



Urban Health and Wellbeing in the Anthropocene

An Interdisciplinary Science-Action Plan for Urban Health and Wellbeing in an Age of Complexity and Systemic Risks (2021 – 2025)

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Foreword by Prof. Dr. ZHU Yongguan

Today, a majority of the global population lives in cities, and urban environment is a model ecosystem for studying and better understanding the health impacts from rapidly changing and increasing complex social, ecological and technological systems. Since its inauguration at the Institute of Urban Environment in Xiamen, the Urban Health and Wellbeing programme has restlessly worked, together with its partners and scientific committee members, to elaborate theory and create collective learning platforms which help us navigate through that complexity. The programme has developed and promoted a systems approach which has been adopted and implemented in a variety of policies and projects in different regions of the world, from San Salvador, where the government implemented the Modelo de Salud Urbana, an integrated interministerial platform which aims at putting Health into All Policies, to Beirut, Lebanon, where a new interdisciplinary Urban Laboratory has been created that puts health at the heart of urban and territorial planning and adopts a collaborative systems modelling approach. The systems approach to urban health and wellbeing jointly developed at the Institute of Urban Environment, puts health to its center, however, extends the notion of human health to the health of other living systems on which human health and prosperity depend. In doing so it has crossed disciplinary boundaries by cooperating with other important science programmes which address disaster risk reduction and data science. The impact of the Urban Health and Wellbeing Programme has crossed the boundaries well beyond those of the city and has shown us how urban, peri-urban, rural and natural environments are all interlinked and interdependent determinants of planetary health. The systems approach is a necessary tool to better understand these interdependencies and develop solutions for enhancing human, urban and planetary health in the real world.



Prof. Dr. ZHU Yongguan

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Preface One

Ten years after its establishment, the Urban Health and Wellbeing programme (UHWB) publishes a second Science Action Plan, for the years 2021 to 2025. The International Science Council (ISC) and the International Society for Urban Health (ISUH) welcome the work by the UHWB community in producing a programmatic document and a roadmap for the programme. The 2021-2025 Plan is an important milestone in UHWB's existence. We have no doubt that it will lead to critical projects and collaborations that will advance urban health and wellbeing worldwide.

In the first years of its existence, UHWB has made strong contributions to our understanding of the factors and dynamics affecting the health and wellbeing of urban populations, thereby supporting cities' efforts to implement the New Urban Agenda and achieve the SGDs. The 2021-2025 Plan marks the culmination of a stock-taking exercise by the programme's Scientific Committee (SC) of key programme achievements and of evolutions in the field of urban health since 2011. The UHWB SC has now identified the "health of cities" as the core focus of the programme's activities in the coming years, evolving from its previous ambition to advance healthy lives in healthy cities.

This development is more than a change in semantics; it denotes an expansion from a focus on human health to approaches where cities create conditions for healthy people and for a healthy planet. As the recent COVID-19 pandemic has demonstrated, the interlinkages, synergies, trade-offs and feedbacks between human systems and environmental systems in a rapidly urbanizing world make such integrated approach of human health and planetary health necessary and urgent. Cities are neuralgic centres in our social-environmental systems. They are the loci where much of the challenges emerge but also where the foresight, planning and decision-making on how to address them can be made and implemented. UHWB's work on the health of cities and its populations will be of immediate relevance to

city administrations and urban populations as they seek to improve urban health and wellbeing within planetary boundaries and while harnessing synergies across health and sustainability.

As co-sponsors of UHWB, the ISC and ISUH want to thank the Chinese Academy of Sciences' Institute of Urban Environment in Xiamen for its unfailing support of the programme as host of its International Programme Office. We also want to acknowledge the Chinese Association for Science and Technology and the Xiamen municipality, for their help and engagement with the programme.



Heide Hackman
CEO, International Science Council

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Carlos Dora
President, International Society for Urban Health

A handwritten signature in blue ink, appearing to read "Carlos Dora".



Depei Liu
President and Co-Chair,
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Preface Two

I am delighted to acknowledge the exciting work of the International Science Council (ISC) Scientific Committee, Urban Health and Wellbeing: a systems approach, which has published its second Science Action Plan for the years 2021 to 2025. This Plan builds on the Committee's first Science Plan in 2011. We recognise that planetary health and the earth's life support systems, which are the foundation for human health and wellbeing, are increasingly under stress. Our deliberations are grounded in the Committee's international research experiences and informed by the priorities of the ISC, where health has an integrating role in major initiatives on cities, carbon mitigation, sustainable development and disaster risk reduction.

The Committee's Science Action Plan highlights the importance of interdisciplinary research collaborations, which take a systems approach. The Plan encourages innovative policy experiments, both planned and 'natural'. In the context of the urgent necessity to reach zero carbon by 2050, these innovations can help to promote case studies of policies and practice, that not only improve the wider environment, but also the health and wellbeing of urban dwellers.

Our efforts have been directed at identifying the dynamics of the social, economic and environmental factors affecting the health and wellbeing of urban populations. These frameworks and evidence can help to implement effective, equitable evidence-based policies that address our main focus on the Sustainable Development Goals 3 and 11 and enable us to work collaboratively with researchers in other international programmes. Our call to action in this Plan has been sharpened by our experiences of COVID-19 in different cities and the scientific and political lessons we have drawn from it in our forthcoming edited book.

To achieve these important aims, our Science Action Plan calls for increasing the capacity of urban researchers through research exchanges involving training and developments to foster and support existing and new networks of urban researchers. The Committee's Plan comes at an important juncture, with the World Health Organization also refocusing on urban networks that support the health and wellbeing of people living in cities and the planet, raising the opportunities of mutually reinforcing agendas.

The Committee's work has been sponsored by the InterAcademy Partnership and International Society for Urban Health and is hosted by Chinese Academy of Sciences Institute of Urban Environment in Xiamen. The Chinese Association for Science and Technology and the Xiamen municipality also provide generous support the Community's programme.



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Preface Three

In the age of the Anthropocene, the relationship between humans and nature on planet Earth have fundamentally changed. Today, the harms inflicted on planetary health, come back as harms to human health.

With progressing urbanization, we have created a big world on an increasingly small planet, where nature is no longer “out there” to be protected, or not even at our doorstep, but already inside our house. The consequences of our actions can no longer be externalized without immediate impacts on our own health and wellbeing. The current pandemic and other infectious diseases, non-communicable diseases, urban heat waves and resource shortages are tragic reminders.

The Anthropocene fundamentally changes societal values, which are the bedrock of economics. Ideas of progress and wealth are being re-thought and re-imagined and there is a sense of urgency as we are being told that we are approaching tipping points and carrying capacities and that cascading effects undermine our attempts to be stewards of the earth.

