2) "Slow City" of Changshan, (3) Healthy Changshan and (4) Leisure Changshan. Changshan government made great efforts in building a sustainable ecological county. The main tasks include: improving green coverage, closing polluting factories, improving transport efficiency, promoting industrial transformation, enhancing rural functions, smart management and building healthy and leisure counties.

7   A Framework of System Approach Is Needed to Toward the Health City

The global pandemic has triggered unprecedented public attention on how to respond to the epidemic. Many hidden societal weaknesses but also potentials emerged and triggered heated discussions globally. According to the pandemic response from different counties, Dr. Franz Gatzweiler pointed out that the pandemic response has often failed to take a systems approach, and this failure may result in making population health worse. For instance, lockdowns and other restrictions failed to support those people living in precarious work and housing situations (slums). They have increased poverty, hunger, displacement, gender and domestic violence, stigmatization and mental health issues, and are contributing to migration out of cities that may further strain resources to support health-promoting infrastructure, services and health care.

Dr. Virginia Murray mentioned that the Sendai Framework for Disaster Risk Reduction 2015–2030 calls for consolidating existing knowledge, developing and applying methodologies and models to assess disaster risks, vulnerabilities and exposure to all hazards (Pearson and Pelling 2015). Supporting the systems approach Dr. Gatzweiler mentioned earlier, she also underlined that the UNDRR Hazard Definition and Classification Review-Technical Report highlights the urgent need to investigate further the direct and indirect linkages and effects of natural, biological, technological and other human-induced hazards and to understand cascading and complex hazards and risks in a systematic way. Currently, neither in the UK nor in other EU counties there are effective mechanisms to consult with local governments to elaborate policies, evaluate their action and scale up promising practices. In a period where the trust of the population is extremely low and pandemics coming back, we need to install dynamic and agile ways to collaborate from local to global levels.

8   Conclusion

Most likely, by disrupting natural habitats and ecosystems the Coronavirus could cross the species boundary and become a threat to humans. The COVID-19 outbreak is a stark reminder that we cannot maintain human health and wellbeing by compromising urban and environmental health. COVID-19 is a systemic disease which has, directly or indirectly, affected all aspects of human life in cities and other human settlements. A united systems approach to emergency response, that considers the scale, complexity and systemic nature of urban health, could have mitigated some of the disastrous impacts of the outbreak.

General urban sustainability promoting measures which also (indirectly) slow down or prevent the transmission of an infectious disease include efforts to integrate health into all policies and build green, healthy, resilient cities. The COVID-19 crisis highlights social and economic inequalities. In order to provide relevant responses,

local and regional authorities, the associations and local actors are indispensable and their action must be facilitated. Government leadership is critical but its power cannot be exercised without partnerships and public engagement, it is also vital for climate change transformation and other health challenges in the future.

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COVID-19 and Urban Food System

Ristina Siti Sundari and Adnan Arshad

1 Key Messages

- The manifestation of food scarcity in urban areas but excess in rural areas exemplifies a gap in the supply chain.
- Urban Farming concepts are useful for improving public health and combating weak economies due to the COVID-19 pandemic while offering the health benefits of urban food security.
- Regenerate urban youth with short online training and awareness sessions about urban farming for wellbeing. The study of social and health benefits is the uppermost encouraging factor for sustainable cities and societies experiencing pandemics.

2 Background of Issue

2.1 Determinants of Planetary Health

The COVID-19 pandemic is impacting the worldwide population in its unparalleled behaviours. It presents different threats to urban economies, food supply chains and planetary health systems that comprise the globalized nutrition structure. The systems of countries which experience natural disasters, social and political conflicts, climate variability and extreme weather events have become a key driver of severe crises

R. S. Sundari (✉)
Perjuangan University, Tasikmalaya, Japan
e-mail: ristinasitisundari@unper.ac.id

A. Arshad
College of Resources & Environmental Sciences, China Agricultural University, Beijing, China
e-mail: ad@cau.edu.cn

in 2019, resulting in insecurity. This situation can be jeopardizing. While (Shahidi, 2020) has defined the hot spots of food security mainly in fragile and conflict-affected states, countries affected by multiple crises (extreme weather events, pests, such as locust, which impact food production, and poor and vulnerable people). For countries which are in currency depreciation and commodity price collapse, such chronic food insecurities are always challenging.

The urban environment does not only involve health hazards with inequitable exposures and distribution of vulnerabilities but also involves opportunities to implement interventions for health equity and wellbeing. The pandemic affects not only food supply chains, trade and market places but also community life, availability of nutrition, purchasing power and livelihoods. It underlines the importance of food chain sustainability to reduce food and health crises. (Galanakis, 2020) Human and natural crises create food insecurity and, more frighteningly, planetary health. Food insecurity could result in hunger, disease and death. Inequality between urban and rural populations may decrease by 50.5% in the urban cities of Asia and 55.7% of the world urban population is going down and the simulation that 56.7% of Asian's Urban and 60.4% of the world's urban in 2030 (World Bank, 2018) will be broken. The activity deals with urban farming can affect different health determinants, such as social capital food security, health and wellbeing (Audate et al., 2019), as indicative of public health.

At the end of the warmest decade in the last 50 years, with a temperature increase of 1.1 ± 0.1 °C. South America, Europe, Africa, Asia and Oceania were warmer, while North America was colder. Ocean heat in the Northeast Pacific peaked the severe heat marine heat wave that continued by creating ocean acidification, sea level rise, CO_2 level rise and the decline of sea ice, Greenland ice sheet has lost about 329 Gt. These areas had significant impact events toward floods in one place and drought in another place, heat wave in Europe and Australia, called hot summer, wildfires and tropical cyclones. The consequence was increasing health risks; food security continues to be negatively affected. The lack of affordable skill acquisition leads to income inequality. This gap goes even more widespread, and it is about to increase further. For the first time in decades, millions of people are projected to enter into poverty, and families who live in poverty will be driven to food insecurity (Ridwan et al., 2017). The scarcity of food becomes a problem that leads to food insecurity threats. Countries face food crises, along with declining income, availability, affordability and safety (FAO, 2020).

3 Insights

3.1 Urban Food Systems (UFS)

The factors influencing **urban food systems** (UFS) included market forces (supply and demand, social norms, etc.), economic constraints (labour, land vs. competition,

zoning, food import food vs. local production, trade and profitability vs. afford-ability), equitable access (transportation, cost competition between food and other basic needs, retail environment), food waste and extreme climate impact (production, transport, land use, water use and other resources). Consumer behaviour has changed to stay safe and healthy, despite the challenges. It is predicted that changes in the four categories of consumer mega-shift (Yuswohady et al., 2020 consisted of a stay-home lifestyle[1]; back to the bottom of the pyramid[2]; go virtual,[3] and an empathy society. The effort to escape from pandemic and food crises has to be based on the community (Ebrahim et al., 2020) and local wisdom culture throughout urban farming activities (Iswoyo et al., 2018); these cultures have a high potential for ecological typology in urban farming.

The urban farming evolution started with types of urban agriculture: conventional farming (reproductive programme go green: uncreated, un-innovated only replication from other city or village), mass production (plant factory: multifunction integrated and oriented, developed collaborative and eco-facture deal with the blue economy), multifunctionality (economics, aesthetics, ecologic: develop UF seriously as a resource of income, job opportunity, business, beautiful environment) and collaborative humanism (Future UF to strengthen urban barn, food investment on long-lasting and edge land). Urban farming can be conducted according to typologies, such as productive land, edge and green space, undeveloped land, rooftop, veranda, wall either indoors or outdoors and use of small spaces efficiently with land and water management. UFS is economically viable and supports urban farming innovation and approaches in order to manage production systems, food and nutritional insecurity and addresses systematic solutions and urban resource management in socio-economic and environmental contexts. There are only ten countries in Asia that have a food security index above 60 (Singapore, Japan, South Korea, China, Kazakhstan, Thailand, Azerbaijan, Vietnam and Indonesia). In 2020, global economies are expected to decline, resulting in and vulnerabilities in earnings and ability to feed families.

Table 1 shows that rice supply in January and February 2020 has increased, whereas from March until May 2020, rice supply declined in comparison to 2019. The UFS system highlights and identifies systematic food scheme transformation. The system is focused on the way food production systems can be economically viable in urban farming. The activated production practices in urban settings and resolved food and nutritional insecurity throughout the system-level solution. The management of public resources in the first activity is to preserve life. When it develops and progresses, it will revive urban farming for all communities, either

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[1] The Falling down of Mobility. The Rise of Stay at Home; Online Shopping Widen-Deepen: from Wants to Needs; Food Delivery: from "Indulgence" to "Utility"; The Comeback of Home Cooking; Frozen Food: Convenience Solution; Going Omni; Subscription Model Matters; Strikes Back; Self-Care, meet Workplace at Home; "Work-Live-Play" Balance: Well-Being Revolution.

[2] The Century of Self Distancing; Contact-Free Lifestyle; Low-Trust Society; Constantly-Fear Customer; Herb is the New Espresso; Halal-thoyyiban Becomes Mainstream; Pay later Solution; The Future of Travelling.

[3] Virtual experience is the next big thing.

Table 1 National realization of rice supply 2015–2020 in Indonesia

Month	2015	2016	2017	2018	2019	2020
January	–	641	4,148	5,467	2,009	6,935
February	–	4,193	48,884	26,876	6,365	39,359
March	30,964	167,950	425,556	215,103	248,311	43,876
April	430,559	649,867	424,064	351,630	305,516	85,978
May	661,741	572,459	218,170	272,124	121,717	101,572
June	385,726	406,485	155,605	133,044	121,717	–
Semester I	**1,508,990**	**1,801,595**	**1,276,427**	**1,004,245**	**748,565**	**277,720**
July	194,344	162,416	277,782	238,172	129,882	–
August	90,231	287,224	202,310	124,562	86,654	–
September	22,985	240,173	196,432	78,055	83,676	–
October	67,359	207,500	122,222	23,234	64,020	–
November	61,328	165,353	65,146	12,681	55,517	–
December	21,265	97,244	20,907	7,636	33,149	–
Semester II	**457,513**	**1,159,910**	**884,798**	**484,339**	**452,899**	
Total	**1,508,990**	**2,961,505**	**2,161,225**	**1,004,245**	**1,201,264**	

rural or urban. Urban farming as agro-cosmopolitan practice has at least six functionalities: protection, subsistence, ecology, aesthetics, economics and production. Urban farming is a leading factor for households, communities and livelihoods, and will be one of the solutions for survival and revival of food security. An emphasis on transformational approaches and connections to multiple aspects, both internal and external. UFS supports innovative ideas to reduce food and nutritional insecurity in socio-economic, health and environmental circumstances.

Application of a technological system can start with a conventional system, such as hydroponic, aquaponic, rooftop or vertical farming. Furthermore, sustainable urban development investments will create more benefits for society, it will improve the status of the environment, food security and health, which in turn reduces health problems and improves economic productivity for society. Ultimately, it results in an improvement in the status of mental health and promotes wellbeing in a society. Handling global problems in food insecurity and health begins at home with urban farming, even soilless and small land or landlocked areas. This activity is urgently required and necessary to regenerate agriculture and farmers to produce salubrious food and keep healthy by means of urban farming. The expectation is that skilled farmer regeneration, and experts either in rural or urban areas become a persistent bridge, collaborator and agent to mitigate food and heath simultaneously. The schemes eventually empower a community-based/shared structure.

