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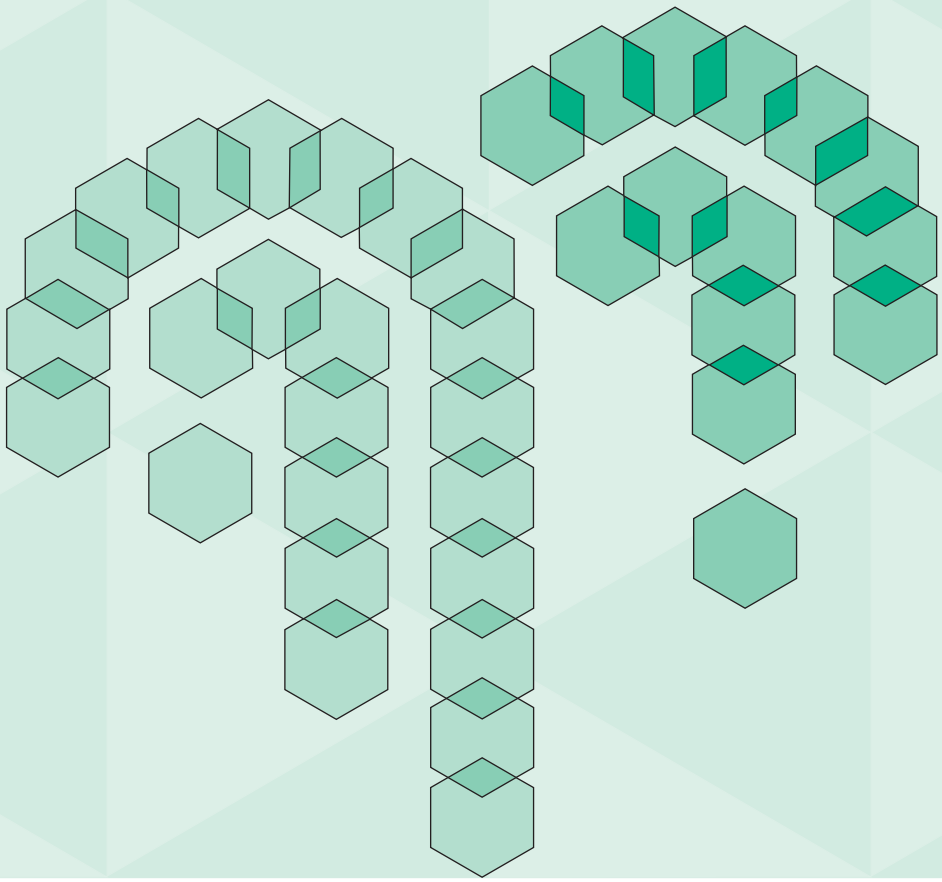
# Towards Sustainable Global Health

edited by Martin Exner, Günter Klein,
Andreas Rechkemmer and Falk Schmidt



**SOURCE**

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# SOURCE

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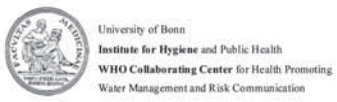


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# Towards Sustainable Global Health

Edited by
Martin Exner,
Günter Klein,
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## Foreword

Global health has in recent years drawn increasing scientific, political and popular attention not only due to global epidemics themselves, but also because of the social activities and environmental conditions that shape health threats and influence those who are affected. Factors that contribute to the emergence and increase of health threats include development patterns which create conditions such as overcrowded cities with poor sanitation, increasing human movement throughout the world, and alteration of the environment and climate. Those who are most vulnerable to evolving health crises tend to be the poor and marginalised. Most recently, global health was internationally recognized as an integral part of the *UN Millennium Development Goals* (MDGs). This international emphasis on continuing and global health issues has generated a multitude of research, conventions and conferences including an UN-sponsored conference on sustainable global health.

In reaction to this, the IHDP has recently strengthened its work related to health. Firstly, it has co-organized the international conference 'Towards Sustainable Global Health', which was held in Bonn, 9-11 May 2007. One outcome of the conference is this SOURCE issue that is based upon central contributions made during the conference. Secondly, the IHDP has joined, as of October 2007, the project of the *Earth System Science Partnership* (ESSP) on Global Environmental Change and Human Health. This partnership pays particular attention to the socio-economic components of this exciting and increasingly important research agenda. Currently, health related themes are included in various ways into the IHDP work portfolio: as special sessions at the Open Meeting 2008, new research initiatives such as Integrated Risk Governance, and through training seminars for young scientists. This SOURCE is a rich study that conveys information of current health issues and hence can be used in many processes that help to foster the agenda of global health importance.

The study deals with the issue of 'Sustainable Global Health' which has evolved from the realization that there will be no alleviation of poverty without success in control of serious public health threats, no economic prosperity and sustainability without a healthy workforce, and no social stability and peace as long as people have to suffer from insufficient health services, from malnutrition, from HIV/AIDS pandemics, or from lack of safe water. The study addresses a broad range of issues related to human health at regional and global levels. It includes the theme of *Technical and Vocational Education and Training* (TVET) as a tool for the private sector to exercise responsibility and interest in using the workplaces as a route and as means for education, and for a wide participation of every citizen in securing his or her individual health and well-being. Highlighted throughout the study are integrated approaches towards sustainable health. These approaches shed light on both the importance of multi-level health governance and the understanding of human health as an issue of human security in responding to health threats. Furthermore, the study emphasizes the links between the phenomena of global environmental change, which often further increases pressure on health systems, and the crucial role urban areas play in this realm.

Andreas Rechkemmer
Executive Director
International Human Dimensions Programme (IHDP)

## Foreword

Human security is increasingly seen and accepted as an all-encompassing concept to improve human well-being, to enhance freedom from fear, from want, and to secure life in dignity for all. Human security has a multitude of dimensions. The *United Nations University Institute for and Environment and Human Security* (UNU-EHS) was given the task to explore in particular the environmental dimension. This mandate may be coined to enhance freedom from hazard impacts. Thus the question could be asked why does this issue of the SOURCE series deal with the process "Towards Sustainable Global Health"?

Health is among the most paramount aspirations of individuals and societies. It is probably the most universal, basic and incommensurable value of all humans, irrespective of their cultural background or social status. Global health is the basis also for global wealth. Only healthy people and healthy societies can pool their efforts together to secure food, water, education, and many other attributes of human well-being. Only this bigger picture encompassing sustainable societies reveals how much resilience depends on health at all scales. It is thus not an exaggeration to claim that health – individual as well as public – is the most fundamental dimension of human security.

Health in general, as well as health care in particular, are factors of organizational functionality and therefore absolutely omnipresent. Health has the broadest "stakeholder community", literally the entire humanity. It plays a significant role at home, in schools, in the workplace, and in public life.

Exactly this universal importance of health motivated several UN and Bonn-based scientific entities to join forces to organize the international conference entitled "Towards Sustainable Global Health" that took place in May 2007 in Bonn. The conference addressed many facets and intriguing questions of how to provide "global health" for a dignified human life to all.

This present issue of the SOURCE series of UNU-EHS does not claim to be the proceedings of the conference, but rather a summary illustrating the richness of the debate reflecting on key contributions and thoughts.

It is not the objective of this foreword to summarize the conference or to introduce the core contributions, nor to comment on the debates of the conference itself. It is however the place to thank the four editors Prof. Martin Exner, Prof. Günter Klein, Dr. Andreas Rechkemmer and Falk Schmidt for the dedicated work. All of them were also among the initiators of the conference. My thanks are also due to Prof. Rupert Maclean, director of the UNESCO *International Centre for Technical and Vocational Education and Training* (UNESCO-UNEVOC), based in Bonn, and to Wolfgang Heller, director of *International Labour Organization* (ILO) office in Berlin, for their engagement and contributions. The claim "global health is the basis of global wealth" has been well emphasized by enhancing the health debate with the labor and educational dimensions.