Human impacts on the planet and climate pressures, are concentrating and accelerating in cities. Yet, despite the population, climate and resource pressures and risks, cities are also the place of hope for future health.

As nodal points in a global interconnected network of people, knowledge and other resources, cities are in the unique position for innovation and collective intelligence to emerge faster than anywhere else. From a systems perspective, urban health is the heart and brain of planetary health. By taking

a systems approach, we can learn to make the connections between how we shape and impact our urban environments and our own human health.

The global science programme on Urban Health and Wellbeing: a Systems Approach, which I have the honor of managing on behalf of its sponsors, and an excellent international and interdisciplinary scientific committee, has attempted to lead the path by collaborating with a global network of scientists and science organisations. This science plan 2021-2025, which is a coordinated effort of all members of the scientific committee, aims at continuing to guide actions of all stakeholders towards urban health and wellbeing in the years to come.



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Summary

This New Science Plan (2021-2025) for ISC's global interdisciplinary science programme on Urban Health and Wellbeing: A Systems Approach, deviates from its 2011 predecessor in that it makes a shift from 'improving health and wellbeing of people in cities' to 'improving population and planetary health in the context of complex urban systems'. The fundamental difference lies in the recognition that in an age of the Anthropocene a less anthropocentric and more eco-centric view is essential^{1 2}. It recognizes humans as part of global ecosystems, the health of which guarantees more long-term human health and wellbeing, in contrast to achieving human health and wellbeing at the expense of the natural environment and ecosystems^{3 4}.

The science plan's vision is cities built and governed as nodal points of global urban networks which are resilient or antifragile, learn from shocks and not only adapt to adverse environmental conditions but contribute to create living conditions which are healthy and sustainable for people and the planet. The goals of the plan include: 1. Support efforts for implementing 'Health in All Policies' and the 'Xiamen Call for Action', 2. Lead the development of an interdisciplinary research project, 3. Communicate the systems approach to urban health and wellbeing, 4. Inform and develop training and communication material, 5. Build networks for collective intelligence on urban health and wellbeing.

This New Science Plan 2021-2025 takes into account the ongoing changing global urban health context as well as the changing science context. It is aligned to the International Science Council's priority domains and explains how health is an essential component of the major global agreements on cities, carbon mitigation, sustainable development

and disaster risk reduction. In fact, as health is mentioned prominently in all major global agreements, it is well positioned to serve as an integrating concept across all programmes of the International Science Council. Urban health and wellbeing has the potential of bringing diverse science communities, from the data- to the earth sciences together in an accelerated effort to co-produce collective intelligence for sustainable development. This new science plan explains why and how it can also be used as inspiration for post-pandemic strategies of cities attempting to recover, exchange experiences, learn from another and emerge out of the crisis, stronger, healthier, and less fragile than before, due to their attempts in applying systems thinking and multiple variations of a systems approach.

A nighttime photograph of a city, likely Rio de Janeiro, viewed from an elevated position. The city lights are visible against a dark blue sky, with a mountain silhouette on the right. The image is used as a background for the text overlay.

Past, Present and Relevance of a Systems Approach to Urban Health and Wellbeing

The birth of the interdisciplinary science programme on Urban Health and Wellbeing goes back to a meeting in Rio de Janeiro on the occasion of the 27th General Assembly of the International Science Council (ICSU) in September 2002, at which health was recognized as an important focus for science.

From the start, initiators of the programme emphasized the importance of a better scientific understanding the “human and environmental health and wellbeing in its many dimensions.”

(Gatzweiler et al 2016: 2)

For several years after that meeting there were debates as to whether health should be a scientific focus for the International Science Council. In its strategic plan 2006-2011 health was explicitly included, with an overall goal “to ensure that health considerations are duly taken into account in the planning and execution of future activities...”.

Past, Present and Relevance of a Systems Approach to Urban Health and Wellbeing

The first science plan was submitted to the 30th ICSU General Assembly, Rome, Italy, September 2011 and the General Assembly approved the establishment of the new science programme as an interdisciplinary body of ICSU, on Urban Health and Wellbeing with a systems approach. The science plan of 2011 laid out the vision, structure, and key concepts of the programme and the role of systems analysis for a better understanding of health and wellbeing in changing urban environments. The first meeting of the programme's scientific committee took place in Paris, December 2012 and in October 2014 the International Programme Office was inaugurated at the Institute of Urban Environment of the Chinese Academy of Sciences in Xiamen, China.

At the subsequent programme scientific committee meetings, it was decided that the 'systems analysis approach' would be modified to a 'systems approach' to signal that complex urban health phenomena cannot be solely understood by conventional analytical approaches. The committee came to the conclusion that a better understanding of health and wellbeing in complex urban systems requires both, an analytical as well as a more holistic and heuristic approach. Those two components became the core pillars of the "systems approach", as it is currently defined. In the years to follow, the programme actively promoted this systems approach at conferences and meetings with other programmes of the International Science Council (ISC) and it has been adopted widely in various scientific and development programmes worldwide, including the ISC's current Action Plan 2019 -2021 (2019: 18).

Having a science programme on urban health and wellbeing (UHWB), has proven to be critically important for addressing the health challenges in and of cities and making the link to the emerging field of planetary health. The focus on Urban Health and Wellbeing has had a strong integrative capacity and thereby contributes to all of the domains of ISC's Science-Action Plan 2019-2021:

1. [The 2030 Agenda for Sustainable Development](#)
2. [The digital revolution](#)
3. [Science in policy and public discourse](#)
4. [The Evolution of Science and Science Systems](#)

With regards to domain 1, the UHWB programme is addressing Sustainable Development Goals (SDG) 3 and 11 and has contributed to a better understanding of how health relates to, and interacts with, many other SDGs⁵. With regards to domain 2, the UHWB programme is engaged with ISC's CODATA programme in a working group on Data for Healthy and Resilient Cities and making Data-Knowledge-

Action Systems work. Activities are planned with World Health Organization (WHO), the UNU Institute in Macau, the Future Earth Health Knowledge-Action Network and other partners. For domain 3, the UHWB programme has worked to bring health to the attention of policy makers, in particular through the Health in All Policies approach and the Urban Health Model developed in El Salvador, with the support of the ISC Regional Office for Latin America and the Caribbean. Eventually, the systems approach developed under the UHWB programme in the context of complexity science, is a major contribution to domain 4 of the ISC science-action plan: the evolution of science and science systems. It does so by providing a theoretical frame and tool for science in an era of increasing complexity and uncertainty and promoting the post-normal science approach recognized by ISC. The UHWB programme has thereby evolved into a critical integrating force for closer collaborative actions between other ISC programmes to build a stronger ISC leadership for integration, consolidation and collective intelligence.