4   Policy Recommendations

(1)   The government can play an active role to up-skill the farmer's regeneration and regulation of the food supply chain while paying particular attention to strengthening urban food systems. Rural and urban empowerment, internalization and marketing of diverse food provide opportunities throughout the community, including technological advancements

(2)   Food production, marketing, distribution and access are better handled by the communities throughout urban farming at every stage in order to enhance self-growing sustenance and lead to improved mental health and sovereignty.

(3)   Urban societies can encourage entrepreneurship in urban farming and the local home industry through education and community-based culture.
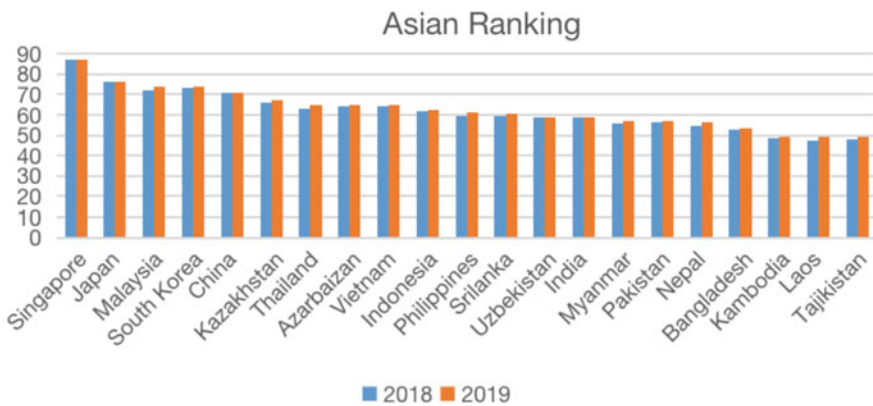
Supplementary Data

See Fig. 1.

Fig. 1   Asian food security index year on year

Fig. 2 Youth and women training on an urban farming development programme in Indonesia and Pakistan

Pictorial View (Fig. 2).

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Developing a Digital Learning Platform for Adolescents in Vulnerable Communities in the City of Medellin, Colombia. A Tool to Tackle COVID-19 Confinement Challenges

Sebastián Bustamante González

1 Key Messages

- COVID-19-related implications have created an additional struggle and stress in high-numbered families from vulnerable communities, due to the lockdown measures adopted by local and national governments.
- Adolescents are in a critical phase in their lives, as they are shaping their character, personality and overall drive for purpose and thus, digital tools and virtual learning methods become crucial for tackling emotional and mental health issues related to confinement (Health Ministry and Social Welfare., 2019).
- An interactive flow of information can help families, especially adolescents, to not only find a different focus while in quarantine but also to create abilities and capacities that will enable them to embrace this new worldwide normality we will be facing during 2020.

2 Background of the Issue

Medellin is Colombia's second largest metropolitan area with 2.5 million inhabitants. It has seen rapid socio-economic transformation, including a halving of the poverty rate in the last 10 years and a wide reduction in violence. It is divided into 16 geographical areas (comunas) and 249 neighbourhoods (barrios). It has a large middle class, 67.3%, with 18.3% population considered 'vulnerable' and 3.3% classed as 'poor' (Cómo Vamos, 2018).

Gambetiando is an impact innovation platform, which aims to improve the health and wellbeing of vulnerable communities in Medellin, using soccer as an entry

S. B. González (✉)
Colombian National University, Bogotá, Colombia
e-mail: sebastian.bustamante@impacthub.net

Fig. 1 Gambetiando activities in Medellin

point for adolescents between 10 and 15 years old (Fig. 1). We intend to develop a set of socio-emotional skills, through a strong partnership framework and a social entrepreneurship programme, implementing a creative use of technology in order to create knowledge, in an aligned way with the SDGs. Gambetiando is part of the Healthy Cities for Adolescents Programme, a 5-year initiative funded by Fondation Botnar and managed by the International Society of Urban Health (ISUH).

During more than a year of implementation, some clear impacts can be witnessed in the group of 160 adolescents we have engaged since June 2019. For example, 93% of boys and girls actively participate in the programme, 79% express that the methodology allows them to work on their weaknesses and build upon their strengths, 93% identify failure as an opportunity for learning and improvement and 79% look for new and different ideas, even though they are contradictory to what they believe (Gambetiando, 2019).

Nevertheless, COVID-19 implications for group-based activities and a close contact approach turned unfeasible to carry out the programme in a "business as usual" dynamic. Adolescents and families entered a lockdown stage, which led us to rethink how the methodology was being carried forward. In order to take care of the adolescent's health and advance the purposes of a social intervention under the Gambetiando programme, we reshaped the strategy of interaction with the beneficiaries. The programme was challenged to think about effective strategies that help not only to prevent but also to mitigate emerging risks that adolescents have, such as sedentary lifestyles and negative emotional health impacts, caused by family conflicts within their homes.

Our programme focus shifted from the execution of activities to implement a method, to a more direct support of our population, becoming part of the new daily routine that adolescents and families face at home during time of social isolation, helping them to understand these changes in their lives. One-to-one contacts were

established with boys and girls, educational videos were sent and self-care tips and physical exercises were developed, all in order to allow the project to continue having an impact on topics ranging from self-care, social isolation, opportunities at home, exercise and psychosocial activities, but above all, to generate a knowledge that they could apply while in the quarantine. Soccer trainers, psychologists and staff were 100% involved in the creation of this process.

3   Insights or Findings & Policy Recommendations

The following are some of the strategies implemented and the results that are starting to arise, after almost 2 months of constant monitoring and evaluation of the impact the virtual programme had on our adolescents. We do think that some of these actions can be replicated at a city level, as there are simple learning that policymakers can easily replicate within their current social impact programmes. Also, some key performance indicators are suggested, as a way to monitor and evaluate the virtual programme's progress and value. We measure these indicators on a monthly basis through different information-collecting methods, such as phone calls and online polls.

- Communication channels matter. By defining and using internal channels of

  communication with the beneficiaries and through a prior diagnostic study of which kind of devices and internet connections they had available, we were able to transmit information from the programme in an assertive way. This allowed us to identify the right ways to motivate the participation of adolescents and families and to adjust the contents to what the technological assets of the population really looked like.

  For example, 77% of boys and girls answered the programme phone calls, 68% of them actively participated in the official WhatsApp group and 84% of parents responded to phone calls and/or WhatsApp messaging, being the parents' key to achieve an integral engagement of the family unit.

- Quality in audiovisual from the beneficiaries reflects community engagement. It

  is hard to create a value transaction through this sort of framework without developing quality materials that generate engagement with adolescents and challenge them to respond with the best possible quality in their feedback. The quality received in the adolescents' production and materials, can reveal high engagement with the programme, a positive perception of the gains they are building out of it and the motivation they have to develop different activities in a confined routine. There are some key elements the programme should strive for:

  - To achieve a high amount of videos received by the participants;
  - That the material received has an acceptable level of quality, taking into account the conditions of the person who produces it (it is assumed that they do not have

knowledge of video production) and the context in which it is made (house, terrace, stairs, etc.);

– That the videos denote an evidence of a creative capacity, the use of elements in their home in a versatile way and inclusion of resources such as music and sound or other audiovisual elements;
– That videos have a clear content, with linguistic resources relatable to previous learnings at school, soccer trainings and psychosocial workshops;
– That there is a good level of collaboration among family members to produce the materials, reflecting union and family support.

At the moment 40% of received videos have quality in screen definition and sound and 36% of videos received have a creative innovation approach, both from home resources and technological tools. 26% of the videos received have a clear content, with adequate linguistic resources and 48% of videos received help from family members is observed. In total, 75 videos from adolescents have been received so far.

• Social media channels play an important role. Taking advantage of ICT resources such as social media networks, we created a closed group on Facebook, which mainstreams activities of Gambetiando and its evolution, bringing together the community of the programme beneficiaries. This space made it easier for adolescents to participate and allowed them to become visible. At the moment, 23% of beneficiaries interact in the group by making comments, liking and/or sharing content. Sixty per cent of them have a positive group perception assessment and 98% of beneficiaries are part of the Facebook group.

• The psychosocial dimension needs to be an underlying factor to monitor. Implementing a virtual stage of the programme aims to bring an understanding of how the psychosocial support that is offered in field activities is still useful. Maintaining a link to socio-emotional factors within the virtual activities is crucial to justify the purpose of this effort. This is why we use virtual strategies that allow clear actions to be taken by adolescents to obtain coherent responses to the programme´s objectives, providing a support that, although not in the field, allows a one-to-one approach with the beneficiaries. In detail, we are trying to create evidence of:

– How boy's and girl's participation in virtual psychosocial activities is constant?
– How beneficiaries respond to awareness in self-care and understand the current situation, the lockdown measures and the parents efforts to protect them?
– How boys and girls consider that the videos and information received regarding psychosocial aspects represent a valuable approach
– How the response from the participation of the beneficiaries is relatable to the learning acquired before the virtual stage of the programme?

We can account for 83% of boys and girls in the programme who participate in virtual psychosocial activities and 50% of children having psychological counseling in the mid of contingency through networks and calls. 110% of boys and

girls report that the videos are attractive and 71% of boys and girls reflect the learning acquired in the Gambetiando in-field programme.

- Physical activity is part of the equation. Soccer training as a fundamental part of the Gambetiando programme promotes physical activity at home, taking advantage of quarantine time to create adequate health habits. We aim to increase the participation of boys and girls in virtual sports activities in a way that is understandable and adolescents are capable of executing them at home, making sure that physical exercises proposed are sufficient to carry out basic training routines. So far, we account for 83% of boys and girls participating in virtual sports activities, 86% understand the videos recommended by the soccer trainer and 100% perform the exercises proposed as part of a basic training routine at home.

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Partial System Analysis of Traffic Noise Reduction in Tarik Al Jadidah, Beirut, Lebanon

Ibtihal El Bastawissi, Franz Gatzweiler, Shirine Khalil, Nour El Baba, Nour El Hage, and Rouba Joumblat

1 Key Messages

- Tarik Al Jadidah is one of the most crowded neighbourhoods of Beirut-Lebanon. Also, it is one of the project-based initiatives in BAU Urban Lab and a focal point of different studies done previously by students at BAU, Faculty of Architecture-Design and Built Environment. In addition, this neighbourhood hosts the main headquarter of Beirut Arab University.
- Tarik Al Jadidah, which was listed as a priority on the Beirut Municipality agenda, suffers from various urban problems, mainly Traffic Noise, a system caused by a set of interrelated urban physical variables.
- Traffic noise is considered among the most ubiquitous urban environmental pollutants in urban areas. Moreover, it was one of the main concerns of Beirut Municipality due to its harmful effects on both mental and physical health of the wellbeing according to WHO guidelines.
- Vester sensitivity model has been effectively applied in the fields of management, urban planning, scientific research and others that is why it was chosen. It was found that it could be considered a supportive decision and assessment tool for traffic noise reduction.
- The main challenge of this research is to discover the key variables affecting traffic noise reduction system.