UNU-EHS is not only privileged that it could contribute to further dissemination of the ideas and results of the conference through this publication, but it had also significant help from its sister institute the UNU *International Institute for Global Health* (UNU-IIGH). UNU-IIGH is the youngest operational research and training centre of the UNU family, established in 2007. Prof. Dr. Mohamed Salleh Mohamed Yasin, the founding director of the UNU-IIGH, as well as Prof. Dr. Syed Mohamed Aljunid Seyd Junid, senior scientist of UNU-IIGH, attended the conference in Bonn and enriched the debate with their expertise. This was not only one of the first academic activities of the institute, but in the same time a successful example of strategic cooperation between UNU institutes.

It is certain that the work to improve global health will never cease. We hope that the 2007 conference and this publication can be another benchmark towards the achievement of this cherished objective.

Prof. Dr.-Ing. Janos Bogardi
Director UNU-EHS

## Executive Summary

***Andreas Rechkemmer, Falk Schmidt, Nico Reinke and Louise von Falkenhayn***

Human actions lie at the heart of global change phenomena and range from the increase of greenhouse gas emissions in the atmosphere, rising worldwide energy demands and depleting natural resources, to the substantial improvement of health care systems for a large proportion of mankind while concurrently marginalizing a significant number of people. The impacts of these challenges will depend on human responses, of individuals, national policies and also the creation of multilateral agreements as reactions of a global society. The *International Human Dimensions Programme on Global Environmental Change* (IHDP), which is co-publishing this SOURCE publication, is an international, interdisciplinary research network, which provides international leadership in framing, developing, and integrating social science research on global environmental change, and promoting the application of the key findings of this research to help address environmental challenges.

Over the course of its first decade, IHDP has been successful in developing an international research programme enhancing the involvement of the social sciences in global change issues and contributed to heightened political and societal awareness of the human dimensions of global change. Entering its second decade – with its Strategic Plan 2007-2015 – IHDP will continue to generate cutting-edge research on coupled human-environment systems, at various levels, and it will broaden its activities in the science policy interface as well as reach out to new, and vital, issue areas. Recently, issues of public health connected to global environmental change have been at the centre of IHDP's scientific portfolio and this publication is a clear outcome of this focus.

This publication introduces the overall theme and specific topics of the international conference "Towards Sustainable Global Health", held on 9-11 May 2007 in Bonn, Germany. The "Bonn Call for Action and Awareness", inserted after this executive summary, is the major outcome of the international conference and was submitted to numerous political stakeholders within the realm of global environmental change and human health. "Sustainability in global health will only be achieved by a strong integration of the basic principles of hygiene and public health, education, safe workplace, political willingness and cooperation of all stakeholders", as stated by Martin Exner during his keynote speech that introduced the conceptual framework of the conference. This publication, though not a volume of proceedings, presents major issue areas identified during the conference and provides contributions from almost all of the keynote speakers. Together they contributed to the overall aim of the international conference "Towards Sustainable Global Health" to provide new conceptual frameworks that foster sustainable global health through an integrated and holistic perspective.

The *"Bonn Call for Action and Awareness on Promoting Sustainable Global Health",* addressed governments, policy makers, stakeholders, people's awareness and scientific research. The general statement promoted by the call is that global health is everyone's responsibility. On the one hand, the central role of health is repeatedly addressed by various forums and actors, for example in each of the *UN Millennium Development Goals* (MDGs). On the other hand, none of these goals can be achieved if basic health requirements are not fulfilled. In order to achieve these international commitments, immediate action is needed and the international conference "Towards Sustainable Global Health" helped to consolidate our knowledge by providing the right framework and atmosphere in order to think critically about existing gaps and limits. The conference consequently facilitated new thinking and the development of partnerships, both in sciences, practice, and between the two.

During the conference, presenters and participants identified the current main health related threats and recommended entry points and goals to meet these threats. Although the global dimension of the prevailing health crisis has never been understood as clearly as today, this agenda has been around for decades. By 1978, at a WHO (World Health Organisation) conference in Alma-Ata, Kazakhstan, the "Health for All and Primary Health Care" agenda was adopted in the "Alma-Ata Declaration". The goal of this

agenda was to achieve health care for all by the year 2000. This was the first conceptual commitment that stated a need for global health care and was followed, in 1986, by the "Ottawa Declaration on Public Health Promotion". Today, the demand for such a global and holistic concept in the sector of public health is more pressing then ever before. Almost 30 years after Alma-Ata, the demand for such a concept was addressed at this Bonn conference. This time, the issue was dealt with in the light of new challenges and an attempt was made to give new answers to the pressing questions on how to achieve sustainable global health.

Through addressing the role of hygiene, sanitation and public health, in a historic context, it is obvious that the pioneers of these fields contributed significant developments to the advancement of world-wide human health care. However, current research illustrates both the continuing lack of health care rudiments and potential strategies to fill these gaps. This reality needs to be kept under global surveillance and, concurrently, an aim for an integrative approach for public health and hygiene must be pursued. Exner and Klein address this aim in the first section of this volume and summarise both the current challenges and potential strategies to address it in a more effective and up-to-date manner. The two authors set the stage in their contributions, reminding of the global scale of the issue at hand, the necessity to think innovatively about it and suggest fundamental but doable changes in order to accomplish the goals identified. Both make it very clear that endeavours to guarantee this integrative approach are compiled largely under the guidelines of the MDGs and the International Decade "Water for Life" and that these two international efforts should be used to pursue the global health agenda. Inequity in health care services and unfavourable life conditions within developed and developing countries were presented and discussed by Jeffrey D. Sachs, Director of the Earth Institute at Columbia University. He has been crucial both for the general development of the MDGs and in particular for the global health agenda.

A rising number of natural hazards and many cases of anthropogenic pollution are affecting human societies at both greater frequency and magnitude. Furthermore, unrestrained population growth, rapid urbanization, and patterns of inequality within societies result in higher vulnerability, lower human security and uneven equity of those affected. The concept of social vulnerability is key to understanding the need for a review of public health care systems and the current practices in many regions of the world. When taking a social vulnerability perspective, people are put in the centre of research and a given challenge, such as the global health crises, is then related to humans in their local context.

Bohle, Hogan and Marandola represent this research stream in this publication and discuss the problems of poverty, deficient education, ignorance and the difficulties in access to public health care services in the second section of the volume. These issues, which are listed in the "Bonn Call", are some of the main phenomena that need to be tackled and require both "formal" and "informal", "top-down" and "bottom-up" responses and action. Evidently, several uncertainties and perilous conditions are currently inhibiting the general goal to secure an adequate health care for all. The remaining lack of knowledge is not an excuse to further delay action and hence, in spite of incomplete knowledge, current cutting-edge science is yielding the most appropriate conceptualisation of uncertainty and guidance for action.

Global environmental change is increasingly becoming a driving force in changing health conditions and this topic is highlighted in the third section in this volume. Adequate scientific answers to questions in this field were introduced at the conference and are currently addressed by a large-scale and long-term international project, *"Global Environmental Change and Human Health"* (GECHH). This project is currently implemented under the auspices of the *Earth System Science Partnership* (ESSP), with the International Human Dimensions Programme on Global Environmental Change being the social science arm of this partnership. These days, issues such as the impact of climate change on human health are being pushed to the centre of attention of a wider audience, for example that of the "Global Health Conference" held in May 2007.