The health perspective and the systems approach have not only proven to be useful for understanding urban health and wellbeing, but also for understanding the systemic nature of the global Sustainable Development challenges and the 2030 Agenda. In 2017, members of the programme's scientific committee contributed a chapter to "A Guide to SDG Interactions: From Science to Implementation" by the ISC⁶ on the multiple interactions between SDGs on the basis that the 'silo approach' does not serve the achievement of health targets and that policy frameworks that need to be adopted to take a systemic, integrated, holistic perspective.

In today's highly interconnected world there is hardly any scientific field in the social or natural sciences, which would not claim that a systems perspective from its point of view makes the interconnectedness of global challenges and the Sustainable Development Goals visible and thereby highlights the central role of that specific field. The health sciences are no exception, however, there is an additional aspect to be considered, which indeed underlines the special role of health for the social and natural sciences. Health is a widely recognized and desired property of both, social or ecological systems and a necessary condition for sustainable development. In the 2030 Agenda for Sustainable Development, the health of people and the environment is a central theme.

Today healthy and resilient systems are referred to in the social and ecological sciences alike. UN agencies partnering with the UHWB programme, such as the UNEP, UNDRR, UN-Habitat in collaboration with the World Health Organization (WHO) have begun integrating health into their programmes

and recognized its importance in all policies across disciplines and sectors. The healthy functioning of ecological, social, economic and political systems refers to the flows of energy, resources and data, needed to sustain the lives of people and the planet. The CODATA programme, under its Decadal Programme 'Making data work for cross-domain grand challenges' identified urban health, resilience and infectious diseases as one of its themes and established a decadal programme working group on 'Data for Resilient and Healthy Cities'. The group partners with the UHWB programme and applies the systems approach in order to improve FAIR data (findable, accessible, interoperability, reusability) for healthy and resilient cities.

In its past six years, since the inauguration of the International Programme Office in Xiamen 2014, the UHWB programme has developed and globally promoted the concept of a systems approach. The systems approach is a timely and relevant response to science and policy in the age of the Anthropocene; when increasing numbers of people live in urban environments, the pace of urban life is accelerated, and the health and sustainability challenges people are facing are increasingly interconnected and interdependent. Where applied, the systems approach equips stakeholders with a better understanding of the complexities of the challenges they are faced with, as well as with the methods and procedures which help them to navigate through those challenges and their many inherent uncertainties. The systems approach developed under the UHWB programme can be used a guide for policy and practice, as well as for science to navigate towards future health on a sustainable planet.

By means of its interdisciplinary collaborations, the UHWB programme has encouraged many other programmes and initiatives to put the systems approach to health and wellbeing on their agendas and strategies, such as ISC's CODATA programme, ISC's programme on Integrated Research for Disaster Risk (IRDR), Future Earth's Knowledge-Action Networks on Health and Cities, or the WHO Western Pacific's "For the Future" vision paper 2020-2025⁷. The UHWB programme provided critical support to ISC's Regional Office for Latin America and the Caribbean (ROLAC) in supporting the government of San Salvador to adopt and launch the 'Urban Health Model' – a high level, inter-ministerial panel which brought Ministers of different ministries together to discuss common policies under the common theme of urban health. Furthermore, the UHWB programme was essential for the Beirut Arab University to establish an Urban Lab and launch a new Journal on 'Health and Wellbeing'.

After an initial statement on 'systems thinking for urban health and wellbeing'⁸, delivered by the Scientific Committee of the UHWB programme in 2016, the UHWB programme in collaboration with the Future Earth Health Knowledge-Action Network (Health KAN), responded to the question of how to achieve a healthy and sustainable urban future by a singular emphasis on health with the Xiamen Call for Action⁹ in January 2019. It underlined the role of a 'systems approach' by stating that "To effectively address complex urban and planetary health issues at the intersection of society and environment, we must drastically increase the level of engagement and collaboration across disciplines and sectors, and take advantage of more effective modes of analysis" and defined the principles of building systems governance for urban health.

There are no policies which do not, directly or indirectly, aim at advancing the health and wellbeing of human populations or the social, cultural and ecological systems they are part of. The Health in All Policies (HiAP) initiative is a collaborative approach, proposed by a WHO health promotion conference in Helsinki in 2013¹⁰, that integrates health considerations into policy-making across sectors. Making health a common denominator and integrator for all policies is not only an effective measure for collaboration across sectors, it is also economically efficient, as it has the potential of producing co-benefits, or positive externalities¹¹. The HiAP approach is therefore a suitable response to numerous wicked and interlinked problems such as healthcare costs, aging, health inequities, non-communicable and infectious diseases, climate change and pollution. The Urban Health Working Group of the IAP, one of the UHWB programme's sponsors, is actively engaged in promoting the HiAP approach in different countries and the Urban Health Model¹² adopted in San Salvador is an example of a practical application.

Much knowledge has been produced in the science community which has not been communicated with decision-makers in the policy arena. Vice versa, having the opportunity to share knowledge is a motivation for scientists and researchers to communicate their findings. Nevertheless, communicating between knowledge creation and policy making is crucial for performing post-normal science in the era of complexity. The UHWB programme, together with the Woman's Economic Imperative (WEI) had the opportunity to share their insights and engage in discussions at the Global Solutions Initiative¹³ under the G20 forum. Being systematically involved in similar fora, like the International Network for Government Science Advice (INGSA) and the UN High Level Political Forum (HLPF), with coordinated leadership by ISC, would make the global voice for science on urban health and wellbeing heard more widely.

Past, Present and Relevance of a Systems Approach to Urban Health and Wellbeing

The impact of COVID-19

Since the publication of the Urban Health and Wellbeing (UHWB) programme's first science plan 2011, the world has become more urban, interconnected and the links between human, urban and planetary health have become stronger and come under increased pressure. The COVID-19 pandemic has emerged along those links and it has become far more than a health crisis. The pandemic affects societies and economies at their core, stresses economic and social systems to their limits and brings cities and entire countries to the edge of chaos by social turmoil and disintegrating global partnership and trade relations. This pandemic, which was caused by a zoonotic virus and led to a systemic disease, has already led to a 5.2 percent contraction of global GDP, the "deepest economic recession since the Second World War"¹⁴. Hardest hit are emerging markets and developing economies (EMDEs), in which also the highest rates of urbanization occur and which are particularly fragile. COVID-19 has made it clear that in an increasingly interconnected world, applying systems thinking and taking a systems approach to health and wellbeing is not just an option, but an obligation. While cities are the places from which the current global health emergency has originated, they are also be the places where it is solved and where the future of our urban life on earth will be written.