I. E. Bastawissi · S. Khalil (✉) · N. E. Baba · N. E. Hage
Faculty of Architecture-Design and Built Environment, Beirut Arab University, Beirut, Lebanon
e-mail: s.khalil@bau.edu.lb

F. Gatzweiler
ISC-IAP-ISUH, Urban Global Interdisciplinary Science Program On Urban Health and Wellbeing, Xiamen, China

R. Joumblat
Faculty of Engineering, Beirut Arab University, Beirut, Lebanon

2   Background

Tarik Al Jadidah is a neighbourhoods in Beirut, which is suffering from a variety of typical urban health issues such as pedestrian crowding, limited green spaces, high population density, rapid urban growth, urban disparities and inequalities. The major urban problem in Tarik Al Jadidah is traffic noise. Moreover, traffic noise was one of the main concerns of Beirut Municipality due to its harmful effects on both mental and physical health causing stress, sleep disturbance and hearing loss.

Among different proposed softwares, a collaborative systems modelling software was chosen. The collaborative modelling software was provided by the company System Logics. The tool helps to create a common understanding of the complex urban health problem by visualizing the components of the system which have an impact on noise pollution. It facilitates a profound and common understanding of the system's components and interconnections, includes quantitative and qualitative data, identifies feedback cycles and allows for interactive simulations and policy scenario analysis. Due to the complex nature of many urban health challenges and the limited data availability, from an epistemological perspective, the tool addresses the need for quantitative data and precision, as well as the need for including stakeholders' qualitative assessments.

Out of the mentioned data the main problem the research highlights is that traffic noise; the major urban problem in Tarik Al Jadidah is embedded into a system of interrelated urban physical variables, such as road direction, building heights, pavement type, that are not only affecting each other but also affecting the human health and the surrounding built environment. The variables were selected based on a group discussion of interdisciplinary researchers including urban designers, architects and civil engineers in a workshop entitled "System Modeling for Urban Health and Well-Being" held at BAU, Faculty of Architecture Design and Built Environment.

The aim then is to identify the key variables affecting traffic noise reduction system and to detect the variables' mutual impacts using Vester Sensitivity Model as a computerized planning and management tool for complex systems.

The Vester sensitivity model is a supportive decision-making tool useful for identifying systems variables related to traffic noise reduction. Knowledge of those interconnected system variables can help in identifying the most appropriate urban interventions to reduce traffic noise for improving health and wellbeing.

The goal of this research was to discover the most influencing physical variables affecting traffic noise and its level. In order to do so, it was important to figure out first what can affect traffic noise level and what is initially the level of traffic noise in the selected area. Thus, the research relied on a quantitative and qualitative method that was divided into two parts: the theoretical part and the practical/application part.

The data acquisition phase helped in acquiring knowledge about traffic noise, like the factors that affect it and help in reducing its intensity in addition to the impact of traffic noise on the health mentally and physically. Moreover, it allowed to specify the category of the road and the noise level of the area based on standards. Those

clarified that Al Boustany Street is a local street and that the area of Tarik Al Jadidah is in the critical zone in response to traffic noise since the value is 76–dBA. After having this overview about the case study, a set of factors/variables that have an influencing impact on traffic noise were identified.

In the application part, it was suggested to discuss and measure the impact of previously stated variables, yet this was done through the use of a software; Vester sensitivity model. This software allows to identify the impact of each variable on traffic noise and different other variables after defining specifically each variable and discussing its impact level among a group of experts from different domains added to the already taken measures. This action was done in a sort of matrix, Fig. 1, which represents the input data of the software and ends up in several tables showing the most effective variables, Tables 1 and 2. An additional important diagram is the reflection on the interrelations of the whole variables on the whole system that shows to what extent is the system resilient or fragile and whether any change in any variable will cause the collapse of the system. In this research case, the diagram showed that the system is resilient enough and that it is in the buffering zone reflecting that most of the variables set may affect the level of traffic noise yet don't dramatically affect the whole proposed system as shown in Fig. 2.

Influence matrix (consensus) of the system model Tarik-AL-Jadidah, Beirut

Impact of var1.... on var2, var3, var4.... (from top to bottom row and left to right column)

	AS	ASxPS (P)
1 no. of cars	26	658
2 pop.density	29	638
3 mobility	31	1147
4 green space	23	230
5 road width	39	624
6 height of buildings	18	72
7 wind flow urb corridor	4	64
8 buildg envelop	10	60
9 transportation type	31	899
10 pavement types	7	84
11 private/public area	42	378
12 traffic noise	15	765
13 public parking space	27	513
14 intersections	31	93
15 road direction	24	284
16 traffic noise regulation	32	664
17 traffic calming measures	24	526
18 Flow of traffic (LOS)	27	837
19 incomes level	17	102
20 speed of cars	19	703
21 land use at ground level	31	279
22 air pollution	8	224
23 noise stress	15	615
24 fuel prices	20	0
25 demographic distribution	14	42
26 road maintenance	23	391
27 housing prices	10	350
28 satisfaction of living	6	306
29 gender	7	35
30 traffic behavior	16	640
31 traffic law enforcement	24	480
PS	33 22 37 10 18 4 16 6 29 12 9 51 19 3 11 27 22 31 6 37 9 28 41 0 3 17 35 51 5 40 20	
Q=AS/PS	79 132 84 230 244 450 25 167 107 58 467 29 142 ### 218 119 109 87 283 51 344 29 37 ### 487 135 29 12 140 40 120	Q=AS/PSx100

Fig. 1 The impact matrix of system model Tarik al Jadidah. *Source* Vester Sensitivity Model software

Table 1 Showing the Lever Variables that mostly impact the target variable: traffic noise

Var. #	Lever variables
2	Pop. density
9	Transportation type
15	Road direction
16	Traffic noise regulation
26	Road maintenance
31	Traffic law enforcement

Source Using Vester Sensitivity Model, table illustrated by Author

Table 2 Showing the most influencing variables related to traffic noise

Var.#	Variable	Impact value traffic noise
1	No. of cars	3
2	Pop. density	3
3	Mobility	3
9	Transportation type	3
10	Pavement type	2
15	Road direction	2
16	Traffic noise regulation	2
18	Flow of traffic	3
20	Speed of cars	2
26	Road maintenance	2
30	Traffic behaviour	2
31	Traffic law enforcement	2

Source Vester Sensitivity Model, table illustrated by Author

3 Findings

The results of this research were derived with the support of the systems software which computed the strength of the impact of each variable on all others. The partial systems analysis showed the variables which have a strong direct impact on the target variable, traffic noise. The suitable levers for improving traffic noise in Tarik Al Jadidah are those which do not belong to the fixed physical infrastructure of a city, but rather belong to the social-institutional infrastructure and the resource flows of a city such as number and flow of people and cars, as well as rules and regulations, behaviours, maintenance of roads and law enforcement.
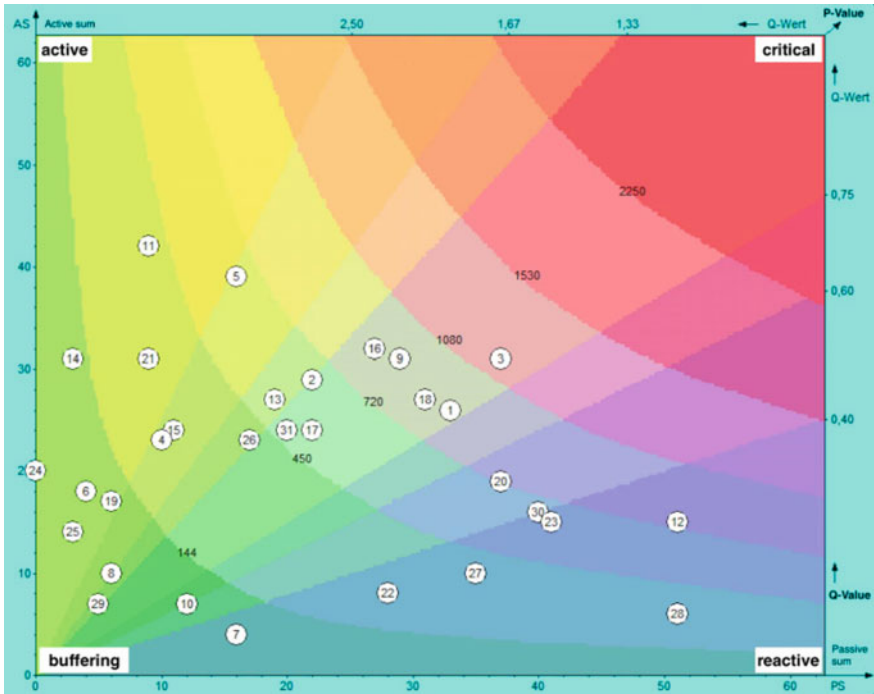
Fig. 2 Systemic Role Diagram of the system model Tarik Al Jadidah. *Source* Vester Sensitivity Model software

Those levers recommended for improving traffic noise in Tarik Al Jadidah are shown in Table 1. It was found that traffic noise is an urban problem that has a direct negative influence on both mental and physical health of humans.

The factors that affect traffic noise are not only related directly to traffic and roads but also to other urban considerations like land use at ground level and the allocation of public-private areas.

As for the selected software, the sensitivity model can be considered a complimentary tool, which leads to a comprehensive investigation regarding any complex decision-making situation and it is able to find a wider set of solutions. It is an interactive system not only built from the viewpoint of experts but also engages the individuals involved in the modelled systems.

4 Policy Recommendations

Since the research deals with traffic noise as an urban problem facing urban residential zones; thus, it targets different parties. Each one of these parties has a major role to play in order to minimize the negative impact of traffic noise and consequently aim for a better level of urban health and wellbeing as follows:

- Local Authorities: Governmental and Nongovernmental

  - Consider more development plans about Tarik Al Jadidah; the case study since any modification in its existing condition may affect Traffic noise.
  - Consider the variables that directly match with the responsibilities of the local authorities in charge such as the municipality and law enforcement forces. These variables are related to:

      Transportation type
      Private/public area
      Public parking space
      Traffic noise regulations, be activated
      Traffic calming measures
      Speed of cars
      Fuel prices
      Road maintenance
      Satisfaction of living
      Traffic law enforcement

- Professionals and academics: Urban designers and planners, and researchers

  - This analysis is based on a partial systems analysis with data including the number and strength of impacts of system variables on another. It is recommended to build a complete system model to deepen the analysis in order to better understand the impacts' changes of the variables on the system as a whole.
  - Conduct further research about Tarik Al Jadidah; the case study, mainly from an academic point of view since the topic is interrelated with many different domains and so reducing its impact might be considered as a sub aim for different conducted researches.
  - Vester sensitivity model, effective software recommended to be implemented in BAU Urban Lab.
  - Shed more light on the variables related to urban design and planning, those include:

      Green Space
      Road Width
      Height of Buildings
      Building Envelop
      Transportation Type
      Pavement Type
      Land Use at GF

- The public: Inhabitants

  - Inhabitants as well have a great role to play in order to reduce traffic noise since they in a way or another can interact with these variables:

      Number of Cars

> Mobility
> Traffic Noise Regulation (Applying the rules)
> Traffic Noise Regulation (Applying the rules)
> Traffic Behaviour

It is clear that there are a set of actions that even if considered personal initiatives yet still have a notable influence on the degree of traffic noise produced.