The roles of institutions and socio-economic factors must be mentioned when addressing environmental change and human health, as both cause problems or can be part of the solution. Earth surface transformations that result from spreading cropland and pastures are significant land-use changes and are often accompanied by infrastructure such as irrigation systems, dams and access roads. Taken together, they often have significant impacts on the environment and its ability to provide health related ecosystem services, e.g. clean drinking water. This situation propagates the spread of health problems that need to be managed at an appropriate level, e.g. by local authorities and institutions.

Cesario and Andrade-Morraye highlight how such human induced changes in natural cycles and biophysical processes result in altered environmental and social patterns. This in turn, results in serious human health effects and is why research on coupled socio-ecological systems is needed. Research in this field has also pointed to promising concepts of how to govern such changes. Current research on the health implications of globalization and multi-level strategies, acting on a local, national and international level to maintain human health, are discussed by Lovell and Rosenberg.

Significant conference outcomes were new concepts relating to good governance and best practices in urban areas, particularly in fast-growing cities in developing countries, which may provide promising solutions to daunting health challenges. This is why urbanization and governance are represented here in two related chapters.

In the year 2007, for the first time in history, more people lived in urban than in rural areas. Increasing population density, growing industrialization, air pollution and land loss, as well as water shortages and contamination, are all involved in the extreme dynamics and changes within socio-economic patterns and inequality in access to services and goods. Rising poverty and social marginalization in urban areas around the world, linked to other unpredictable change patterns, are some of the main challenges faced and which have attracted the attention of many scientists. Particularly, it is essential to include and understand the interactions within and between informal/ squatter settlements in the process of urban regulation improvement and the implementation and development of new policies. For this reason, the fourth section provides articles by Bharucha and Krafft, and Wang and Krafft that highlight the challenges and risks of urbanization and human health in two countries, India and China, which both have these significant dynamics.

Concurrently, several participants stated that good urban governance is a major entry point for improved and effective public health care systems, given the more conducive environment of cities (infrastructure, people's capacity, integration into markets etc.) as opposed to rural areas. The Mayor of Kolkata, Mr. Bhattacharya, substantiated this theory by presenting the future challenges of the city of Kolkata.

A great deal of current cutting-edge science, in the area of social science, takes place in the field of governance. This field of research encompasses a wide range of ideas and implications, although the overall landscape remains rather ambiguous. However, all different descriptions or concepts of governance (in the realm of human health) include the issues of transparency, equity, and efficiency, and they each aim to promote new ideas and integrate them into day-to-day implementation processes. Effective governance systems, at various levels, have significant influences on health care and public health, i.e. they are prerequisites for a higher quality of public health. Representing the linkages between governance and human health, the fifth section concludes this volume with contributions by Hein, Füssel, and Huynen, Martens and Hilderink. These contributions focus on the developments of global health governance, the complex political issues, the aspects of conceptual frameworks for globalization and health, and climate change adaptation assessments for health. These aspects are discussed and analysed with the aim of achieving good global health governance to ensure and secure health.

The conference fostered fruitful discussions geared towards the implementation of a unique framework of worldwide co-operation in order to achieve formerly set goals. The vision is to have a syste-

matic, cross-sectoral and progressive regulation process under a global umbrella. However, this does not mean that "one size fits all" solutions are envisaged. The most promising conceptual frameworks, both theoretically and practically, point out that multi-level approaches are needed; approaches where different levels within the general global framework needed to guide the implementation of specific issue areas. While it makes sense to set up guidelines at the global level, e.g. on the quality of drinking water, actors need to take concrete action pertaining to the area that they are operating in. Since real action takes place on the ground, pursued by people and based upon their knowledge, ability to learn and passion, initiatives such as the international conference "Towards Sustainable Global Health" aim to support this action by fostering new knowledge and creating facilitative environments. Such holistic approaches hark back to governance research that concurrently identifies ways and means to link actors, across scales and levels, in order to achieve desired outcomes.

A wide range of specific case studies, mainly from developing countries, were presented and offered promising insights into issues within areas such as hygiene, drinking water supply and sanitation, and education. Each of these areas provides essential tools to achieve good health. However, sufficient understanding of how to up-scale individual success stories and how to successfully and broadly implement more integrated concepts is still lacking. We hope that this publication will aid this endeavour by supplying a rich SOURCE and a starting point for concerted action.

The conference aimed explicitly at bridging the gap between science and practice. It acted as a platform for the creation of science-policy networks to ensure that practice is guided by the recent findings of science and that scientific endeavours are finally translated into action. Even so, more needs to be done, and particularly when feasible, *Public Private Partnerships* (PPPs) should be supported. At the conference, representatives from several NGOs, and some private companies working on site, gave accounts on the difficulties of their work and highlighted the important need to perform more efficiently in the working field of health. These voices, from all global angles, have been captured in the "Bonn Call for Action and Awareness on Promoting Sustainable Global Health". These are the voices that provide us with hope and are the voices that urge us to act, now!

# Bonn Call for Action and Awareness on Promoting Sustainable Global Health

## Preamble

We, the participants at the International Conference **Towards Sustainable Global Health** held in Bonn, Germany from 9 – 11 May 2007, including a unique multisectoral, multidisciplinary group of

- Government, academia, and practitioners
- International organizations, NGOs, and civil society
- Ambassadors, mayors, and slum dwellers

**Realizing** that millions of people suffer and die unnecessarily annually in a world where an estimated two billion humans lack adequate access to health care,

**Considering** that human health, including physical, mental, emotional and spiritual aspects, is at the center of human aspirations and a basic human right,

**Recognizing** that human health cuts across all Millennium Development Goals (MDGs) and is a prerequisite for achieving human well being and a balanced social and economic development,

**Acknowledging** the achievements of health workers, plumbers, scientists, visionary political leaders and other stakeholders in proving the fundamental societal value of hygiene and public health,

**Emphasizing** the importance of promoting and achieving access for all to high-quality and affordable health care,

**Call for action** and systematic engagement by national governments, the international community, business leaders and all relevant stakeholders to take recommended measures to promote sustainable global health, outlined below.

## Messages of the conference for Policy-makers, Business and Social Partners

**Good health is good wealth**
Health is the bedrock of economic prosperity, and fosters better investment opportunities and improved productivity of human resources.

**Good health is good governance**
Health fosters good governance. A healthy work force, safe homes and working conditions, social health protection, and access to water and sanitation are not only noble objectives. Good health fosters stable cities, rural areas, and societies.

**Good health is good balance between economic, social and individual development**
A healthy population of workers and managers is capable of fostering a mutually responsible and supportive relationship between wholesome individual wellbeing, the civil society and economic activities.

**Good health is good for security and peace building**
Health is the backbone for human development of all social groups irrespective of their religious affiliation or cultural background. Providing sufficient health services to all is not only the expression of social solidarity. Health underpins social stability, and is an indispensable pillar of human security and well being world wide.

## Challenges for sustainable global health

The world faces a variety of existential challenges today and in the near future, which pose a threat to human health and security with consequences for political and social cohesion. These challenges are accentuated by

- Climate change, accompanied by increasing frequency and intensity of natural hazards, and changing climatic conditions affecting disease vectors,
- Environmental degradation such as air and water pollution, loss of biodiversity and lack of food security,
- Decline of ethical and moral orientation within families, at the workplace, in social interactions and at corporate business / governance level, leading to decreasing sense of responsibility for collective well-being and social progress,
- Patterns of inequality, including gender discrimination, poverty, and educational gaps in urban and rural areas.

These factors bear grave consequences for the physical and mental health of all adult women and men, children and youth, and the elderly. These challenges can derail progress towards the Millennium Development Goals and hold back human development.

