

Report

Science-Policy dialogue on “Modeling Urban Health and Wellbeing for policy and action: Algorithms vs Institutions”

From Apr 28-29, 2016 international experts from China, Europe and Asia-Pacific met on the island of Gulangyu, Xiamen, China to discuss the role of models in efforts to address the threats to human health in rapidly changing urban environments. Gulangyu was chosen as workshop location for its importance in the history of tropical medicine during the 19th and early 20th century. The workshop was hosted by the Institute of Urban Environment of the Chinese Academy of Sciences (CAS), headed by Prof. Yong Guan Zhu; it was organized by the “Urban Health and Wellbeing: a Systems Approach” programme of the International Council of Science (ICSU), managed by Dr. Franz Gatzweiler, and moderated by Prof. Roderick Lawrence from the University of Geneva.

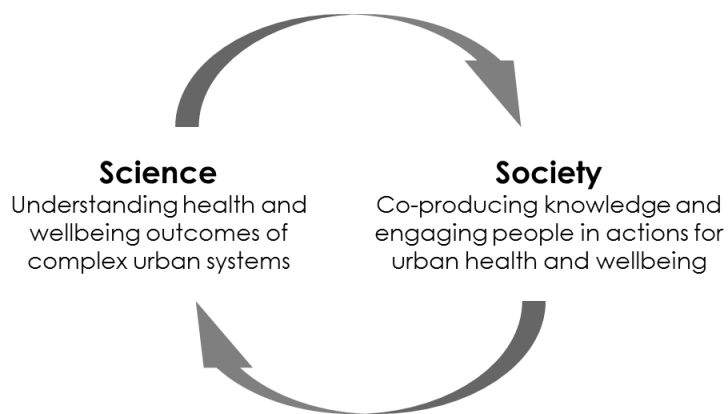


Participants discussed the role of models for a better systemic understanding of, and decision making on, urban health issues such as air pollution, infectious and lifestyle diseases (such as obesity and cardiovascular diseases); but also antibiotic resistance and the urban heat island effect, which exacerbates respiratory problems and causes heat stroke, exhaustion, and premature deaths. Rapid urban environmental change combined with climate change is not only a real threat to peoples’ health and wellbeing but also their survival. Heat waves peak in cities and cause thousands of premature deaths every year. Just at the time of the meeting, a record heat wave hit India and South-East Asia.

Although life expectancy is generally improving and better in urban than in rural areas, how and where people live and work in cities strongly effects their health and life expectancy. For the urban marginalized and poor, life expectancy is lower than it is for people living outside cities. Health and income inequalities are concentrated in cities – an indication of quality access to employment, education, and public services, still being a privilege of the better-off.

The issues that confront urban decision makers attempting to improve health and wellbeing, are immensely interconnected and complex and therefore require intelligent solutions and support from complex-system modelers. Some of the world’s leading modelers came together in Xiamen to discuss with representatives from local governments, private and public funding agencies, private sector organizations, and the media, how to better implement scientific knowledge on urban health and wellbeing for policy and action.

Franz Gatzweiler, executive director of the “Urban health and Wellbeing: a Systems Approach” science programme, opened the dialogue by challenging participants with the question on whether conventional scientific modeling of urban health issues is sufficient for overcoming the gap between what scientists know about emerging urban health issues and what needs to be done about them. Science is facing a dilemma of incompleteness. Conventional analytic models need to be precise, objective, coherent and replicable and they often seek universal rules (algorithms) for interconnected urban health issues. To the extent that they are coherent, Gatzweiler explained, they are incomplete as they often tend to neglect the changing context and do not question the rules under which the scientists design their analytic methods. Experimental designs need to assume “all other” than the observed variable, remaining unchanged. Such conventional approaches in science assume that



scientists know the unknowns, ask the right questions, apply the best possible methods and eventually provide answers which simply need to be communicated with the rest of society. Inter- and transdisciplinary approaches in modeling are more reflexive and address the incompleteness dilemma by including people into the scientific design process, allowing them to

pose the relevant questions and co-creating the knowledge they need to address the daily challenges of urban health and wellbeing. In that process people become scientists themselves and simultaneously learn how to jointly identify common threats to health and wellbeing, make decisions which effect themselves and build collective intelligence. The systems approach taken by the programme on “Urban Health and Wellbeing” sees both approaches belonging together and complementing each other. The business of science itself needs innovation in order to co-create solutions for urban health and wellbeing.