Managing Urban Green Spaces for Biodiversity and Health: Systems Thinking from a Regional Australian City on Synergies, Trade-Offs and Enablers

Emily Flies, Penelope J. Jones, Pauline Marsh, Elise Jeffery, Gabriella Allegretto, and Dave Kendal

1 Key Messages

- Environmental risk factors specific to urban areas lead to urban-associated diseases such as allergies, asthma and mental health disorders. To address these diseases, there has been a shift towards using urban nature as a preventative and therapeutic tool to restore and enhance human wellbeing.
- Urban nature is a wellspring of biodiversity and cities are home to many species and ecosystems of conservation significance. Hobart is a regional city on the island state of Tasmania, Australia, at the doorstep of Tasmanian Wilderness World Heritage Areas, and home to a suite of endemic flora and fauna.
- We hosted a workshop with local stakeholders to explore synergies, trade-offs and enablers for managing urban nature for biodiversity outcomes and for human wellbeing outcomes in regional cities like Hobart. We identified barriers to managing urban green spaces for both biodiversity and wellbeing including the diversity and disconnect of actors and stakeholders, competing health and nature agendas, insufficient resources, language barriers and "biophobia" (a fear of nature).

E. Flies (✉)
School of Natural Sciences, University of Tasmania, Hobart, TAS 7000, Australia
e-mail: Emily.Flies@utas.edu.au

P. J. Jones
Menzies Institute for Medical Research, University of Tasmania, TAS, Hobart 7000, Australia

P. Marsh
Centre for Rural Health, University of Tasmania, Hobart, TAS 7000, Australia

E. Jeffery
City of Hobart, Hobart, Tas 7000, Australia

G. Allegretto · D. Kendal
School of Technology, Environments and Design, University of Tasmania, TAS Hobart 7000, Australia

- Enablers for improved green space management include empowered local governments, community engagement and education and resource sharing across public, private and academic stakeholders.

2 Findings from a Workshop that Explored Trade-Offs and Synergies in Biodiversity and Wellbeing Outcomes Arising from Different Urban Nature Management

Urban living is now the dominant way of life for most people on earth and almost 70% of the world's population is expected to be living in cities by mid-century (UN DESA 2018). Urban dwellers have greater access to some social, economic and public health resources, and often enjoy health benefits compared to their rural counterparts (WHO and Metropolis 2014). However, there are significant disparities in health within and across urban areas as well as urban-associated diseases linked to environmental risk factors (Flies et al. 2019). In response, there has been an explosion of interest in using urban nature as a nature-based solution (Frantzeskaki et al. 2019) part of preventative and therapeutic health strategies, and research aimed at understanding the mechanisms leading to increased wellbeing from urban nature. Urban green spaces can help restore or enhance wellbeing and there is some evidence that more biodiverse green spaces are more salutatory (Flies et al. 2017; Fuller et al. 2007; Lai et al. 2019).

Urban green spaces also have biodiversity conservation benefits. Efforts to conserve biodiversity have historically focussed on remote and rural environments away from cities, with cities and urbanization largely seen as threats to biodiversity. Yet increasingly, cities are being recognized as a critical place for conservation, with many threatened species only found in cities (Ives et al. 2016) and experiences of urban nature shaping society's attitudes to conservation and environmental protection. While historically, urban nature has been managed largely for amenity, there is a shift to managing urban nature to achieve biodiversity outcomes such as creating habitat and protecting threatened species.

We are now confronted with a situation where urban nature is potentially being managed for incongruent and sometimes competing purposes. Management for human wellbeing can lead to adverse effects on biodiversity such as habitat simplification or the use of pesticides and herbicides that can have detrimental impacts on wildlife and threatened species. Management for biodiversity can lead to public concerns about safety due to the introduction of structurally complex vegetation as habitat, or restricting public access to certain areas.

We explored this issue in Hobart (Fig. 1), a regional city of approximately 240,000 people in the greater metropolitan area and 50,000 in the City of Hobart Local Government Area. The City of Hobart borders and contains a range of protected and managed natural areas and like many cities, the management of urban nature occurs under public and private administration, according to diverse policies across multiple government divisions with different objectives. This complexity can prevent

Fig. 1 The regional city of Hobart on the island state of Tasmania borders World Heritage wilderness and manages a range of urban nature types

the optimizing of trade-offs between biodiversity and health outcomes. An example is the City of Hobart Biodiversity Action Plan (City of Hobart 2019; Jeffery and Smith 2019). This plan has many strengths: it is run by local government and it outlines the city's plans for protecting Hobart's bushlands, ecosystems and native plants and animals and it builds on community recognition that "connections between nature, history, culture, businesses and each other are the heart of our city" (City of Hobart 2018). However, this is an operational document limited in scope to land designated as "bushland". It was not developed with the strategic framework to address biodiversity outcomes or identify opportunities across divisions of council or engage with external stakeholders for outcomes across land tenure. Furthermore, a single-purpose management plan like this one does not allow the management of multifunctional urban green spaces or identify and enable synergies to maximize both local biodiversity and impacts on human wellbeing.

In order to better understand how Hobart's urban nature can be managed for both biodiversity and wellbeing benefits, the Healthy Landscapes research group of the University of Tasmania organized a workshop with local stakeholders to exchange views and brainstorm ideas on how better outcomes can be achieved. The workshop participants included stakeholders from academia and community groups, urban planners and engineers, city councillors, practitioners from five local councils and one local Aboriginal community member. Ethics approval (H0017691) was obtained and the workshop was audio-recorded so participant views and workshop outcomes could be synthesized and disseminated.

Fig. 2 Participants discuss synergies, trade-offs and solutions for managing urban green spaces for both biodiversity and health

The workshop found that many actors were involved in managing urban nature, including the practitioners and councillors from local councils, as well as also other levels of government (state and federal), not-for-profit organizations, private industry and Indigenous groups (Fig. 2). There were also many relevant policies, including traditional amenity-focussed green space policies (parks and open space, street trees, etc.), local and regional conservation and biodiversity plans and strategies for landscapes (e.g. cat containment, reserve management plans), recreation policies (e.g. mountain biking) and health and wellbeing (e.g. Healthy Tasmania strategic action plan).

The workshop explored (i) trade-offs and synergies in biodiversity and wellbeing outcomes arising from different urban nature management strategies (Table 1) and (ii) barriers to and enablers of better management strategies.

3   Conclusions

Key enablers for improved management of urban nature revolved around two main themes: community participation and education and long-term planning. Community education was seen as an important pathway to increase understanding of urban nature's biodiversity benefits, that may otherwise be perceived as a fire risk or unsafe—that is, education could reduce "biophobia". Language translators could be useful to make programmes and information sessions more inclusive and increase participation from a diverse community. Community co-design and participation in programmes can foster engagement and community pride, e.g. mountain bike project in the City of Hobart. Integrated planning (e.g. across stakeholders and government

Table 1 Potential synergies and trade-offs when managing components of urban nature for both biodiversity and health

Urban nature components	Managing urban nature for biodiversity and health	
	Potential synergies	Potential trade-offs
Street trees	• Provides biodiversity habitat • Provides ecosystem services (e.g. mitigating storm water run-off, air pollution and urban heat island effects) • Improves human health and wellbeing in a variety of ways	• Some native trees may not meet practical safety, maintenance or pollen/allergen objectives • Non-native trees are often planted for shade, safety or aesthetic features (according to Angle-Australians; e.g. elm trees), but may not provide quality habitat for local wildlife and may be perceived as Anglo-centric
Recreational infrastructure	• Encourages the use of green spaces (which can lead to people caring about the biodiversity of these spaces) • Can encourage physical activity	• Habitat loss and fragmentation • Overuse of green spaces can lead to degradation of landscape
Artificial light at night	• Encourages the use of green spaces when it is dark • Can improve safety (e.g. reducing injuries and crime)	• Increases light pollution (especially if blue-rich LED lights) • Disturbs wildlife (can make animals more vulnerable to predation) • Can disturb surrounding residents (e.g. harsh light can disrupt circadian rhythms)
Understory vegetation	• Provides habitat important for biodiverse flora and fauna	• Can be perceived as a fire risk • Can restrict access • Can lead to safety concerns
Domestic dogs	• Can encourage physical exercise • Can encourage social interactions (40% of households in Australia have canine companions; Animal Medicines Australia, 2019)	• Endangers wildlife (major source of injury and death)

silos) with a long-term vision (e.g. 50, 100 years), was seen as a strategy to foster more sustainable outcomes that could have community and biodiversity benefits.

Barriers to managing both biodiversity and health revolved around resourcing and the integration of desirable outcomes into complex governance and planning processes. Lack of resources and inequitable distribution of resources across local

councils for urban green space management led to differing levels of quality and quantity of urban nature across different areas. Environmental policymaking and management were often siloed away from health and wellbeing developments. Resourcing pressures were leading to green spaces being sold off to save on maintenance costs and make additional funds available to council and promote development opportunities. Complex administrative and policy frameworks and outdated planning schemes make urban green space management difficult, particularly when considering multifunctional outcomes. Variation in policy and approaches from developers leads to inconsistent integration and design of green space in new subdivisions.

Local government has been identified as being the "most significant sphere of government in regulating land use" (Binning et al. 1999) and the most capable at addressing the barriers. For example, local governments are well placed to address the key enabler of engaging with and educating the community, including Indigenous and First Nations people, and understanding local values and management needs. But local governments face significant barriers to that goal, including language barriers within the community, disconnects within and across levels of governments, overworked staff and insufficient resources and engagement with relevant public, private and academic expertise. Sufficient resourcing partnered with attention to the links between health and environmental management decisions, community collaboration and long-term planning would maximize the likelihood of achieving mutual biodiversity and health benefits from urban nature.

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Interdisciplinary Participative Platforms to Ensure the Wellbeing of African City Dwellers

Florence Fournet

The ISPP "Urban Dynamics and Sustainable Development"

1 Key Messages

- Adjusting scientific knowledge to the capacities and know-how of the stakeholders involved in the management and development of the city is crucial
- Providing a regional gateway to urban data in addition to national statistical services opens the way to analysing the functioning of the cities and their dynamics using updated, adjusted and validated data, and to understanding the social, economic and environmental processes at work.
- Creating platforms bringing together all relevant stakeholders appears as an efficient and more democratic way of fostering healthy cities. These platforms should be based on specific tools designed to develop an interdisciplinary and participative approach.
- The solutions resulting from the research projects would be implemented within these platforms.

F. Fournet (✉)
Montpellier, France
e-mail: florence.fournet@ird.fr

2 Introduction

In 2017, the urban African population stood at 472 million inhabitants and it is expected to double over the next 25 years (Vinay et al. 2017). This surge will be mainly driven by the countries located south of the Sahara. In this area, West Africa will be the engine of urban population growth. Urbanization results in environmental, as well as in lifestyle changes, which can impact independently and synergistically the wellbeing and health, compromising the achievement of the SDGs, in particular SDG 11 (Sustainable Cities and Communities).

Many African cities are characterized by low-rise buildings and large urban sprawl, and infrastructure investments fail to keep pace with this fast expansion. In these cities, access to services is often limited to the city core and some pockets in the peripheries, while large parts of urban space are not well provided for. In informal settlements, technological constraints combined with institutional and financial hurdles explain the difficulty to connect. In addition, people have to travel great distances to go to work generating urban mobility at the origin of the gigantic traffic jams that cities like Dakar or Abidjan are experiencing (Fig. 1).

These living conditions have direct and indirect impacts on health. The African urban population has not really experienced an epidemiological transition since infectious diseases have not been replaced by chronic diseases (Gouda et al. 2019). Rather, chronic diseases like diabetes have been added to infectious diseases such as malaria or diarrheal diseases. Infectious diseases are linked to poverty and limited access to

Fig. 1 Aerial view of Ouagadougou (2004) showing urban sprawl

healthcare system. For example, faecal pollution remains a concern in many African cities, causing high early childhood mortality, especially in informal settlements. Vector-borne diseases like malaria or dengue find in cities favourable conditions for their development (Fournet et al. 2018). For instance, the vectors of malaria breed in the spaces dedicated to urban agriculture raising the question of the compromise to be found to reduce the risk of malaria without hampering the possibility of feeding urban citizens. This question is important because it also arises on a more global scale with regard to the greening of cities. For example, there are important risks linked to the global loss of biodiversity, the closer proximity between humans and pathogens (often in newly urbanized areas) and the emergence of new infectious diseases (such as the recently appeared COVID-19).