Prompted by this concern, several Bonn-based UN entities

- UNESCO International Center for Technical and Vocational Education and Training (**UNESCO-UNEVOC**),
- United Nations University Institute for Environment and Human Security (**UNU-EHS**) and
- International Human Dimensions Programme on Global Environmental Change (**IHDP**) together with
- International Labor Organization (**ILO**) and the
- Institute for Hygiene and Public Health of the University of Bonn, WHO Collaborating Center for Health Promoting Water Management and Risk Communication (**IHPH - WHO CC**)

organized the International Conference 'Towards Sustainable Global Health'.

### *Central questions at the Conference*

***What*** are the advantages of an integrated and holistic global health strategy to reach the MDGs?
***What*** are the risks, challenges, and needs for global health in the future?
***What*** significance will holistic hygiene concepts and disease prevention have on public health strategies, particularly for newly born, infants and children?
***How*** can we achieve sustainable global health in the face of environmental change, including threats to human security and the dangers of accelerating urbanization and the impact on rural livelihoods?
***How*** can we move towards a multi-level strategy integrating education and training, individual capacity and knowledge, home and workplace, science, government and private organisations?
***What*** is the role of corporate social responsibility and public private partnerships in improving global health?

## Top seven threats

To answer these questions, delegates at the conference identified seven major threats to sustainable global health:

- **Poverty and inequality** between social groups and gender. Disparities between rural and urban areas and developing and developed countries.
- **Rising vulnerability** to natural and human induced hazards and communicable and chronic diseases.
- **Water and sanitation** such as inadequate water supply and infrastructure to support safe water and sanitation.
- **Uncontrolled urbanization** such as the increase of slums in mega- and meta-cities and their impact on rural areas.
- **Unsafe workplace and home conditions** such as exposure to poor hygiene and dangers at the workplace, home, and health care facilities.
- **Unethical and irresponsible practices** in public, private and civil organizations caused by insufficient awareness, structural corruption, and loss of empathy and ethical consciousness. Contributing to poor transparency and accountability, and to dislocation of social support systems such as the family unit, civil society, and private organizations.
- **Insufficient allocation of resources** for health and supporting infrastructure for primary health care and social health protection, and insufficient support for social entrepreneurship, micro-financing and training for potential entrepreneurs in developing countries, especially women and youth.

## Recommended entry points

A comprehensive framework for joint actions by all stake-holders should include and integrate the basic principles of ***public health and hygiene*** and ***human development***, with implications for:

**Poverty and inequality**
- Increase access for all, especially poor and marginalized, to high quality, affordable primary health care and pharmaceuticals.
- Facilitate access of all people to social health protection.

**Rising vulnerability**
- Enhance mitigation measures and adaptive capacity to global environmental change including climate change, particularly for air pollution and natural hazards.
- Foster information exchange such as geographic and other earth-observation systems, including effective surveillance systems for disease control.
- Enhance risk governance and provide acute prevention measures such as vector control.
- Strengthen applied research in hygiene, public health, and public health policy.
- Enhance outreach and cover of vaccination programs.

**Water and sanitation systems**
- Provide safe water in a socially feasible setting.
- Secure investment and provide appropriate sanitation / plumbing systems and assure their maintenance.

**Urban and rural health governance**
- Improve governance and infrastructure of healthcare systems, particularly for marginal groups.
- Provide preconditions for establishing public health systems, including community-focused health councils.
- Train health workers for primary and community health, and provide adequate communication and data tools.
- Promote e-media and information technologies to make public health care accessible for experts and the public.
- Establish formal and informal cost effective programmes for individual health promotion (hygiene, family services, nutrition, housing, sexual behavior).
- Secure holistic epidemiological characterization and monitoring of public health in urban and rural areas.

**Societal and sectoral health awareness**
- Establish mechanisms for enhancing holistic health competence through all channels, such as schools and universities, workplace, and communities.
- Integrate public health and hygiene in medical curricula.
- Strengthen public organizations to ensure hygiene, safe water supply, adequate nutrition and public health.
- Facilitate action among sectors to achieve safe and decent workplaces.
- Educate basic hygienic measures to prevent diseases, particularly targeting women and girls (home hygiene).
- Promote awareness and individual capacity for health maintenance, including physical, mental, emotional, and spiritual well-being.

**Restoring ethical practices**
- Establish and evaluate innovative consciousness development and learning programmes for private, public, and civil organizations, to foster ethical and socially responsible management practice in society and the workplace, by
- Combining traditional and innovative therapeutic practices for self-enhancement, including cognitive-behavioral therapy and the techniques of introspection and meditation.
- Empower individuals through knowledge transfer and mentoring programmes aimed at fostering individual capabilities and self responsibility for physical mental and emotional health, and social consciousness.

**Resources and commitment**
- Implement and evaluate adequate material and im-material resource management and long term planning.
- Support micro-financing and innovative cooperative ventures and training.
- Invest in transparent, accountable, and effective infrastructure for primary and public health, including plumbing and proper sanitation and water treatment.
- Design and establish affordable insurance programmes, and investment schemes for improved provision of clinical and other healthcare services, to protect individuals from social relegation and financial ruin.
- Support and enhance corporate responsibility and public private partnership projects.

**Global Health is Everyone's Responsibility.**

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# 1. SECTION

## INTEGRATED APPROACHES FOR PUBLIC HEALTH AND HYGIENE

## 1.1 Integrative Approach for Global Health – Hygiene for All

*Martin Exner*

### Abstract

Various threats will have severe consequences for sustainable global health for all people in developed and developing countries with regard to life quality and life expectancy. To address these challenges, a global and multidisciplinary commitment to sustainable development and strategic partnerships between all countries are essential and must be incorporated in policy decisions and individual choices.

Sustainability in global health will only be achieved by substantial implementation of the basics of **hygiene and public health.** This chapter provides an overview of the challenges and risks and a working definition of the terms: hygiene, public health, health protection, and health promotion. It discusses historical learning and the most important issues of hygiene and public health. The chapter concludes with an overview of important action areas for hygiene and public health policy.

### Introduction

The world faces a variety of challenges now and in the near future, all of which have the potential to severely threaten international public health and security with consequences for global, political, and social stability and progress. If not properly addressed, these challenges have the potential to derail progress towards the *Millennium Development Goals* and hold back human development.

### Drivers of Risks and Threats for Sustainable Global Health

Drivers of risks and threats include:

- climate change, global warming and increasing natural disasters;
- population growth from the present six billion to eight billion in the next decades;
- urban growth and the increase of slums in mega- and meta-cities;
- the rapid spread of communicable diseases through the processes of globalization, rapid global travel, and international trade;
- old and new communicable diseases, epidemics, and pandemics with the threat of new antibiotic resistant micro-organisms, especially in health care;
- chemical and nuclear accidents and other environmental, natural, and man-made environmental pollution;
- a water crisis in which more than one million people are denied the right to clean water and 2.6 billion people lack access to adequate sanitation to fulfil their domestic personal hygiene needs;
- increase of the vulnerable and older populations;
- increase of chronic diseases, which will burden health systems;
- increase of stress related physical and psychological diseases due to fast growing and changing societies and human activities;
- inadequate access to health systems, adequate hospitals and ambulances;
- inadequate human resources in public health systems and their infrastructure;
- inadequate social health insurance systems;
- increase in poverty and social inequality in and between countries;
- almost three billion people are estimated to live on less than two US-$ per day;

- 2.4 billion people lack basic sanitation;
- two billion people without electricity;
- one billion adults are illiterate;
- one billion people without adequate shelter;
- 110 millions school-age children are out of school, 60% of them girls;
- one billion people lack access to safe water;
- 808 million people lack access to basic health services;
- 790 million people lack adequate nutrition;
- 250 million children between the age of four to 14 years do wage work outside their household, often under harsh conditions;
- one third of human deaths, some 50,000 daily, are due to poverty-related causes and thus avoidable, insufficient universal primary education and vocation of people, inadequate access to public health and primary health care (Hoveck et al., 2007). The difference between the life expectancy in the Sub-Saharan countries and industrialized countries is 31 years on average (Unicef, 2007).