The COVID-19 pandemic has revealed the systemic nature of urban health¹⁵ and it has widened existing social and economic inequalities in cities, making the virus more harmful beyond its direct detrimental human health impacts. COVID-19 has also exacerbated existing inequalities. A diverse urban economy, adequate housing, public spaces and urban green, employment, equality and inclusion, public transport, air quality, sanitation and healthcare systems are all critical factors for creating healthy and resilient cities that are effective in containing the transmission of infectious diseases and recovering from an outbreak in addition to facilitating the

kind of urban development needed for a sustainable, healthy, and equitable future¹⁶.

The current era of the Anthropocene is also an era of complexity and of systemic risks. Understanding them requires the recognition that we are also in an era of post-normal science¹⁷, which the ISC has engaged in and which the UHWB programme has been actively promoting by developing the systems approach and engaging in collaborations with other science programmes. The UHWB programme has been visionary in its attempt to promote a better systemic understanding of urban health and wellbeing by means of a systems approach. However, it has been a struggle to build stronger cooperation with more specialised science programmes and networks (which either focus on 'urban', 'health' or 'environment') and with city governments – a process which requires leadership and which cannot rest on the shoulders of a small science programme alone. The COVID-19 pandemic has also made the role of leadership very clear and that increased efforts and investments need to be made to cross disciplinary boundaries, collaborate and build collective intelligence for health and wellbeing on an urban planet.

The impact of climate change

COVID-19 is not the only global health emergency with systemic risks we are facing and which needs to be addressed by a systems approach. Climate change also has far reaching, long-term impacts for current and future generations and many of the world's nations are vulnerable to those risks. Floods, heatwaves, droughts, wildfires and typhoons "are a harbinger of even greater impacts in years to come as models predict that such extreme weather will become more frequent and intense"¹⁸. Those events are systemic in nature and threaten basic life support systems and services such as food and biodiversity.



The Global Urban Health Context

Living in a big world on a small planet¹⁹, means that humanity has produced such large pressures on Planet Earth that people have become the largest force of change at the planetary scale.

From the nine planetary boundaries²⁰, four have been crossed: loss of biosphere integrity; climate change; land-system change; and altered biogeochemical cycles. Moreover, the rate of change of the Earth's system is accelerating²¹.

2.1 Urban Health and Wellbeing in the Anthropocene

Living in a big world on a small planet¹⁹, means that humanity has produced such large pressures on Planet Earth that people have become the largest force of change at the planetary scale. From the nine planetary boundaries²⁰, four have been crossed: loss of biosphere integrity; climate change; land-system change; and altered biogeochemical cycles. Moreover, the rate of change of the Earth's system is accelerating²¹.

Similarly, the 2015 Planetary Health report "Safeguarding Human Health in the Anthropocene Epoch"²² concludes that despite improvements in life expectancy and under-5 mortality, these gains have come at the cost of natural ecosystem degradation, which threatens the health of humanity and destabilizes the earth's key life-support systems.

Along the same lines, the European Environment Agency (2015)²³ finds that in the context of global megatrends, which include urbanization, human development for many developed countries, has created an ecological footprint beyond the world's biocapacity – the global productive area available on earth (Figure 1). The report comes to the conclusion that there is "the need for action to reconfigure systems of production and consumption so that they operate within planetary limits and thereby ensure the well-being of current and future generations."

Ecological footprint
(hectares per person per year)