As for chronic diseases, their emergence in the African urban world lies not only on the adoption of a sedentary lifestyle and unhealthy diets but also on pollution. The latter is now recognized as a causative agent for respiratory pathologies (asthma, obstructive pulmonary disease) and also cancers. The main sources of pollution are industry, power generation, agricultural burning, transport and traffic, the combustion of wood, coal, unpaved roads and burning of household solid waste.

An indirect impact on health is correlated with the loss of productive urban and peri-urban agricultural land for the benefit of the town sprawl. As a result, production of the main staples such as maize, rice, cassava and yam, for example, fell. This affects household livelihoods and food (Fig. 2).

This double burden of infectious and chronic diseases weighs heavily on the health system (which is not prepared at its first level of entry), on the households (people may have to choose between treating malaria in a child or hypertension in an adult),

Fig. 2 Rice culture in lowland irrigated in Bouaké, Côte d'Ivoire

and more generally on policy development. Moreover, many of these health problems (and their underlying environmental and social factors) remain poorly understood (e.g. links between pollution and allergies or cancers) and probably underestimated. Indeed, there is no functional and generalized system for registering, and then linking social (civil status, socio-demographic data, etc.) and health data. In particular, despite the efforts of the World Health Organization (WHO), recording of cancer cases is still underdeveloped in low- and middle-income countries (Fatunmbi et al. 2019).

These health issues are and will be exacerbated by climate change, adding pressure to already highly constrained environments. For example, cities located in the African intertropical area will be particularly vulnerable to intensified rains and temperatures (IPCC 2007; de Sherbinin et al. 2007; Douglas et al. 2008). The consequences of this vulnerability are manifold and recently illustrated by extreme events, such as floods observed in Abidjan in 2010 (Kangah and Alla Della 2015), or more recently, in 2018 and 2019. In addition, urban growth very often induces over-exploitation and degradation of natural resources (water, soil, biodiversity, etc.) and associated ecosystem services (water flow regulation, carbon storage, mitigation of the urban heat island, urban agriculture production) (Fig. 3).

Coastal areas represent particular challenges. The ocean is a resource (fishing) but also a danger (rising water level in connection with the global warming). This also leads to specific problems such as the salinization of soil and surface water (consequence of market gardening), coastal erosion (destruction of habitat), pollution of groundwater which is a potential sources of water supply and the disappearance of peri-urban mangroves or the pollution of lagoon waters with its ecological and health consequences.

Fig. 3 Flooded houses in Pikine, Sénégal

Above all, urbanization is marked by the production of inequalities of all kinds. This is true not on;y between countries, between cities in the same country but also within the same city. The prevalence of malnutrition among urban children in sub-Saharan Africa has increased faster than the urban population itself. In Angola, the Central African Republic and Senegal, a study found that poor urban children were as likely to be stunted as poor rural children (Kennedy et al. 2006). But at the same time, Ziraba et al. (2009) found that overweight and obesity were on a higher increase among urban poor populations in sub-Saharan Africa.

So how do we make these cities healthier?

In 2020, a workshop organized in Abidjan (Côte d'Ivoire), has brought together researchers, private and public operators, civil society, policymakers and financial partners around the issue of sustainable cities. It aimed at identifying opportunities for research collaborations across West and Central Africa, to explore priorities and needs for sustainable cities, to produce new tools for capacity building and to help cities to become healthier.

3   What Research Gaps Need to Be Filled and How

Urban planning, risk management, biodiversity, governance, accessibility of services, emerging diseases, sources and impacts of pollution have been identified as major and complex research issues to be tackled by intersectoral collaboration. This will allow to produce a clearer definition of what should be a sustainable and healthy city in Southern countries. It is evident that the solutions and models for sustainable cities developed in Western countries are not applicable to cities of the South. Fourchard critiques the vision of the architect Rem Koolhaas that sees Lagos as an anomaly and a failure of urban planning. On the contrary, he underlines how the informal occupation of public spaces is a "form of urbanity" that requires to understand the uniqueness of African cities and their specific needs. Such definition must be the starting point for the interdisciplinary work that is indispensable for the sustainable improvement of the living conditions and health of urban Africans.

4   The Data Paradox: Not Enough, or Too Much and Rarely Operational

Many research teams in Africa are studying urban dynamics and their underlying processes: social demography, health and environment, climate impact, availability of resources, urban metabolism, urban governance… This research is often implemented through population observatories such as that of Ouagadougou in Burkina Faso (Rossier et al. 2019). However, these researches generate data which are hardly

visible, concern some domains more than others, and are often inaccessible due to their great dispersion because of sectoral and institutional fragmentation, two very serious barriers to an interdisciplinary approach. In addition, this data can be collected at different scales which are not always compatible with each other. Also, they are not always updated on a regular basis. Also, the knowledge produced could advantageously be made available, archived to be kept, through a data portal.

5 Advocacy for Inclusive Cities

The need to bring together locally the different actors of "the sustainable city" (i.e. private companies, civil society, donors, administration, technical services and elected officials, scientists, observatory managers) within participative platforms appeared essential. These platforms would have both an advisory role (entry point for all projects related to the sustainability of cities and the health of their inhabitants) and a prospective role (anticipating and stimulating initiatives of all actors such as public decision-makers or NGOs). They could also advocate for a model of collective governance through multi-actor approaches, taking into account the challenges of cities considered complex systems and in close interaction with scientific knowledge.

6 Capacity Building in Interdisciplinarity

Addressing the issue of sustainable and healthy cities calls for an interdisciplinary approach to grasp the complexity of such a subject of study. The structuring of university teaching is largely disciplinary and does encourage specialization. This is not necessarily a problem as "solid" interdisciplinarity must be based on researchers firmly rooted in their disciplines, but open to dialogue and collaboration with other disciplines. Nevertheless, the underlying skills and the necessary tools of interdisciplinarity must be taught. To reach this objective an "educational kit" dedicated to interdisciplinarity in the context of healthy towns should be developed with a relevant bibliography, feedback from ongoing projects, concept and method handbooks, exercises and guidance for participatory approaches. This "educational kit" would be intended to students, researchers and stakeholders.

7 Conclusion

It took a long time for health not to be strictly restricted to the medical field, a long time also for urban health to be recognized with the institutionalization of an annual world day. Several holistic and interdisciplinary approaches have emerged in recent years to improve health. Planetary health, One health or Eco health are conceptual movements whose implementation requires strong intersectoral political commitment (Lerner and Berg 2017). If sustainable development and the development of healthy communities in African cities is to be supported, such a commitment is necessary.

Health in all policies is another response to these challenges. **Nevertheless,** we need to go a step further and that participatory research integrating not only all disciplinary, technical, empirical and traditional knowledge but also all actors of the cities must be implemented. Participatory platforms can provide a framework for this shift.

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Access to Contraceptives Among Urban Residents Living in Informal Settlements in Kira Municipality, Uganda

Moses Tetui

1 Key Messages

- Most facilities that offer family planning services are small privately owned clinics and drug shops. These often have limited capacity to provide all the needed services to the population. Additionally, the access to modern contraceptives for those unable to afford could be seriously curtailed where private actors are the main providers. Regulation and quality control measures therefore have to be heightened, especially in informal settlements where private actors form the bulk of healthcare providers and contraceptive services specifically.
- Facilities in informal settlements have a comparatively limited stock of long-acting contraceptives. It's important that access to a wide range of contraceptives is made available to all women who may need it at any one point. Working through public-private partnerships can improve this access since the majority of facilities in informal settlements are small private clinics and drug shops with limited capacity.
- A considerable number of facilities do not offer contraceptives to unmarried adolescents. Engaging existing providers and key stakeholders to promote access to contraceptives for all women who need is essential. This will contribute to limiting undesirable maternal health outcomes such as unsafe abortions and teenage pregnancies.

M. Tetui (✉)
Department of Health Policy, Planning and Management at, Makerere University in Uganda, Kampala, Uganda
e-mail: mtetui@musph.ac.ug

Department of Epidemiology and Global Health at, Umeå University, Umeå, Sweden

2   Introduction

The world's population is projected to grow by an additional one billion before the end of the century, more than half of this growth shall come from countries in sub-Saharan Africa (UN DESA 2019). Similarly, 68% of the world's population shall be urbanized by 2050, again most of this growth shall be driven by sub-Saharan Africa and Asian countries (UN DESA 2018). This, therefore, calls for an urgent attention to population growth control, especially in urban spaces. It's a known fact that in most low-income countries, urban population disparities invariably affect the urban poor (Ezeh et al., 2017; Lilford et al., 2017). The urban poor often live in informal settlements and usually make up the vast majority of the urban population. For example, 60% of the Kampala (Uganda's capital city) population, resides in informal settlements (UBS 2017).

Globally, access to family planning services remains a public health challenge (WHO 2018). The unmet need for family planning remains highest in low-income countries (Azmat et al. 2015), with 22% of sexually active women not using a modern contraceptive method even when they desire to (UN DESA 2015). The family planning unmet need has stagnated in Uganda for over decade. This stagnation cuts across urban and rural residents. According to the latest demography and health survey done in 2016, there is still a high 22% unmet need of family planning among Urban residents. This figure falls below the country's current commitment to reduce the unmet need for family planning to 10% and increase the modern contraceptive prevalence rate among married women to 50% under the 2020 family planning vision (MHU 2016; FP 2020. With the current urbanization growth rate of about 6%, the urban population is projected to double in the near future (UBOS and ICF 2016), thereby making the challenge even bigger. Apart from the capital city, Kampala, Wakiso is the most urbanized district in Uganda with 70% of its population living in urban areas. With a highly heterogeneous population with residents coming from all parts of Uganda and beyond.

A majority of urban residents live in informal settlements, often without proper social services including healthcare, education and sanitation services. Such residents are often more vulnerable in terms of accessing services such as quality modern contraceptives when needed owing to their social-economic status which is usually lower than that of the other urban residents. Interestingly, people living in informal settlements are always assumed to have better access to services and information, hence interventions targeting urban places are often fewer (Vlahov et al. 2007). Therefore, the designing of urban reproductive health services and indeed all services should pay attention to these urban disparities, so as to increase equitable access to services.

3 About the Research

A cross-sectional study was conducted to determine the availability and distribution of family planning services in Kira, municipality, Wakiso District, Uganda. Mapping and analysis were conducted using GIS mobile technology and ArcGIS (version 10.1), respectively. A service provision questionnaire was administered to establish the services offered. This was analysed using STATA to determine the family planning service provision offered by facilities in informal settlements compared to those in formal settlements (Fig. 1).