According to the national rural health mission (2005–2012) concerning the state of public health in India, only 10% of Indians have some form of health insurance, mostly inadequate. Hospitalized Indians spend on average 58% of their total annual income on health expenses, over 40% of hospitalized Indians borrow heavily or sell assets to cover expenses, and over 25% of hospitalized Indians fall below the poverty line because of hospital expenses.

Each of the threats mentioned has a severe impact and consequences for all developing countries and their people, with regard to quality of life, life expectancy and public and individual health.

Good public health unleashes positive productive forces. Without elementary health, hygiene, and nutritional levels, people cannot focus on the alleviation of poverty, achieve equity and economic development, gain education to qualify for work, and move towards the *Millennium Development Goals* and beyond.

## Learning from History

The developed countries in Europe have faced similar challenges in the 19th century, as we are encountering today on a global scale. They have developed a system of hygiene and public health rooted in the 18th century, the epoch of enlightenment, as a holistic tool based on a strong political, scientific, interdisciplinary, and financial commitment and infrastructure (Exner and Pfingsten, 2004).

The pioneers of hygiene and public health have been:

- *Johann Peter Frank* (1745–1821) can be regarded as the founder of a holistic modern system of hygiene and public health by his massive treatise, "A complete system of medical policy", the first publication covering in detail the principles and practises on all aspects of hygiene and public health. He called in his academic speech the people's misery as the mother of diseases and who emphasized that health conditions of people must be changed by political instruments taking into account hygiene and public health;
- *Sir Edwin Chadwick* (1800–1890), the principle architect of the sanitary reform movement in the 19th century, who advocated "The Public Health Act" in 1848;
- *John Snow* (1815–1858), a historic giant of public health, wisely recognized for his seminal work on the epidemiology of cholera in London and founding father of modern epidemiology;
- *Max von Pettenkofer* (1881–1901), under whom hygiene became an experimental science founded on physiology; he was professor of the first university institute for hygiene in Germany;

- *Florence Nightingale* (1820–1910), one of the most influential, and, up to today, underestimated leaders in hygiene and public policies. She had tremendous political and scientific influence, not only in raising nursing to the level of a respectable profession for women, but for developing scientifically based modern concepts of hospital hygiene, home hygiene, surveillance, hospital building, and education for nurses and medical students;
- *Louis Pasteur* (1822–1895), who demonstrated that organisms, such as bacteria, are responsible for souring wine and other foods. He extended this study to explain the causes of infectious diseases including anthrax, cholera, tuberculosis, and smallpox, as well as their prevention by vaccination; and
- *Robert Koch* (1843–1910) discovered the tuberculosis bacillus, Vibrio cholera, and introduced methods for investigating water, air, and soil and developed prevention strategies to eradicate water-transmitted cholera and typhoid fever.

All these pioneers have helped to develop a system of hygiene and public health, rooted in the 18th century, as a holistic tool based on a strong political, scientific, interdisciplinary, and financial commitment and infrastructure.

This commitment proved to be extremely successful to prevent and bring under control the disease burden and to increase life expectancy by up to 35 years in the 20th century.

In the year 2000, Dr. J. Koplan, the director of the US-Centre for *Disease Control and Prevention* (CDC), pointed out that a person in 1900 could expect to live, on average, to the age of 45. Today, in developed countries, life expectancy is nearly 80 years. Of the 35 years of lifespan people in developed countries have gained, only about five years have been attributed to advances in curative medicine. The other 30 years of lifespan have been attributed to improvements in sanitation, health education, the effect of vaccines, and other hygiene and public health advances. The retreat of the great levels of diseases was due to more urban improvements, superior nutrition, and public health and hygiene rather than to curative medicine (Koplan, 2000).

In 2007 the British Medical Journal gave readers ten days to vote on a short list of fifteen milestones of the most important medical inventions since 1840, when the journal was first published. More than 11,300 readers chose the introduction of clean water and sanitation, the sanitary revolution, as the most important medical milestone since 1840.

The work of the pioneers of public health and hygiene of the 18th and 19th centuries, the introduction of piped water to people's homes, and sewerage systems, attracted 15,8% of the votes, while antibiotics took 15%, and anaesthesia 14%. The next two most popular were the introduction of vaccines, with 12%, and the discovery of the structure of DNA with 9% (Ferriman, 2007).

Therefore, it is time to implement what is already known in the hygiene and public health sector as an important tool to support *the UN Millennium Development Goals* and the goals of the UN-Decades "Education for Sustainable Development and "Water for Life".

## What Are Hygiene and Public Health, Health Promotion, and Health Protection?

**Hygiene** is the science and art of prevention and control of diseases and health preservation by health protection and health promotion. The goal of hygiene is the assurance of life-preserving and life-promoting environmental and social conditions in a community and society of solidarity, which promote, enhance, and claim health compatible individual behaviour patterns.
On the conference "Towards Sustainable Global Health" Prof. Hartemann (University Nancy) made the additional proposal for a definition of hygiene:
"Hygiene is the medical discipline dealing with the relationship between man and his environment in the way to promote the best health status thus including physical, mental and social domain according to WHO-definition of health." (Hartemann, 2007).

**Public health,** as defined by Charles Edward Winslow (1920), is the science and art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing service for the early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health.

**Health Protection** includes all conditions, which are employed by a community, independent of the behaviour of individuals and not to be influenced by individuals alone, to ensure and guarantee health-supporting environmental and social living conditions, including the legal framework for water hygiene, sanitation, sewage and waste disposal, food hygiene, home hygiene (including adequate shelter), hospital hygiene, hygiene of the working environment, urban hygiene and hygiene in public buildings, and the vaccination policy of a community.

**Health Promotion** includes all measures, which should empower the individual to protect and promote his or her own health. These attitudes depend on ideals mediated by the family, society, religion and culture, literacy, education, vocation, formation, information, communication, motivation, compliance, and guidance to personal responsibility. It includes personal hygiene (in a broad sense including cleanliness), healthy eating and drinking, smoking behaviour, alcohol and other drug use, sexual behaviour, physical training and maintaining a healthy body weight, willingness to get appropriate vaccinations, regular exams and screenings, stress management, and behaviour of safety and self-protection (Exner and Pfingsten, 2004).

## Examples of Hygiene and Public Health Topic Areas

What can be achieved by systematic application of basic principles of hygiene and public health? In this chapter these issues are discussed within three areas of hygiene and public health: water, hospital hygiene, and education of undergraduates in medicine.

*Water*

A tremendous part of the human population is suffering from unsafe water, inadequate sanitation, and lack of proper hygiene. 1.1 billion people lack access to adequate drinking water supply. Many more drink water that is grossly contaminated. Four billion cases of diarrhoea occur annually, of which 88% are attributed to unsafe water and inadequate sanitation and hygiene. 1.8 million people die every year from diarrhoea diseases, the vast majority are children under five years. Lack of safe water perpetuates a cycle whereby poor populations become further disadvantaged and poverty becomes entrenched (WHO, 2007).

WHO estimates that 94% of diarrhoea cases are preventable through modifications to the environment, such as interventions to increase the availability of clean water and to improve sanitation and hygiene.