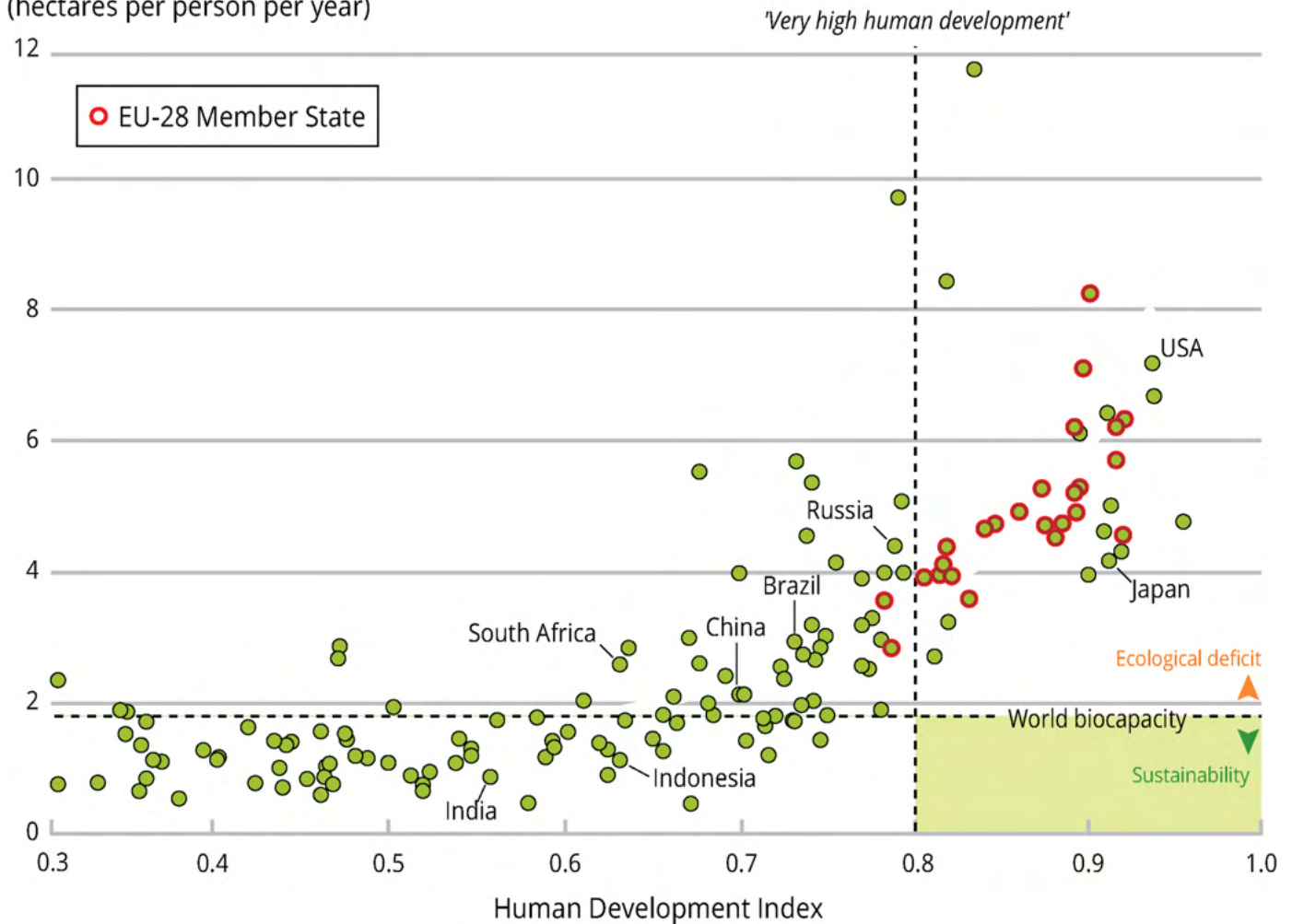


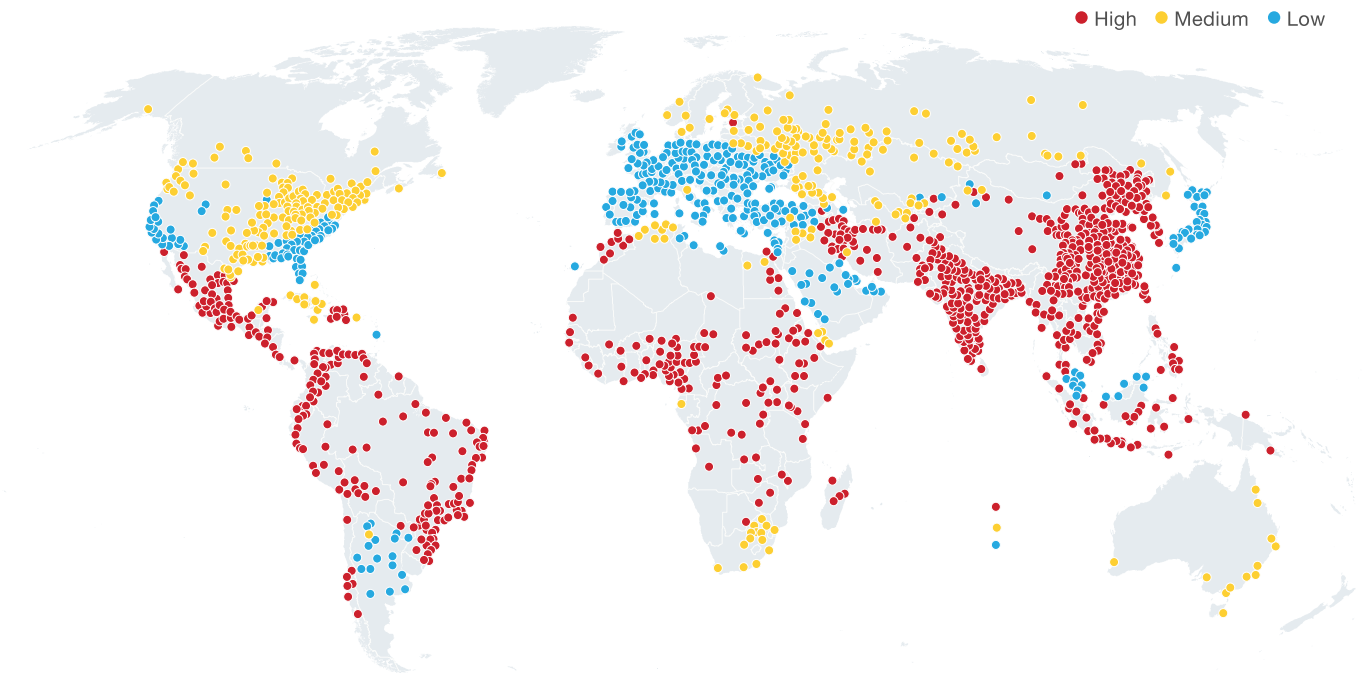
Figure 1: Correlation of ecological footprint (2008) and the Human Development Index (2012). Source: European Environment Agency 2015

Planetary health and the earth's life support systems, which are ultimately the foundation for human health²⁴ and wellbeing, are increasingly under stress. Two thirds of the 2,600 cities analyzed by Frem et al. (2019)²⁵ were at risk for either resources, acute environmental (drought, floods, cyclones) stresses or social stresses (governance, poverty, unemployment). Figure 2 shows that cities are vulnerable to three types of resource stress: chronic stress on water, energy and food, acute stress resulting from natural disasters, climate change and weather-related events, such as floods, droughts and cyclones, and social stress from poor governance, rapid urbanization, unemployment and inequality. What intensifies these stresses are: the growing frequency of acute stresses and the compounding combined effect of acute and social stresses and the contagiousness of stresses.

Cities play a vital role in responding to the health challenges in the Anthropocene. They are most sensitive to global environmental and health crises, but also harbour the most human, social and technological capital needed to respond and find solutions. Since 2008, we have lived on an urban planet. For the first time in history, more than half of the global population live in cities. By 2050, about 70% of the global population will be living in cities. Urban environments play a vital role in the health and wellbeing of people and the planet. Urban growth contributes to 70% global GDP and is largely responsible for improved access to water and sanitation, better hygiene and housing. Overall, life expectancy has improved and under five mortality has declined. Those improvements, however, have come at a cost and are responsible for carbon emissions, biodiversity loss, ocean acidification, global warming, deforestation, overfishing, pollution and increasing inequality. Those environmental changes are the cause for a growing number of health issues in cities (Whitmee et al. 2015).

When it come to resources, urban growth has significantly increased risk for cities worldwide.

Resources stress level by city



McKinsey&Company

Figure 2: Resource stress level by city. Source: 2018 McKinsey & Company

2.1 Urban Health and Wellbeing in the Anthropocene

In the same context of the Anthropocene, the occurrences of risks which cities are facing are increasing. The World City Risk Report 2015-2025 looks at threats faced by cities. The top six threats with respect to their total GDP damage across the 300 World Cities are: Financial Crisis, Interstate War and Human Pandemic, closely followed by the Natural Catastrophe triad of Windstorm, Earthquake and Flood²⁶. These risks are all directly or indirectly related to human and environmental health.