4 Key Findings

- The municipality has only four public health facilities, all of which are lower level facilities (Health Centres II and III, see Fig. 2). A majority of the facilities were privately owned (95%) and are mostly small clinics or drug shops with 1–3 rooms. This could indicate inequitable access to modern contraceptives since access could be determined by ability to pay.
- On the day of the survey, more than 48% (86/176) of the facilities had less than three modern contraceptive methods in stock for clients. There was no significant difference noted between the areas of settlement when all the methods were put into consideration. However, a look at the availability of at least one long-acting method indicated that fewer facilities in the informal settlements had the implant or IUD available on the day of the survey, a difference that was found to be statistically significant. Short-acting contraceptives are less protective against unintended pregnancies, thereby making women living in informal settlements more vulnerable.
- Almost 25% of the facilities did not offer contraceptive services (counselling and commodities) to unmarried adolescents in facilities found in both informal and formal settlements. Unmarried adolescents, especially in areas of lower socio-economic status, are more vulnerable to sexual exploitation and thereby having unintended pregnancies.

5 Recommendations

- There is a need to take into account the informal and non-informal urban settlement disparities that affect the utilization of family planning services when designing service delivery mechanisms. This calls for a review of the service provision policy in urban spaces to create a stronger linkage between urban planners and service provision sectors or departments.
- Increasing access to contraceptives for women living in informal settlements through public-private partnerships can be strengthened further. While these

Fig. 1 A map of Kira Municipality indicating its geographical demarcations

efforts exist, more needs to be done to ensure that contraceptive stock levels are maintained, and a higher level of contraceptive method mix is developed and sustained. The availability of especially long-acting contraceptives such as implants and intrauterine devices (IUD)s should be strengthened. This will be essential in facilitating the users' contraceptive choices and increasing the chances of use.
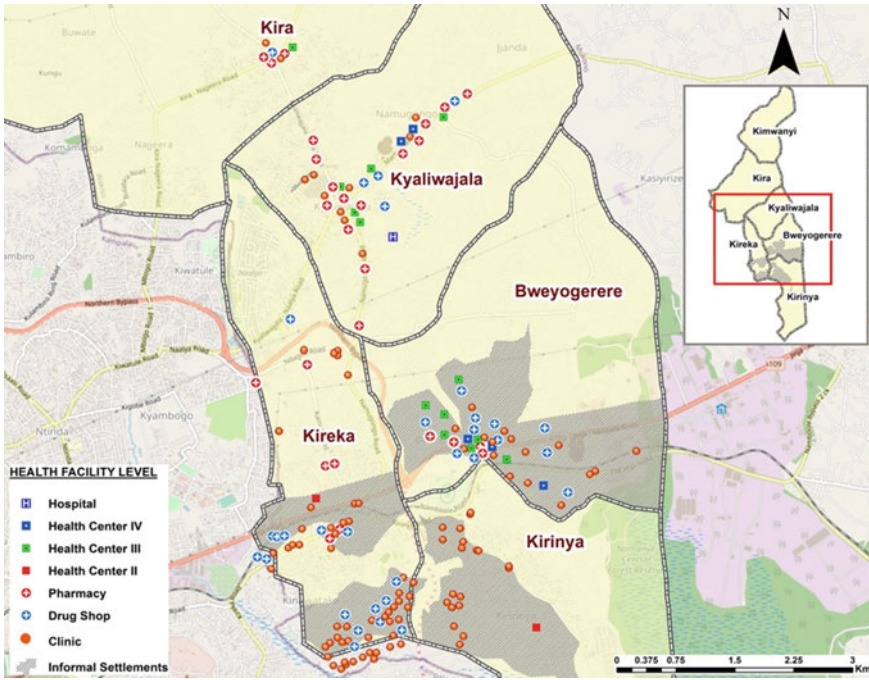
Fig. 2 A map illustrating the kind of health facilities found in Kira Municipality by the level of care

- Increasing access to contraceptive services for more vulnerable groups such as unmarried adolescents is key. This will create greater decision-making power, especially for unmarried adolescents over their sexuality and reproductive health rights.
- Policy directives against discrimination of adolescents in the provision of contraceptives should be considered in line with other existing laws such as the legal age of consent.

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Effective Execution of Provisions Under Cigarettes and Other Tobacco Products Act (COTPA) Through Multisectoral Approach to Reduce Use of Tobacco in Indore City, India

Neeraj Mishra

1 Key Messages

- Following the approval of the Framework Convention on Tobacco Control by the World Health Assembly in May 2003, India passed the Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) (COTPA) Act later that year showing political will to control tobacco use.
- The Government of India launched the National Tobacco Control Program (NTCP) in 2007–2008 and also assessed the prevalence of tobacco use by undertaking the Global Adult Tobacco Survey in 2009–10 and 2016–17. However, implementation of the COTPA and NTCP remain major challenges.
- Under the USAID-funded Building Healthy Cities (BHC) project, several initiatives were undertaken in Indore City in 2018 and 2019 including orientation of City Officers on provisions of COTPA; completion of a Non-Communicable Disease (NCD) Risk Factors & Environment Survey to estimate prevalence of all tobaco use and support to the city in the Multi-Sectoral Indore Smart City Working Group to formulate an action plan for effective tobacco control in the city. These steps at the city level supported a policy decision by the city administration to make Indore a COTPA-compliant city by the year 2022.

N. Mishra (✉)
John Snow India Private Limited, Delhi, India
e-mail: neeraj_mishra@in.jsi.com

2   Introduction and Background

In India, of the more than 266 million people who are tobacco users, almost 200 million are smokeless users and almost 100 million are smokers (Fig. 1), Tata Institute of Social Sciences (TISS) and Ministry of Health and Family Welfare, Government of India, n.d.).

   Tobacco use is one of the most preventable causes of death and disability. Despite knowing their ill effects, most regular users still continue to use tobacco. Tobacco smoke is made up of thousands of chemicals, including at least 70 known to cause cancer (American Cancer Society, 2017). World Health Organization passed resolutions in 1986 and 1990, urging the member states to take necessary action to stop passive smoking. The World Health Assembly passed the resolution on Framework Convention on Tobacco Control (FCTC) on May 21, 2003. Many countries including India voted to adopt FCTC (WHO n.d.).

   The Government of India introduced laws and regulations to control the use of tobacco and its products including the following:

(1)   Ministry of Health & Family Welfare of the Government of India enacted comprehensive legislation, namely, the Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003 (COTPA 2003) to discourage the consumption of tobacco products and prevent health hazards (Ministry of Law and Justice 2003).
(2)   Regulation 2.3.4 of Food Safety and Standards (Prohibition and Restrictions on Sales) Regulations, 2011 dated August 1, 2011, issued under the Food Safety and Standards Act, 2006 by the Food Safety & Standards Authority of India
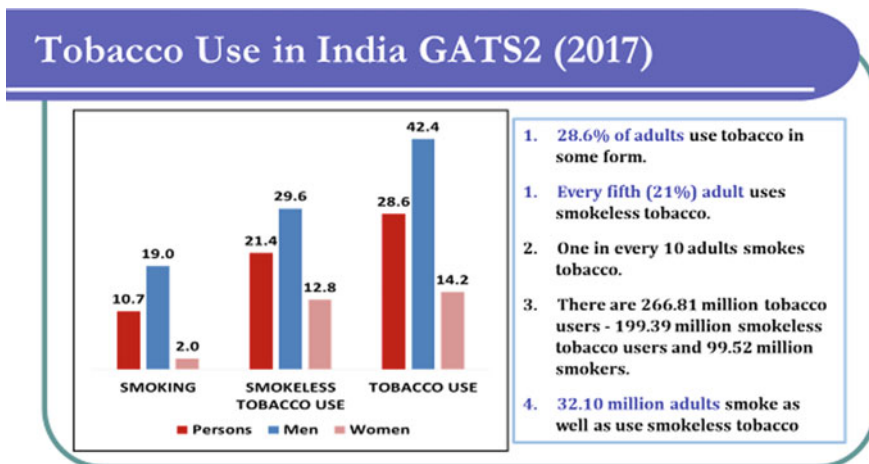

Fig. 1   Tobacco use in India 2017

(FSSAI), lays down that tobacco and nicotine shall not be used as ingredients in any food products (Ministry of Health and Family Welfare 2011).

(3) Section-77 of the Juvenile Justice (Care and Protection of Children) Act (2015), states that whoever gives, or causes to be given, to any child any intoxicating liquor or any narcotic drug or tobacco products or psychotropic substance, except on the order of a duly qualified medical practitioner, shall be punishable with rigorous imprisonment for a term which may extend to 7 years and shall also be liable to a fine which may extend up to one lakh rupees (Ministry of Law and Justice 2015).

(4) The Prohibition of Electronic Cigarettes Ordinance of 2019 prohibits the production, manufacture, import, export, transport, sale, distribution, storage and advertisement of electronic cigarettes.

The COTPA has provisions for restricting the sale of tobacco products, banning sale near educational institutions, restrictions on smoking at public places, ban on advertising of tobacco and warning signs on packaging of tobacco products. The District administration of Indore had initiated the following actions to reduce tobacco use:

(1) Smoking in public places was banned since October 2, 2008.
(2) The District Tobacco Control Committee was re-organized and expanded to involve more departments and integrate efforts
(3) A Sub-divisional Magistrate was designated as the Nodal Officer to enforce and monitor COTPA (2003) provisions.
(4) The District Administration with the help of IMC removed more than 700 hoardings which were violating provisions under section 5 of the COTPA.
(5) The Urban Administration and Development Department designated zonal officers as nodal officers to enforce COTPA provisions in each and every zones of urban local bodies
(6) The IMC intensified efforts to stop spitting in open by imposing fine a of ₹500 under the Swachh Bharat Abhiyan (Clean India Mission).

Despite these efforts, implementation of COTPA was a challenge. Smoking in public places in Indore was a common sight. Many small shopkeepers were selling tobacco products without permission and some even selling to children.

The USAID-funded Building Healthy Cities (BHC) Project is being implemented in three smart cities across Asia to refocus city policies, planning and services with a health equity lens while improving data-driven decision-making for Smart Cities. BHC project was is working to support the city of Indore, India, since March 2018. This brief highlights specific activities that BHC has supported to move Indore towards COTPA compliance.

3   Insights

In 2018, BHC and Indore Smart City (ISCDL) co-funded an NCD Risk Factors & Environment Survey in Indore (Building Healthy Cities 2019). The survey provided data on a wide variety of health behaviours including the prevalence of tobacco and alcohol use, dietary practices, physical activity and risk of common NCDs. The survey revealed that one in three adult men was currently using some form of tobacco products; this figure was six times lower among women. Poor adults (lowest quintile) were using tobacco products more often than rich citizens. Also relevant to COTPA, over half Indoreans were exposed to secondhand smoke during travel, and one-third were exposed during work, exposing how widespread exposure to tobacco smoke is in public places. This has implications for the working-age population as well as maternal and child health. Table 1 below gives details of tobacco use in Indore city.

The BHC Workplan for 2018, approved by the City Government included an orientation training to build capacity of city officers on provisions of COTPA and their enforcement. The training was developed in consultation with several experts on tobacco control, including key officials from the Government of India. The training was organized in July 2018 and attended by 198 city officers from IMC, Departments of Health, Social Welfare, Slum Development, Police and NGOs actively working in Indore.

BHC also supported the formation of a "multi-sector smart health working group" in Indore which was formally convened and is chaired by Chief Executive Officer, ISCDL and co-chaired by the Chief Medical and Health Officer, Indore. The group consists of district heads from the Departments of Health, Education, Women & Child Development, Water Supply, Traffic and Madhya Pradesh Pollution Control Board (MPPCB) as well as representatives from various developmental partners working for health in Indore.