What needs to be done? We have learnt that an effective and sustained advocacy on water sanitation and hygiene at all levels is a prerequisite. Water, sanitation, and hygiene education programmes must be integrated in every school. Investment in sanitation infrastructure, such as latrines and toilets, a focus on long-term, sustainable service delivery, and the involvement of women in the planning and design of water and sanitation facilities must be assured. Most of all, it is vital to bring water sanitation and hygiene to the political agenda and to guarantee that these items have a high political priority (WHO, 2007).

By these principles, a strong political priority, a strong legal framework, a strategy to guarantee water safety from catchment to tap assuring a good water filtration which guarantees better basic protec-

tion than disinfection by chlorine. Since the beginning of the 20th century, strong surveillance and monitoring under the leadership of public health departments supported by a network of hygiene public health institutes and a *Public Private Partnership* (PPP) with water utilities under the control of public health departments had been integrated into a holistic strategy. By these principles and the implementation of a strong drinking water guideline in 1896 and 1906, not only water-borne cholera was eradicated in the beginning of the 20th century, but also other infectious diseases such as typhoid fever and shigellosis were brought under complete control. The mortality of children under five was reduced immediately after the introduction of water filtration. Today 40% of German drinking water can be distributed without chlorine or any of the other five disinfectants.

*Hospital Hygiene*

WHO estimates that at any time more than 1.4 million people worldwide are suffering from infections acquired in hospitals. Between 5 and 10% of patients in modern hospitals in the developed world acquire one or more infection. The risk of health care associated infection in developed countries is two to twenty times higher than in developed countries. In some developing countries, the proportion of patients infected by health care acquired infections can exceed 25%. Health care associated infections in England are estimated to cost one billion pounds per year. In the United States the estimates are between US $ 4.5 billion and 5.7 billion per year (WHO, 2005).

The annual Epidemiological Report on communicable diseases in Europe summarizes that antimicrobial resistance and health care associated infections are one of the most serious public health problems in Europe. If this negative development is not halted, mankind will soon lose one of its most important weapons against infectious diseases. Therefore, health care associated infection, with or without resistant pathogens, is seen as the most important health risk in Europe. Health care associated infections are a rapidly grown problem in European hospitals, as there are every day infections which afflict the community. Every year approximately three million people in the European Union catch a health care associated infection, of which approximately 50,000 persons die (ECDC, 2007).

Some of the risk factors in hospital hygiene are lack of awareness and commitment regarding the import of health care associated infection, lack of specific regulation and policies of prevention of health care associated infection, lack of guidelines on basic hygiene in health care, lack of promotion of national or regional campaigns to improve basic hygiene and health care, and insufficient allocation of financial resources for this purpose. Therefore, even Florence Nightingale recommended in 1894 (Training of Nursing and Nursing the Sick) that health care workers must be told the nature of a contagion and infection as well as the distinctions between disinfectants and antiseptics. Florence Nightingale pointed out that if such precautions had been always scrupulously observed, mischief done by students and dressers might have been saved and valuable lives spared, even among surgeons (Nightingale, 1894).

The global patient safety challenge, initiated by the WHO, pointed out that health care associated infections affect 1.4 million people worldwide in hospitals at any given time and concerns every patient in the world. This adds up to billions of dollars of losses every year, promotes drug resistance, endangers health care workers and puts patient's relatives at risk. Therefore, WHO promotes "clean care is safer care". What is needed are clean hands, clean environment, clean equipment, clean practises, and clean products (WHO, 2005).

Germany has one of the lowest infection rates in hospitals (NAO, 2004). The basic aim to reach this status should be met by political support, a strong legal framework on prevention, constructional function, operational criteria, a written national hospital hygiene guideline, a consented communication and training integrating medical undergraduates, a personal framework and vocation for hospital hygiene, roles and responsibilities, building, design and construction and management of hospital hand-hygiene, hygiene with invasive systems and strategies. Also needed are a clear strategy for antibiotic policy and cleaning disinfection and sterilisation strategies, a protection system against contamination,

holistic water hygiene, an environmental microbiological control, monitoring and evaluation, surveillance and effective outbreak management and a hygiene-infection control committee in each hospital and the evaluation and ongoing monitoring review and correction by health departments or other independent institutions.

*Education of Undergraduates in Medicine*

Johann Peter Frank wrote in his proposal for the education of undergraduates in 1786 that hygiene and public health must be a main topic of the medical education (Frank, 1812).

In 1957 the WHO made a proposal for the teaching of hygiene and public health in Europe. In this initiative the WHO recommended that the medical curriculum should provide future physicians with the knowledge and skills needed not only for the diagnoses and treatment of diseases, but also for promotion, maintenance and protection of health through application of the methods of hygiene and preventive social medicine (WHO, 1957). In most European universities the basic principles of hygiene and public health are still not fully integrated. This does not then avoid the problem that there are generations of physicians in Europe who are not well educated in the basic principles of hygiene and public health.

These principles have been integrated into the teaching of hygiene and public health for medical students at the University of Bonn, Germany. During the first semester of the medical curriculum at this university, a short introduction to medicine is given to guarantee a general idea of medicine as a hole wherein hygiene and public health is presented as a part of holistic medicine.

In the second clinical semester, hygiene, social and occupation medicine, microbiology and biology are taught. Hygiene includes selective seminars on the following topics: hospital hygiene, water hygiene, vaccination, food hygiene, environmental hygiene, healthy cities, and hygiene in developing countries, outbreak management, and management of public health. In the third and sixth semester, clinical seminars are held on public health and focus on the prevention of cardiovascular diseases, allergies, tuberculosis, HIV, aids, alcohol and drug use, vaccination and health promotion.

Consequently, there seems to be an urgent need to invest in capacity building beginning in the medical schools.

## Conclusion

In conclusion it should be pointed out that the redetection of hygiene and public health must be seen as an indispensable and strong instrument to guarantee health protection and health promotion. Curative medicine alone is too late, too expensive and associated with a high risk of poverty for individuals and a high financial burden for societies. It is necessary to guarantee a scientific base, risk analysis and risk management, political support for hygiene and public health policy, a strong legal framework to ensure health protection and health promotion, communication, education and training of the principles of hygiene within the home, work-place, villages, cities and environment. A multi-sectoral and a multidisciplinary approach is needed. A strong system of public health departments and a network of scientific institutes dealing with hygiene and public health must be guaranteed.

Hygiene and public health have demonstrated their tremendous efficacy for assuring health, life quality and prolonging life expectancy. They must be regarded as a basic part of the aim to realize the *UN Millennium Goals*.

"We have the knowledge; we have the instruments, let us implement what we know to reach the worldwide reasonable state of harmony" (Exner, 2007).

Global partnership means the support of the countries and communities creating and implementing these basics in every area of the world.

Hygiene and public health, these two are the adequate medicine of a modern and healthy society.

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## 1.2 Meeting the Water and Sanitation Challenge – Action at Different Levels

*Günter Klein*

### Water and Sanitation – The Pre-Condition to Safe and Healthy Living

In many organizational schemes we find human health and safety under "social aspects", and commonly reduced to the tasks of health services. This reduction of health to the provision of services to sick people is by far too narrow. It does not capture the wide range of elements through which the housing and working environment, societal and educational mechanisms can support sustainable health.

It is of course relevant not to neglect the social component in the provision of adequate health services. However, sustainable health needs a much stronger focus on promoting health and wellbeing at all appropriate entry points. Schools, workplaces, and the home as well as other routes and means for building competence will form the basis for a wide participation of every citizen in securing his own health and wellbeing. Established institutions providing health services need to expand their portfolios much more towards preventive action.