Social epidemiologist **Basile Chaix** presented a spatial mobility model which helps to explain the relationships between how and where people move in the city and obesity. He could show that the mode of transport contributes significantly to daily physical activity (around one third) and that developing public transport may be a powerful lever to promote physical activity, which shows that urban health related to the issue of transport and health implies a strong collaboration between Urban planners and Public health practitioners. **Fabien Pfaender** explained how to understand urban system behavior by using quantitative methods, gathering city data, visualizing and modeling urban systems and involving the city's stakeholders through participative urban science. **Stefan Reis**, a senior scientist and research group leader on modelling and integrated assessment, works on the development of conceptual models to assess environmental and human health, for the operationalisation of Ecological Public health, and the integration of models and environmental sensors. Physicist **Barry Newell** said that urban-policy initiatives can cause a spectrum of unexpected outcomes. Therefore he develops a practical system-analysis approach called Collaborative Conceptual Modelling (CCM) which supports communication about the dynamic interactions of the parts of complex urban systems. He stressed the challenges of communication across sector and discipline boundaries, and the need for continuing focused dialogue between scientists and policy makers to meet these challenges. In particular, he said that it is necessary to keep in mind that, contrary to expectations, words do not carry meaning—it follows that care must be exercised to ensure that all parties to a discussion are using the same words to refer to the same concepts.

Gabriele Harrer-Puchner is an expert in systems modeling and sensitivity analysis. She uses a biocybernetic tool developed by Prof. F. Vester to model complex systems such as cities and provides decision support for city administration, the armed forces and coordinates the contest “ecopolicyade” which gives hundred-thousands of students access to systems thinking and train them on how to reflect on how to govern a complex country. Civil and structural engineer **Peter Head** and his team at the Ecological Sequestration Trust are creating an open-source GIS human well-being-ecological-economics systems model and aims at bringing it into mainstream collaborative use for national and regional decision making. **Muhammad Zaman** addresses one of the most important and unresolved issues in urban health and wellbeing: modeling issues associated with access to quality care. He develops technologies for high-value healthcare problems in the developing world, particularly in

the area of maternal and child health. He is helping to set up biomedical engineering departments in Africa and directs the UN Africa biomedical initiative.



Martin O'Connor specializes in research-action on the 'interfaces' between science and society, economy and environment, knowledge and politics; and the multimedia interfaces between material and 'virtual' realities. He proposes to make use of tools that allow stakeholders in urban health and wellbeing (including experts and decision-makers) to suggest and appraise actions that might or should be components in strategies for sustainable urban systems. **Deyu Zhao** is concerned about the theory and methodology of policy science and its applications to many social issues including health care. He uses system dynamics models to understand policy making and says that for the development of community health services a whole system structure is necessary. The concept of a model can be confusing. In Chinese culture there is a special idea of a model. If the model is good, it can be adopted by policy makers. A model can also be a political process.

Those urban system modelers discussed with decision makers from local government, private sector investors, public funders and the media what it takes communicate and implement the knowledge from models to real-world decision making - to transform algorithms into institutions. Climate manager **Armin Bobsien**, works in the city of Emmendingen in the upper rhine valley, which is one of the worst affected areas of climate warming in Germany. The impacts of increased heat stress and adverse bioclimatic conditions are compounded in cities. Despite the signs of climate change being clearly visible to everybody in the area, for example by urban heat islands and consequent premature deaths, there seems to be large disconnect between the perception of risks and vulnerability assessments of decision-makers, city planners and the local population on one side, and scientific modelers and urban health professionals on the other side. Overcoming this gap of knowledge, translating complex scientific models into a common language, and making climate related urban health issues relevant for urban transition management remains a real challenge.