This working group provides a platform to discuss many cross-cutting health-related issues. The results of the NCD risk factor survey were disseminated by BHC, in the presence of CEO, ISCDL, Chief Medical and Health Officer, Indore, partners and other stakeholders on May 31, 2019 on the occasion of the World No Tobacco Day 9 (Fig. 2). On the conclusion of this meeting, it was decided to make Indore a COTPA-compliant city by enforcing provisions of the act and reducing the prevalence of tobacco use.

Finally, in addition to the training and capacity development, BHC has also been implementing a Health Promoting School (HPS) program in Indore to promote healthy behaviour among students through trained teachers of middle, high and higher secondary schools. This work is helping to, among other things, promote COTPA compliance in school areas, which will have a positive impact on second-hand smoke exposure among children. Under HPS, an assessment was conducted on the status of existing infrastructure and captured the exposure of tobacco products on the school premises. One of the objectives of the assessment was to share findings to the concerned department for necessary action at policy as well as implementation level. In line with the HPS program, the Department of Education has completed

Table 1 Details of tobacco use in Indore city

	Men (95% confidence intervals)	Women	Both	Lowest wealth quintile	Highest Wealth quintile
Current tobacco users (smoke and smokeless) (%)	37(34–40)	6(5–7)	21(19–23)	35(30–39)	12(9–15)
Current smokers (%)	12(10–15)	0	6(5–7)	7(5–10)	5(3–8)
Current smokeless tobacco users (%)	28(25–31)	6(5–7)	17(15–18)	31(27–36)	7(5–10)
Adults exposed to secondhand smoke at home in the last 30 days (%)	25(23–28)	18(17–20)	22(20–24)	29(25–33)	17(14–21)
Adults exposed to second-hand smoke at work in last 30 days (%)	32(29–35)	14(12–16)	24(22–26)	29(25–34)	21(17–26)
Adults exposed to second-hand smoke while travelling during the last 30 days (%)	57(53–60)	35(33–37)	46(44–48)	53(48–57)	39(35–44)

Managing urban gre
(95% confidence intervals)
Source BHC Project 2019. "Indore Noncommunicable Disease Risk Factor & Environment Survey: Fact Sheet." Arlington, VA: USAID-funded Building Healthy Cities Project. https://publications. jsi.com/JSIInternet/Inc/Common/_download_pub.cfm?id=22434&lid=3

"yellow line marking" in many schools indicating that a radius of 100 m around schools is a no-tobacco zone.

4   Policy Recommendations

The ISCDL and Health department are continuing to work to develop better preventive efforts for tobacco use in Indore. Some of the most important suggestions from BHC's overall work to improve citizen health in Indore include:

Fig. 2 NCD survey factsheet released by CEO, ISCDL and other delegates in Indore on May 31, 2019 (Photo: Gupta Vision Video, Indore)

(1) *Enforce the various provisions of COPTA.* To enforce the act in Indore, IMC with the support of ISCDL, BHC and other government departments should enforce COPTA's bans on spitting in the open, advertising tobacco products and public smoking as well as restricting the sale of tobacco products to those below 18 years of age. Under the Swachh Bharat Abhiyan, IMC is already working to make the city clean, therefore it can integrate COPTA enforcement easily with existing teams.

(2) *Involve elected representative and community leaders.* Engaging local community leaders (formal and informal) is essential to raise citizen awareness about the harms of tobacco use, and understand the reasons that citizen continue to use even after knowing the risks. Consistent efforts are required to change behaviour towards tobacco products. Elected representatives are the link between the administration and the public. District administration should work as a convener between various government departments, police, NGOs and elected representatives.

(3) *Regulate Vender Licensing.* Strict vender licensing is necessary to control the illegal sale of tobacco products. IMC must tighten the execution of provisions under COTPA when giving license to shopkeepers to sell tobacco products. This will require vigilant monitoring.

(4) *Raise awareness of Indore as a COPTA-compliant city.* Behaviour change requires disseminating the information through multi-media including television, radio and the internet focusing on adolescents and young adults.

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Operationalizing the One Health Approach in a Context of Urban Transformations

Timo Falkenberg, Juliana Minetto Gellert Paris, Krupali Patel, Ana Maria Perez Arredondo, Dennis Schmiege, and Sandul Yasobant

1   Key messages

1. Urban transformations have implications beyond the health of humans, also affecting the health of animals and the natural environment.
2. The One Health approach can be applied to the urban context to address complex health issues, to engage collaborative and coordinated actions at various levels and scales of operationalization.
3. The diverse sources of health threats in the urban context call for intersectoral collaborations under one umbrella to achieve health in all policies.
4. The process for intersectoral collaboration has to emerge from a common understanding of the drivers of urban change, the implications of urban transformations focusing on the threats to health, the strategies to tackle threats to health and the outcomes pursued.
5. We propose a framework for operationalizing the One Health approach in the context of urban transformation.

2   Background

Urban transformation processes create immense changes in social, economic, ecological, technological and institutional spheres, while at the same time being itself a result of changes in those spheres.

As a powerful driver of change, urban transformation brings different health benefits and threats (Maassen and Galvin, 2019). On the one hand, the desire for a better life, access to employment, markets, education, the provision of advanced and better

T. Falkenberg (✉) · J. M. G. Paris · K. Patel · A. M. P. Arredondo · D. Schmiege · S. Yasobant
Center for Development Research (ZEF), Rheinische Friedrich-Wilhelms-University of Bonn, Forschungskolleg 'One Health', Bonn, Germany
e-mail: falkenberg@uni-bonn.de

health care and access to health facilities are the main attractions for rural-urban migration and consequent urban expansion. On the other hand, the evolution of complex and unplanned urbanization, especially in low- and middle-income countries, is driving processes that directly and indirectly influence the wellbeing of urban dwellers and the incidence of various communicable and non-communicable diseases including mental health issues. Some examples of the adverse effects of urban transformation are higher population density, poor social and living conditions, unplanned conversion of land use to satisfy the demand for food and housing, contamination of water bodies, soil degradation, air and noise pollution, inadequate sanitation and waste disposal and traffic congestion, among others.

In an interconnected world in which trading goods and services between sectors and across borders are entirely common, urban transformations such as spatial change, demographic change, institutional change and digitalization have implications beyond the health of humans, also affecting the health of animals and the natural environment. Therefore, there is a need to look at (urban) health from an integrative perspective. Under this light, the One Health approach recognizes that the health of humans, animals and the environment are intertwined (One Health Commission, 2020): impacts in one of the domains may entail implications for the other—a clear delineation is impossible. In the graduate school "One Health and Urban Transformation", we accumulate knowledge at the interface of those two concepts. Crosscutting topics include the connection between biodiversity and health through blue and green infrastructure, food systems and food security, health governance, the distribution of antibiotic resistance in the community and environmental compartments, as well as issues around water, sanitation and hygiene.

The integrated perspective on which One Health is based urges that multiple sectors work collaboratively under one umbrella (i.e. intersectoral collaboration) (Kuruvilla et al., 2018) capitalizing on interdependent threats to health, to achieve health in all policies that integrate and articulate health considerations into policy-making across sectors to improve the health of all, enhancing efficiency, synergies and co-benefits for urban dwellers (Shankardass et al., 2018).

3 Framework for Operationalizing One Health in the City Context

The diverse realities that encompass the dimensions of urban settings and their different outcomes to urban health and wellbeing, constitute a complex health issue, which requires system thinking. Therefore, the implementation of strategies at the human-animal-environment interface needs (1) coordination among the several institutions involved in the urban health complexity; (2) a flow of integrated action from international to national, regional and subsequent local and city levels; (3) the integration of different sectors with target-oriented actions as public health, animal health,

agriculture, environment, infrastructure and services administration; and (4) and the inclusion of socio-economic and cultural contexts of the urban reality.

To facilitate addressing health as a complex issue, One Health can be applied to the urban context seeking collaborative and coordinated actions at various levels and scales of operationalization. Yet, the process for intersectoral collaboration has to emerge from a common understanding of the drivers of urban change, the implications of urban transformations focusing on the threats to health, the strategies to tackle those threats and clearly defined outcomes. For this purpose, we propose a framework for operationalizing One Health using the DPSIR framework as a reference (Kristensen, 2004) (Fig. 1).

For enabling intersectoral collaborations under the OH approach, Fig. 2 explains the components of the framework for operationalizing One Health.

Intersectoral collaboration following the One Health approach will enable multiple actors and sectors to use the transformative power of cities for the promotion of health and wellbeing. Like any other complex issue, developing the base for intersectoral collaboration is an iterative process that needs to involve all actors to achieve joint prioritization and consent. For example, the threats to health can be identified in a first instance, and the grouping of those threats might allow for the identification of the drivers of change. Another option is to use the desired outcomes to determine the actors and sectors relevant to the development and application of strategies. Moreover, the outcomes can intrinsically create drivers of change for future transformation processes.

4   Application of Framework for Operationalizing One Health: The Case of Antibiotic Resistance

The following example is given for illustrative purposes and does not intend to be exhaustive.

The development of resistance in bacteria against antibiotics constitutes undeniably one of the greatest public health challenges of our time. The One Health approach is often mentioned as a highly promising strategy to tackle antibiotic resistance (ABR) (Laxminarayan et al., 2020).