This is true for the poor and poorest, and it is equally true for the world's richest countries, where health policy makers struggle to lower the financial burden of treating sick people. In many countries, this policy shift from providing expensive care towards investing in effective prevention has just been kicked off. However, we need to bear in mind that societies in developing countries have to deliver both at the same time: expanding health services to achieve equal access to appropriate care for everyone, and exploring avenues for prevention in order to avoid economic collapsing of the growing health services.

One of the key-elements to success in all countries and societies in the world, and in history, was and is the proper handling of water. Experiences gained in many industrialized countries over the last centuries need to be made available at the earliest possible stage. Sustainability will only be achieved when the global society works together and avoids the repetition of mistakes. The ways in the past that many industrialized countries have chosen to solve water quality and availability problems, and the ways in which these solutions are presently implemented under the new challenges of ageing societies and climate change, also pave the way for future strategic approaches towards meeting the global challenge.

**No wealth and no health without understanding the role of safe water!**

The commitment under the **UN Decade "Education for Sustainable Development"** is therefore equally important to achieve progress towards this end, as is the **UN Decade Water for Life.**

Water is an issue that is of cross-cutting importance for all *Millennium Development Goals* (MDGs) and other internationally agreed goals and targets. Food security, poverty eradication, energy supply, literacy, reduced child mortality, gender issues, and environmental sustainability depend on sufficient and clean water to the same degree as public health. Two million children are dying every year from water-borne diseases, such as diarrhoea, and many more people die from other water-related causes. Where an understanding of basic hygiene exists, most of these deaths are preventable. This perspective is addressed by Fewtrell et al. (2007) in the published article: 'Quantifying the health impact at national and local levels in countries with incomplete water supply and sanitation coverage'.

It is particularly this health perspective that makes very clear why it was so important to supplement earlier formulated targets, which were originally purely water-oriented (like HFA strategies of WHO in the 1980s), with an equivalent target on sanitation, such as the *Millennium Development Goals* (i.e. MDG's 7, Target 10 Water-related Disease http://www.who.int/water_sanitation_health/diseases/en/).

However, both targets are only achievable if the knowledge, power, and willingness of those affected are fully harvested and if women and men play their specific role. Community involvement, institutional capacity development, and active participation of civil society, are keys for achieving the water and sanitation target. This is a fact that underscores also the triangular of health, water and education and which was central to the Bonn conference on Sustainable Global Health.

## Water in the Everlasting Cycle – Man-Made Water Scarcity or Human Interaction

Of equal importance is the understanding of a constructive and productive relationship between land use, and industrial and agricultural use of water as part of the global, regional and local water cycles, in comparison to the perceived, or provoked, competition for water resources. It has been sufficiently and convincingly demonstrated, that conflicts, and even armed conflicts around water, have been, and will be artificial (Shuval et al., 2006).

The only human way of water related interaction is cooperation. Therefore, this article is directed towards progress in common sense, good governance and the necessity to cooperate – to the benefit of all. Adequate cooperation for water instead of competition has only winners, no one will lose.

## The Community-Industry Challenge

The **UN Decade "Water for Life" 2005–2015** was established by the UN General Assembly Resolution 58/217. Simultaneously, UN-Water was established by the UN Secretary General in order to join forces in the global endeavour to end the suffering caused by lack of water and sanitation. For far too long, the provision of safe water and sanitation to the poor has been carried out by the good will and good intentions of well meaning and highly motivated people working in a wide range of professional or charitable organizations. Despite the fact that not all opportunities were used to work towards the common goal in a coordinated and professionally excellent way, they have done a tremendously good job. Supply of safe water is now reaching the vast majority of people in the world. The "last billion" of underprivileged people will be halved by 2015.

However, the world community is confronted with the three-fold risk of failure:

1. Due to the lack of progress in providing adequate sanitation services to some two to three billion people

This will continue to be "the critical issue", since the source of water contamination (and also food contamination) has been and will continue to be the unsafe handling of excreta or sewage. At small scale, at the family level, as well as in large scale, conditions at community or mega city level, only safe handling of sewage and excreta will guarantee health, and will control water related diseases. Comprehensive understanding of the water system, rather than the suspicious look at the water in the kettle, has been and will be an essential element for building health competence and combating poverty on the basis of "safe water for all".

2. Due to the lack of clarity in strategic approaches for future development with major water users and polluters: industry, energy and agriculture

Comprehensive analyses of the global water situation have been presented in the two *World Water Development-Reports* (WWDR). While the first WWDR1 in 2003 (http://www.unesco.org/water/wwap/wwdr1/table_contents/index.shtml) highlights the challenge to create "cleaner industries" in the light of the predicted growth of industrial water demand in correlation with economic growth, the second WWDR 2 in 2006 (http://www.unesco.org/water/wwap/wwdr2/table_contents.shtml) expresses concern about the alarming increase in water use by agriculture, (partly) due to the need to produce enough food for growing populations, especially in regions under water scarcity.

Both reports do not focus on, or provide sufficient guidance on solutions, despite the fact, that:

- firstly, industries in many countries have demonstrated their capability to reduce water consumption by two to three orders of magnitude

  (WWDR 2 figure 8.1., Trends in industrial water use by region, 1950–2000: p. 278) and to control pollution of water by closing inner cycles of water and products; and

- secondly, a few countries only apply technical means for effective irrigation. The exceptional performance of agriculture, such as in Israel or Cyprus, in this respect, provides the example of **how global society has to cooperate** in order to reduce the present wastage of water resources by irrigators in almost all countries. This is true for rich nations (like Spain, Portugal, USA), economies in transition (like Turkey, Russian Federation, China), and almost all the countries which we find on the list of those under extreme water stress.

These experiences have to be addressed, and existing technical solutions have to be found and placed at the top of the list of elements for international cooperation related to water management.

3. Due to the lack of collaboration at the urban-rural interface

Many mega cities across the globe gather a magnitude of wealth and economic dynamics in their modernizing centres. Here, provision of sufficient water and sanitation seems not to be an issue, and it is not at all a question of economic feasibility. The cost for water supply in these centres is negligible in relation to the economic turnover characterizing business in these places. However, many of these urban centres suffer from bad maintenance of distribution systems, sometimes combined with bad compliance with financial regulations.

The loss due to leakages and the economic loss due to unaccounted water flow amount to an order of magnitude between 25 and 50% of the distributed water. In the case of a big city such as Teheran, some 250 to 300 million m³/year of safe water are either lost or not paid for. Saving these losses, caused by leakage, would be sufficient to provide another 20 million people with safe water services.

In the majority of cases, neither a suitable system for water pricing, nor an effective system for leakage control has been established. The opposite has "happened". Instead of implementing such a **solution oriented approach** additional **problems have been created.** Compensation for these losses has been taken from outside. The construction of new dams, abstraction of groundwater, and competition with local suppliers and farmers in the peri-urban belts, puts additional stress on those people who form the human resources for the economic progress and success of the central urban areas. **It should be noted, that these processes were not just "happening", but they were "actions" implemented on the basis of decisions against a more sustainable and future oriented approach.**

Models of cooperation between the urban and the peri-urban and the surrounding communities provide the ecological basis for water and food supply, which needs to be established in cities. This should be based upon on a case-by-case analysis and decision making process. Models for such an approach exist and have been implemented for many decades, and proven successful (e.g. Ruhr-Verband in Germany http://www.ruhrverband.de/ruhrverband_en/html/index.html).