Christoph Graf von Waldерsee sees the need to re-evaluate resources in order not to overstress our planet and endanger our future existence. He is a multilateral development finance specialist working towards that goal with the Ecological Sequestration Trust. He expressed the need of an overall "new social contract", supported by innovative partnerships between private and public stakeholders. A new

social contract for the benefit of human health and wellbeing in cities and rural environments is about sharing, partnering, participating, and collectively developing intelligence in order to successfully adapt to change. “Green” could be one of the social wellbeing benchmarks. Along those lines **Peter Head** underlined that private sector organizations are effective change agents if institutional environments allow them to get their business models right. Processes of policy making are extremely slow, do not match the current dynamics of change and therefore hinder change processes in which the private sector could play a pivotal role. It is necessary to get smart, energy efficient and environmentally friendly technology into infrastructure build today in order to cater development for the foreseeable needs of tomorrow.

Denise Young is head of communications at the International Council for Science and says that in communicating science to society attention also needs to focus on the development of thought leadership and opinion pieces which are designed to influence the agenda and decision making processes of policy makers. She says that because of rapid technological change, also the media increasingly finds itself in a situation of not knowing. Communicating science to society however requires using empathy, trying to reach people and connecting them to which affects them. Communication between science and society is not only about “translation”. Increasingly it is about co-exploration between media and science, for example by creating events together. The media are not intermediaries but co-creators of knowledge. Telling the right stories and telling stories right is a skill many scientists could be better at.

Yong-Guan Zhu is a leader in taking multi-scale and multidisciplinary approaches to soil and environmental problems and director general of the Institute of Urban Environment, Chinese Academy of Sciences. He said that for reaching the goal of becoming an ecological civilization, urban development in China needs to consider the health and wellbeing of urban populations. **Feng Feng**, lead decision maker at the Bureau of International Cooperation, Natural Science Foundation of China (NSFC) welcomed the dialogue and stressed the interest of his organization to fund research in urban health and wellbeing, particularly by taking system approaches in order to achieve the goal of becoming an “ecological civilization”. He underlined the importance of science news for all levels of policy making.

Participants found common ground on the need of including local communities in modeling urban health issues and connecting what they experience in everyday life to findings of urban health modeling. Faith communities who are committed to the sustainable development goals need to be part of the dialogue. Participants saw an urgent need for education and capacity building for societal processes which support integrative and inclusive decision making for urban health and wellbeing. Beyond improving skills of science communication science itself needs to change towards being more inclusive in the methods they apply thereby co-creating knowledge. Participants identified a divide between what urban health scientists are capable of by modeling complex systems and the capacity of people to perceive the issues of urban health as problems and decide on what the problems are; to connect them with scientific findings; and connect what they value with required actions to be taken.

All stakeholder groups need support for facilitating communication and organizing collective decision making processes for achieving health and wellbeing in cities. China’s goal of building an ecological civilization and the circular economy and the global sustainable development goals require the systems approaches in science and society, just the approach which is being promoted by the programme on “Urban Health and Wellbeing”. That systems approach needs to be applied to science itself in order to produce innovative and creative solutions for policy and action. If scientists want to be helpful in responding to the emerging urban health risks, transferring of scientific knowledge is necessary but not sufficient. There needs to be strong two-way communication between scientists and decision makers. Both need to actively engage and support local action.

Participants of the Xiamen dialogue agreed to collaborate in the design of a training programme, collaborate in a model project in China, and to publish the core messages of the dialogue in diverse media. The programme on Urban Health and Wellbeing: a Systems Approach, with its programme office located in Xiamen, will be a hub for coordinating those activities.

Webpage: www.urbanhealth.cn

Media links:

1. http://china.cnr.cn/gdgg/20160429/t20160429_522028268.shtml?from=groupmessage&isappinstalled=0
2. <http://www.chinanews.com/m/gn/2016/04-29/7854383.shtml>
3. http://digitalpaper.stdaily.com/http_www.kjrb.com/kjrb/html/2016-05/01/content_337921.htm?div=-1&from=singlemessage&isappinstalled=0
4. http://news.xinhuanet.com/english/2016-04/30/c_135325376.htm