Applying our proposed framework to ABR in the context of urban transformation helps to develop a common ground to minimize the development of ABR without jeopardizing the health of animals, humans or the environment (see Fig. 3). The main driving force of ABR is the inappropriate and excessive use of antibiotics in humans, animals and plants. In turn, this is influenced by other factors, such as population growth and ageing populations, unhealthy lifestyles, intensification of agriculture, aquaculture and livestock production, overcrowding or unregulated access to antibiotics. The threat of ABR is the infection of human or non-human individuals with (multidrug-) resistant bacteria, which may be impossible to treat. There are implications at the individual level but also higher spatial scales (e.g.
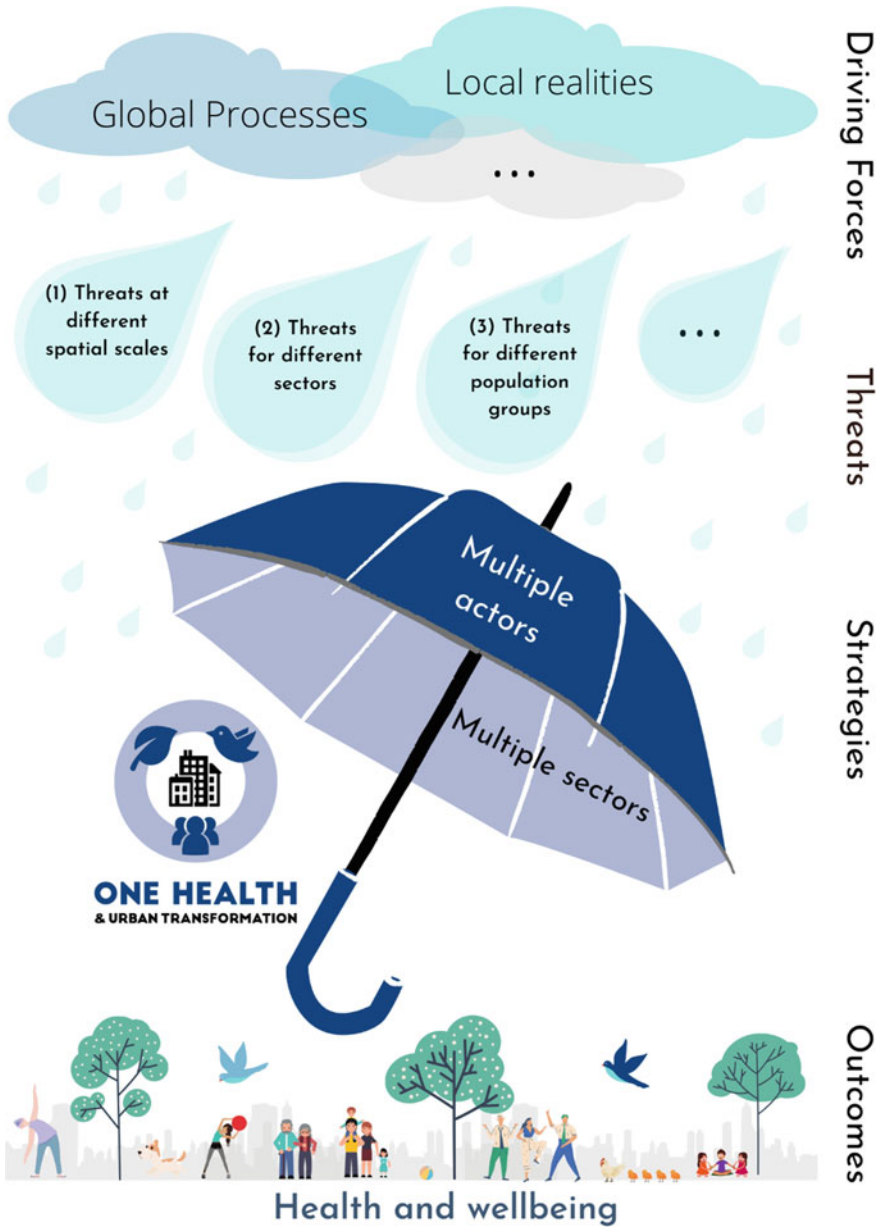
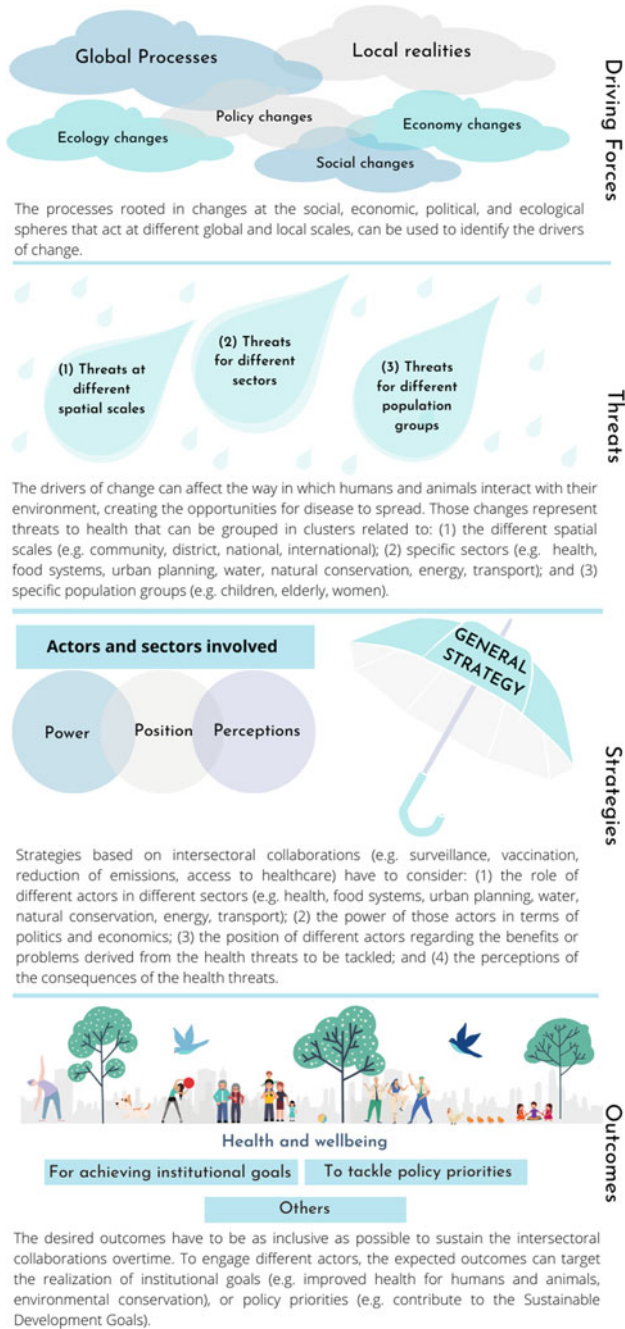**Fig. 1** Framework for operationalizing One Health

Driving Forces

Global Processes

Local realities

Policy changes

Ecology changes

Economy changes

Social changes

The processes rooted in changes at the social, economic, political, and ecological spheres that act at different global and local scales, can be used to identify the drivers of change.

Threats

(1) Threats at different spatial scales

(2) Threats for different sectors

(3) Threats for different population groups

The drivers of change can affect the way in which humans and animals interact with their environment, creating the opportunities for disease to spread. Those changes represent threats to health that can be grouped in clusters related to: (1) the different spatial scales (e.g. community, district, national, international); (2) specific sectors (e.g. health, food systems, urban planning, water, natural conservation, energy, transport); and (3) specific population groups (e.g. children, elderly, women).

Strategies

Actors and sectors involved

GENERAL STRATEGY

Power   Position   Perceptions

Strategies based on intersectoral collaborations (e.g. surveillance, vaccination, reduction of emissions, access to healthcare) have to consider: (1) the role of different actors in different sectors (e.g. health, food systems, urban planning, water, natural conservation, energy, transport); (2) the power of those actors in terms of politics and economics; (3) the position of different actors regarding the benefits or problems derived from the health threats to be tackled; and (4) the perceptions of the consequences of the health threats.

Outcomes

Health and wellbeing

For achieving institutional goals   To tackle policy priorities

Others

The desired outcomes have to be as inclusive as possible to sustain the intersectoral collaborations overtime. To engage different actors, the expected outcomes can target the realization of institutional goals (e.g. improved health for humans and animals, environmental conservation), or policy priorities (e.g. contribute to the Sustainable Development Goals).

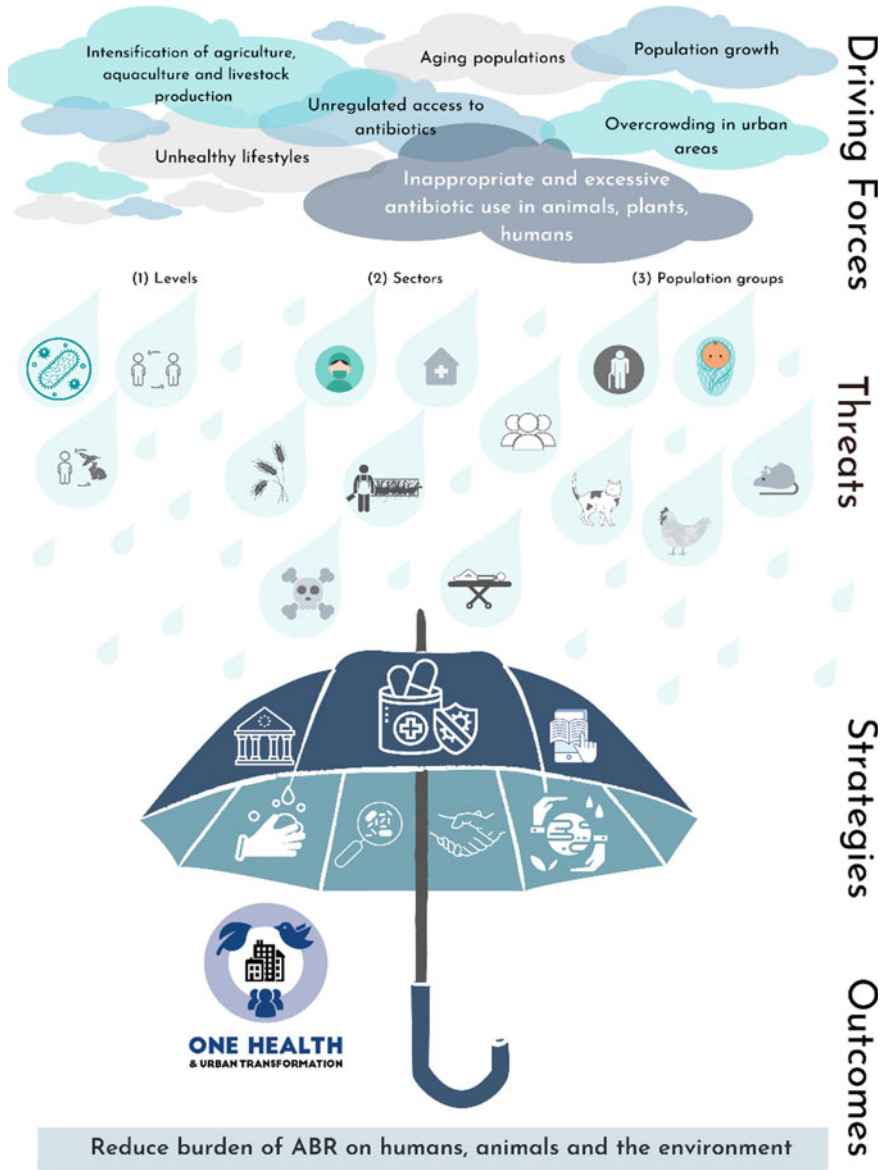**Fig. 2** Elements of the framework for operationalizing One Health

Fig. 3 Framework for operationalizing One Health applied to the case of antibiotic resistance

outbreaks in the community or healthcare settings). Specific populations at risk not only include children and the elderly, as well as people with underlying health conditions, but also animal handlers and animals, including livestock, pets and wildlife, can be affected. Strategies can centre around the reduction of antibiotic use, e.g. through water, sanitation and hygiene (WASH) interventions, public education or the regulation of markets, as well as the integration of intersectoral efforts, e.g. for the surveillance of resistance in bacteria. The desired outcome is the reduction of the burden of ABR for humans, animals and the environment.

5   Policy Recommendations

Based on the experiences of the graduate school "One Health and Urban Transformation" in various research fields and distinct geographical settings in Accra, Ahmedabad, Sao Paulo and the Ruhr Metropolis, it needs to be acknowledged that the impacts of urban transformation vary widely across space and time. Moreover, to address the effects on the health and wellbeing of humans, animals and the environment caused by urban transformation is a difficult task that needs the cooperation of multiple actors, which can only be mobilized through strong incentives for action, functioning and reliable institutions, availability of financial resources and clear role distributions.

In the context of urban health and wellbeing, we derived the following policy recommendations:

- Intersectoral collaboration following the One Health approach will enable multiple actors and sectors to use the transformative power of cities for the promotion of health.
- The process for enabling intersectoral collaboration with an integrative health perspective (e.g. One Health) to develop targeted and locally suited strategies has to be based on joint prioritization of health (leading to health in all policies).
- It is advisable to use a systems approach through participatory methods among the actors involved in the strategies to address complex health issues, for the development, application and evaluation of the operational plans for the different contexts.
- Promoting synergies is a continuous process with varying levels of integration between the actors, i.e. communication, cooperation/alliance, coordination/partnership, coalition and collaboration/integration. Each urban setting should identify their current stage and proceed towards the highest ladder of this collaboration process.

Relevant Links

https://www.zef.de/onehealth.html

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