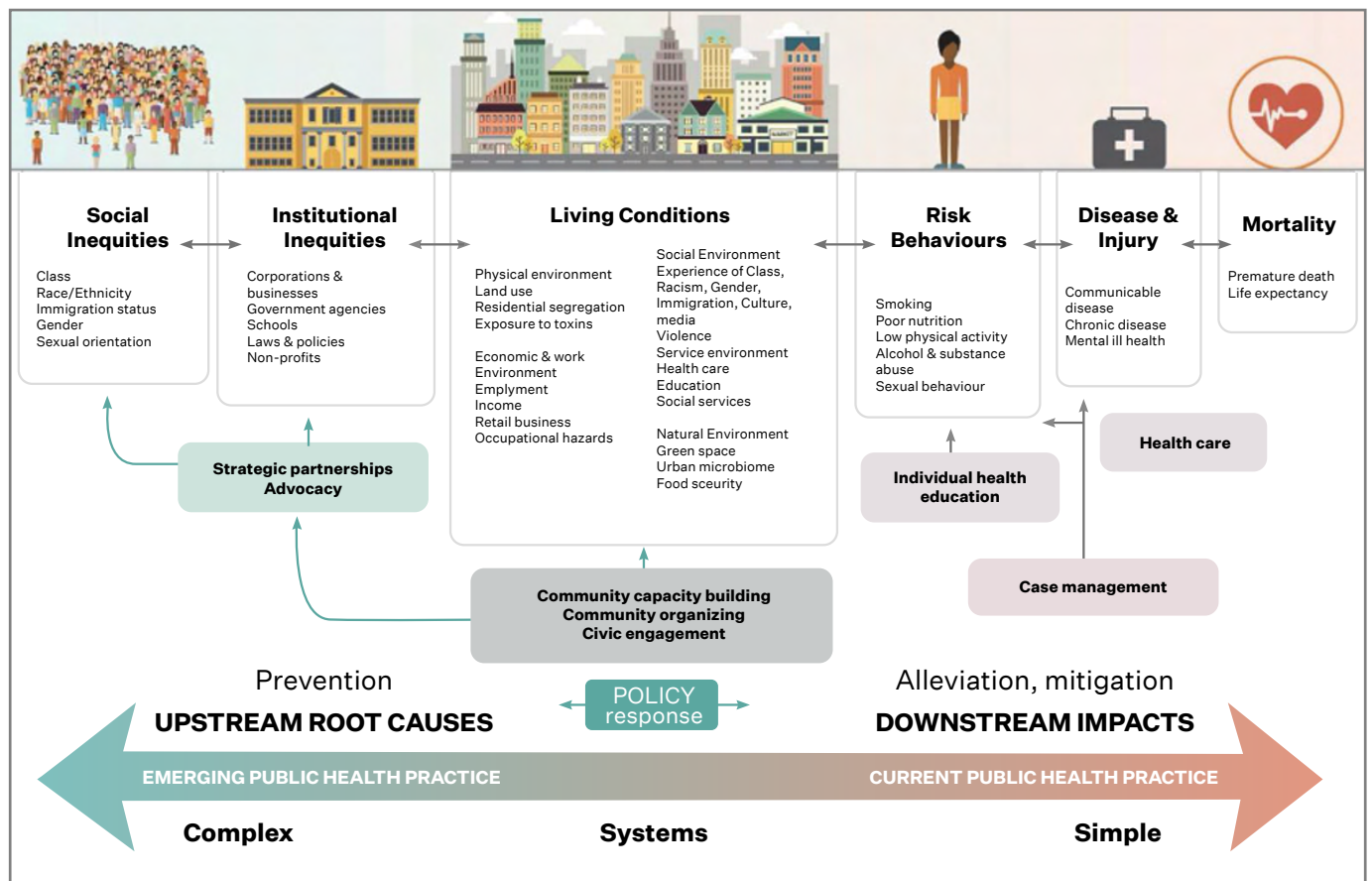


Figure 3: Population health in cities can be improved by taking a systems approach to address increasingly complex upstream root causes of health. Source: Modified from Corburn (2013)²⁷

2.2 Health and Wellbeing – a Common Goal in the Global Policy Context

The Global Sustainable Development Agenda 2030, the New Urban Agenda, the Paris Agreement and the Sendai Framework are all connected through health and wellbeing being a common goal. As we are living on an urban planet where the majority of people are living in cities, urban health and wellbeing is a common thread in the global policy context, agendas and agreements.

In an age of complexity, when taking a systems perspective to urban health and wellbeing, it becomes clear that it is not only about the common goals and improved output indicators of improving health and wellbeing in cities, but also about the healthy functioning of cities as complex systems. Health therefore needs to be regarded not only as an outcome of sustainable development, but sustainable development also needs to be a healthy process co-created by a healthy population, and a systemic condition of living (urban) systems and their functioning. This mutual dependence of human, urban, environmental and planetary health becomes evident on the following major international agreements.

The **Global Sustainable Development Report 2019 (GSDR)**²⁸ states the need for a fundamental and urgent change in the relationship between people and the planet. Unless that is achieved, any progress in the last two decades is at risk of being undone. Most sustainable development goals overlap with health benefits. Health is not just a desirable outcome, but a fundamental driver of sustainable development and it is interconnected to various other sustainable development goals. **The Agenda 2030** recognizes that global health threats are increasing in frequency and intensity and aims at promoting physical and mental health and wellbeing of people. **Goal 3** of the agenda aims at ensuring healthy lives and promoting well-being for all ages and **goal 11** aims at making cities and human settlements inclusive, safe and sustainable. In all 17 goals health of people and health of the systems they are part of, is directly or indirectly relevant.

The **New Urban Agenda (NUA)**²⁹ mentions health as one of the sustainability challenges cities and human settlements are facing. In addition, the World Health Organization has identified health as the pulse of the New Urban Agenda³⁰ and for the agenda to succeed “key actors and stakeholders in urban planning, governance and finance must incorporate health as a central consideration in their decision-making processes.” (NUA:3). The New Urban Agenda recognizes that decent housing, access to health care, water, food and sanitation but also green and quality public spaces and social interaction and inclusion are basic building blocks of health in cities.

The Sendai Framework for Disaster Risk Reduction 2015-2030 aims at pursuing the following goal: “Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience.”

The Sendai Framework recognises that in an increasingly populous, networked and globalizing society, the nature and scale of risk has changed to a degree that there needs to be a rethinking of established risk management institutions and approaches. The Framework promotes health resilience and has an explicit focus on people’s health and livelihoods and mentions that “managing the risk of disasters is aimed at protecting persons and their property, health, livelihoods,...”.

The **Paris Agreement** acknowledges that climate change is a common concern of humankind and that when taking action, the right to health should be considered. Further, it “Recognizes the social, economic and environmental value of voluntary mitigation actions and their co-benefits for adaptation, health and sustainable development.”



2.3 The Central Role of Cities in the Response to Systemic Threats to Health and Wellbeing

Today, the infrastructure of our cities is increasingly networked, and movements of people, goods, services and finance have reached unprecedented levels. Digitalization has fuelled that development. However, urban growth and interconnectivity have also significantly increased risks and stress levels for cities. By 2030, the demand for water, energy and food will outgrow supply in many cities in China, India, Africa and the Americas³¹. Extreme, climate change-related weather events, like floods and hurricanes, threaten coastal cities. Inequality, unemployment, poverty and marginalization cause social stress. It is expected that the frequency of natural disasters will increase and that the compounding effect of multiple stresses and increasing global interconnectedness will make cities susceptible to contagious stresses, pandemic diseases leading to financial crises and political tensions.

Cities are key players in this new global risk landscape. In September 2015, the Cambridge Centre for Risk Studies, in their World Cities Risk Report 2015-2025³², projected that seven of the most severe threats account for three quarters of the total damage to Gross Domestic Product (GDP) across 300 of the world cities. Financial crises, are the top threat and account for 20% of GDP at risk. Threats of human pandemics, windstorms, earthquakes and floods form the next tier of most damaging threats.

Another trend in the global urban risk landscape is that so-called 'natural disasters' only account for one third of expected GDP losses to cities, more than half of the future risk is from man-made and emerging threats, like financial shocks, human conflicts and pandemics. These latter threats do not disrupt physical objects like buildings and machinery, but networks, connections and trading relationships. They belong to the category of systemic risks³³.

In addition to the evident effects of risk associated to direct effects of physical and biological agents, the social aspects and way of life of urban living is associated with silent epidemics of chronic non-infectious diseases, such as obesity and psychiatric disorders. The pathogenesis of such events is complex and most probably reflects the combination of genetic, epigenetic and environmental factors, whose role can be only comprehensively addressed by a systemic approach. An example of the necessity of the need of an integrated

analysis is presented by the role of cities as promoters of psychiatric disorders. Several studies evidenced the role of the urban environment on the pathogenesis of some mental health problems, such as psychotic experiences, depression and stress-related disorders, probably due the complex combination of biological and environmental factors.³⁴ These factors may include genetics, consumption behaviour, drug use, migration, poverty, education, violence, social isolation, working conditions, air/light/noise pollution, and exposure to extreme climate events.

Reducing those risks could be achieved by improved infrastructure, better organization and response and reducing man-made stresses, like inequality and unemployment – measures which also generally improve urban resilience and health. Renn et al (2018) develop an integrated risk governance model³⁵ for cities which aims at pre-estimation, assessment, evaluation, management and communication of risks. Those steps are generally compatible with the "systems approach" developed by the UHWB programme.

As mentioned, COVID-19 has revealed the systemic nature of urban health globally³⁶. Governing urban complexity³⁷ to secure the health and wellbeing of cities, as reconfirmed by the scientific committee of the UHWB programme, can be facilitated by adhering to the principles outlined in the Xiamen Call for Action³⁸ :

1. Clear leadership and mandate to deal with urban health issues in an integrated manner.
2. Inclusiveness: including human rights; mutually beneficial for sectors.
3. Inter-sectorality: various urban sectors, such as transportation, energy, housing, including primary health care, work, and achieve urban health outcomes together.
4. Health and wellbeing as performance indicators which need to be measured centrally and locally in all policies.
5. Risk sharing: stakeholders investing in and benefiting from cross-sectorial collaboration also share the costs
6. Pre-cautionary principle: incorporates both the curative and preventive dimensions of health.

2.4 Urban Health and Wellbeing in a Changing Global Science Context

Understanding the complexities of our increasingly interconnected urban world requires a new science beyond reductionism³⁹. It is also now well recognized that the ‘health of cities’⁴⁰ goes beyond the medical understanding of the health of people living in cities. It is a systemic and interdisciplinary concept which recognizes cities as complex adaptive, social, ecological and technological systems⁴¹.

Recognizing cities as complex adaptive systems, requires a new kind of thinking in science which is centered around systems and closely associated with complexity science itself. Complexity science has helped us understand the emergent behaviour of living, self-organising⁴², complex systems and has broadened the scope of the ‘scientific method’ itself. It has initiated a dialogue across a broad range of scientific disciplines, in particular between the natural and the social sciences⁴³. This sense of an underlying commonality in the patterns and emergent behaviour of complex adaptive social and ecological systems enables the bridging of disciplines⁴⁴.

The changing science landscape towards complexity has most prominently been described by Warren Weaver in his 1985 report to the Rockefeller Foundation⁴⁵ on science and complexity and earlier had been prominently brought to attention in 1961 by Jane Jacobs⁴⁶. It is a shift from dealing with problems of simplicity to disorganized complexity, dealing with large systems with many variables understandable by means of statistical analysis, to problems of organized complexity, when variables have feedback relations and adapt over time. More recently, Judith Innes⁴⁷ proposed a collaborative systems approach to urban planning which is closest to the systems approach developed by this programme in that it recognizes wicked problems and radical uncertainty which cannot be assumed away by a belief in optimization. Consensus building and communication as a method of deliberation was found to produce agreements, innovations and solutions which are workable, implementable and enjoy public support.

Problems of disorganized complexity are partly addressed by the New Science of Cities⁴⁸, which marks a shift from the science of geometry, place, localities and form to one of living systems, flows, interactions, and networks.

The former assumed urban systems usually to be in equilibrium, performing a specific function, being largely plannable and controllable and therefore typically organized and governed from the top down. The new science of cities has shifted to a science of flows and interactions.

Recognizing cities as complex self-organized systems bridges the natural sciences and the humanities or the “two cultures”⁴⁹. The systems approach developed and promoted by the UHWB programme and the perception of the city as a complex and self-organized system helps guide actions in two ways:

1. “Taming the city”: understand complexity and learn how to identify control parameters, simulate, model and predict urban change for the health and wellbeing of its residents.
2. “Co-creating the city”: participative urban planning and agency. This includes taking human values and principles into account, such as the precautionary principle.

Increasing global interconnectivity and complex interdependent global challenges of sustainability, as visible in form of global urbanization, also led ICSU to accept a post-normal science, which appraises the quality of knowledge via an extended peer community (instead of merely a peer review). That means, the quality of science knowledge is appraised by the difference it makes in practice and action. As Gluckmann, said at a conference August 28-29, 2014 in Auckland : “Such is the world of post-normal science where ‘the facts are uncertain, values are in dispute, the stakes are high and decisions urgent’. This is now our domain – the domain of what I term ‘post-normal science advice’.”⁵¹

For that reason, the UHWB programme aims at going beyond the mission of turning knowledge into policy advice and action. Because of the complex nature of cities, it is necessary to identify and accept the limits of scientific knowledge and find ways to make decisions in an uncertain world we cannot predict and understand. Redundancy, diversity, precaution and building collective intelligence are some strategies which have been proposed in response to those limits to knowledge.

A nighttime aerial view of a city with illuminated buildings and streets. A large white rectangular box is centered on the page, containing text. The background shows a dense urban area with various skyscrapers and lower buildings, with light trails from traffic on a highway in the foreground.

Vision, Goals and Actions of the Urban Health and Wellbeing (UHWB) Programme 2021-2025

A narrow focus on improving health conditions of people in cities overlooks the interdependence of urban and planetary health and the systemic risks created by increasing interconnectedness. Therefore, the merging of the science communities is moving ahead along the common trend and umbrella theme of the Anthropocene, with complexity as the shared topic and a systems' thinking as the shared approach. Accordingly, the **new overarching goal** of the Urban Health and Wellbeing (UHWB) Programme is on solving the core conflict created by an anthropocentric focus on health at the expense of the environment, by putting a focus onto the health of cities.

Vision, Goals and Actions of the Urban Health and Wellbeing (UHWB) Programme 2021-2025

Human health has been improved in cities around the world, yet this development progress is also accompanied by increasing demands for food, energy and natural resources, creating just those pressures to human health and wellbeing (e.g. inequality, pollution, infectious and non-communicable diseases), which progress towards the Sustainable Development Goals aims to reduce. In order to break this vicious circle driven by cities, the UHWB programme aims at addressing the core conflict between human wellbeing and planetary health, by implementing variations of a systems approach.

In the context of global environmental and climate change, increasing global interconnectivity and pressures on planetary boundaries, the health and wellbeing of people, ecosystems and other living systems are increasingly at risk. Cities, as hubs of global urban systems, have the potential to defuse this conflict. They take a central role in responding and adjusting to those emerging threats. Cities can be viewed as neurons in globally networked urban planet⁵³ – hubs in which energy, resources and information about the city and its environments are collected, processed, where knowledge is produced to be tested, implemented into action, the results and impacts of which then re-enter the Data-Knowledge-Action Systems (DAKAS). Cities are the global hubs of those DAKAS.

The previous vision was “...to generate policy-relevant knowledge that will improve health status, reduce health inequalities and enhance the wellbeing of populations living in urban environments...”. The new vision is a progression from the programme’s previous vision, which was people-centered and put less emphasis on the fundamental conflict of improving health and wellbeing within planetary boundaries.

In its initial science plan, the UHWB programme spent considerable time and effort in concept development, global networking and interdisciplinary collaboration. In recognition of the challenges cities are faced with, in particular during COVID-19, the UHWB programme, in its phase 2021-2025,

will put more effort on learning, education and training activities for implementing the systems approach, improving the science-policy dialogue and collaborating with urban stakeholders and networks, fostered by exchanges of doctoral students between collaborating system-focused research institutes.

In addition to clearly identifying the major threats to health and wellbeing of people and cities, and understanding their complex interconnections, the UHWB programme’s **new vision** are cities governed as nodal points in global urban networks which are ‘antifragile’, learn from shocks and thereby create living conditions which are healthy and sustainable for people and the planet. Enabling ‘urban-planetary co-development.’

In order to progress towards that vision, cities need to make progress in further developing (organized) complexity⁵⁴ within planetary boundaries: the urban physical infrastructure needs to be adjusted in order to supply resources and opportunities that are healthier, more efficient, and equitable and in a way that is less polluting and wasteful; public services need to be provided more reliably cognisant of health needs and planetary boundaries, by urban governments which make decisions collectively with stakeholders, informed by knowledge created in cities from data about cities, people and the planet. And as cities seek solutions to their populations’ health and wellbeing, they increasingly need to engage in collective decision-making and collective action beyond their boundaries as their health and wellbeing increasingly depends on that of others.

In accordance with New Vision, Overarching Goal and Aims set out above and current urban developments, **the specific goals and actions** of the UHWB programme have been linked to the science domains of the International Science Councils science-action plan 2020:

Table 2 Goals and actions of the UHWB Programme 2021-2025 and their link to the ISC’s science domains



Goals & actions

Specific goals and actions of the UHWB Programme	Science domains of the International Science Council's Science Action plan 2019-2021
<p>Goal 1</p> <p>Support efforts for implementing Health in all Policies (HiAP) and implement the Xiamen Call for Action in cities.</p>	<p>ISC domain 1 ‘2030 Agenda for Sustainable Development’ 1.1 International science for global sustainability: addressing complexity, supporting policy coherence</p> <p>ISC domain 3 ‘science in policy and public discourse’ 3.1 Science-policy interfaces at the global level</p>
<p>Goal 2</p> <p>Lead the development of an interdisciplinary research project on Data-Knowledge-Action Systems for Healthy and Resilient Cities, together with CODATA, other ISC programmes and organisations.</p>	<p>ISC domain 2 ‘digital revolution’ 2.1 Data-driven interdisciplinarity</p>
<p>Goal 3</p> <p>Communicate the systems approach to urban health and wellbeing to urban decision and policy makers and thereby contribute to a better understanding of complexity governance and health as a global public good.</p>	<p>ISC domain 3 ‘science in policy and public discourse’ 3.1 Science-policy interfaces at the global level</p>



Specific goals and actions of the UHWB Programme

Science domains of the International Science Council's Science Action plan 2019-2021

Goal 4

Inform and develop training, education and communication material for natural and social science communities about how to take a systems approach in all health and wellbeing related research in the changing global science context.

Actions

Develop a MOOC on A Systems Approach to Urban Health and Wellbeing and other training and information material for specific stakeholder groups on what it means to take a systems approach.

Training on the balance between human and planetary health in cities, particularly for city governments and NGOs. Training on collaborative modelling for urban health and wellbeing.

ISC domain 4

'evolution of science'

4.5 Knowledge production and diffusion as global public goods

Goal 5

Cooperate with organizations and networks globally in the building of collective intelligence and action for systems approaches to urban health and wellbeing Consider establishing local and regional chapters of the programme.

Actions:

Cooperate with the newly established WHO-Centre on Environment and Health in Seoul to produce information / training material on how to take a systems approach and thereby contribute to the WHO-WPR strategy. Discuss potential model projects.

Building regional communities of practice to link regional development agendas to this UHWB plan.

ISC domain 1

'2030 Agenda for Sustainable Development'

1.1 International science for global sustainability: addressing complexity, supporting policy coherence

ISC domain 3

'science in policy and public discourse'

3.1 Science-policy interfaces at the global level



Conclusion

Despite the specific differences of cities in different regions of the world, current global urban trends and the increasing risks they pose to urban and planetary health require us to understand cities as complex living systems. In order to grasp the opportunities of increasing urban complexity, we need to address the emerging challenges for urban health and wellbeing by promoting a new urban systems science and the adoption of systems approaches for the co-creation of solutions for future healthy cities.

There are a wide range of examples at different levels for such solutions inspired by systems thinking, from urban community rooftop gardens, healthy housing, networked urban infrastructure, collaborative urban systems modelling, to integrating health into urban and territorial planning.

This new science plan of the International Science Council's interdisciplinary programme on Urban Health and Wellbeing: a Systems Approach has provided the rationale and background of what a systems approach to health and wellbeing in cities is and why it has become a necessity in the current age of the Anthropocene.

Through our programme of goals and actions we hope to provide insights and knowledge which urban stakeholders can adopt and adjust to their own local requirements and circumstances. Through our global network of scientists and other urban stakeholders, which is continuously growing and exchanging knowledge, we hope to give direction and guidance to shape the future of urban and planetary health and wellbeing.

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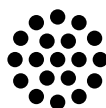
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