The economic valuation of groundwater production, which is the highest contribution forests are giving to societies, has not been acknowledged in the past. It has not yet been expressed clearly enough in relation to land-use policies and other uses of woods. It is surprising then why the clearing and logging of rich rainforests still seems to be an acceptable action, devaluating the forest system to an extent that would be unimaginable in most other fields of economic activity (see Table 1). By harvesting water instead of wood a 5 – 50 fold higher economic benefit is attained. If this water were to be bottled then these values would even reach 100 times higher.

## Getting the figures right…

Services of the forest:

- Firewood
  5 Fm/ha x a x 40 $/Fm 200 $/ ha x a
- High Quality Furniture Wood
  3 Fm/ha x a x 400 $/Fm 1200 $/ha x a

High Quality Safe Ground Water
0,2 – 0,5 m_/m_x a x 1 $/m _ 2000–5000 $/ha x a

(Fm = solid cubic meter of wood)

*Table 1: Valuation of Forest Services*

*The Challenge to Industrial Development – A Noble Task*

While the WWDR 1 states that industrial water consumption is increasing proportionally to the GDP of many countries, it is equally true that within all the industrialized countries the water-efficiency was raised in many industries to an extent, which seems at the first glance to be unimaginable at the global scale. However, looking at car, steel or paper producers, power stations or chemical factories, car washing stations or breweries, in Europe during the last four decades industrial water consumption, in general at national scale, was stabilized or reduced. In several areas a reduction by a factor three to ten was achieved. Through effective cycles of reuse and treatment, many big enterprises reduced the water intake and the sewage outlet by two or three orders of magnitude! Thus, these companies, in close cooperation with the local authorities, reduced the water stress and averted pollution of aquatic systems.

Most companies, who are engaged globally with factories or production sites in many other countries, have the experience, the knowledge, and the technical and financial means to implement such a strategy at any place on the globe. Exploding economic centres in South-East Asia, Africa, Latin America, and in coastal areas and around the big cities, have the potential to change their part in the direction of seemingly inevitable water trends.

The increase in water consumption by growing industries is not just happening, and it is not "taking place". No, it is action, or the consequence of in-action. It is an activity that follows a management decision to do so or, much better, not to do so.

Hence there is no automatism or necessity, and there is no need to accept silently the increasing water consumption and water pollution. It is the opposite in this case. There is a great challenge and a noble task to modern and innovative industries to demonstrate their capabilities. This not only involves production of goods and generation of income, but also the task to produce in a resource-effective manner. Blind production, as well as blind exploitation and blind pollution of aquatic systems, is archaic, and not adequate to the otherwise often proclaimed efficiency of globally acting industries and global businesses. People all over the world are willing to contribute to modern production, and that includes the best and most effective use of water effective technologies and processes.

*The Community Challenge – Focusing Resources*

How and where to find the necessary resources we need for expanding the activities in the education sector? How can shrinking public budgets in all countries, rich and poor, cope with an increasing awareness of the benefits that societies will gain through better education? Why not intensifying the collaboration with other partners, such as businesses, and small and big enterprises already actively involved in capacity building for their staff? Is it not in the interest of any company and their share-holders to take advantage of a well skilled and healthy workforce living in a safe environment?

The foundations of such an approach can be found far back in the 18th and 19th century. However, how far are we in applying this experience? We can follow the historical approach, which teaches enough for the "convinced". Industries in the late 19th and early 20th century were neither more nor less "charitable institutions" than global business is today. However, growing evidence had been convincing for industry leaders and top managers to make them invest in their work force. Maintaining competence for special work processes, and keeping a highly skilled and competitive team, became an asset in the course of increasing demands on the quality and reliability of technical products. Those companies with better experts, and stronger and healthier workers, could better manage the upcoming competition for quality and liability.

During the same period of time, societies and science went through a learning process regarding what "health" means, and what is needed for individuals to maintain their health. Learning about hygiene and water supply, safe food and adequate nutrition reached many people through basic education, and the spreading capability of reading and understanding complex issues of life. Thus, industry managers found a well prepared audience for strengthening the wellbeing of their staff through housing programs, support to community based water and sanitation programmes. These initiatives provided sufficient water for running the factories, as well as safe water supply for their people and the food supply for canteens sufficiently increased standards by satisfying basic nutritional needs.

As a side effect of this social corporate governance, the long-term staff supply was ensured by binding the staff and their families to a favourable and supportive environment. Children and grandchildren of workers from mining or other industries kept the flow of the healthy and motivated labour capacity going. The social connection to their "Siemens" or "Krupp" company or to the many mines in the Ruhr-region made the workers in these areas feel socially safe and almost like a big family. Supporting physical activity became an equally useful mechanism for strengthening social cohesion and corporate identity. This has been "sustainable", which is proven by the still existing football clubs, e.g. "Bayer Leverkusen" or "Schalke 04", founded one hundred years ago!

*Industrialization and Sustainable Development Meet – The Final Decades of 20th Century*

Personal and individual business interests governed this process for a long period of time, until the world became increasingly aware of the inter-linkages between countries, businesses and all political developments made in the world. "Limits to growth" have been formulated and presented at the global level by the Stockholm Conference in 1972. The Brundtland Report (1987) and the Ottawa Charter (1986) brought the understanding of health and environment together under one umbrella. During the 90s, regional conferences on environment and health and the Rio Earth Summit in 1992 created a high level of political commitment for creating environments supportive to health.

Throughout this process, education has increasingly been identified as the crucial "bottom-up" element for any society's development towards sustainable patterns of production and living. It was no longer the task of the medical doctor to deal with health as: health is everybody's business!

However, it took a few more years to create a better understanding of the need for integrated approaches, integrating public, private and individual competences and their respective tasks. The Amsterdam treaty (1999), which came into force on 1 May 1999, was the first international binding document that was geared towards holding policies of all sectors accountable for their impact on public health.

In the same year, the WHO-UN-ECE – *Protocol on Water and Health to the Convention on Transboundary Waters* – became the first international binding treaty focusing on water management on a human outcome: a serious commitment of 35 States to provide the basis for public health (http://www.euro.who.int/Document/Peh-ehp/ProtocolWater.pdf).

"Good global governance" became a key phrase for the "successful triangle". Only those societies, that were successfully economically and socially stabilized, and where the partnership between the economic sectors, the public authorities and "human resources" as competent and independent individuals was good, functioned to the benefit of the whole. The Johannesburg Summit and the MDGs shaped the common challenge for all societies, citizens and businesses in the world.

*Public Awareness and the UN Decade "Education for Sustainable Development"*

The recent Bonn conference in October 2004 on TVET for Sustainable Development highlighted the needs we face, both at the educational and the health front, especially where poverty and deprivation, armed conflicts and political crisis continue to be characteristics of everyday life. In these places health conditions are bad due to inadequate water supply and sanitation, children have no access to continuous school education, schools are not available to everybody, and health competence cannot be built up. How can this vicious cycle be broken?

In order to approach this question in a cooperative and multi-sector manner, it is important to find mechanisms which enable us to communicate with the so far untouched audiences. These audiences are those that had no chance to go to school and who need a new type of "classroom", either at the community level, or at the work place. In the light of limited resources in the public sector (in all countries, rich and poor) we have to look more carefully in the world of work and production. Here we have to identify opportunities, where mutual benefit will become obvious. Exploring the full potential of e-learning and the remote availability of the internet everywhere on the globe is important for competence building mechanisms in the interest of civil society as well as for business.

## The Urban-Rural Challenge

*From Health Concern to Multi-Sectoral Action – The Case "Urbanization"*

The urban poor have always been at risk from water-borne diseases, respiratory infections and the adaptation of vector-borne infections to urbanization because of poor housing and sanitary conditions. Cities at the beginning of the 21st century pose a new set of risks linked to the environment, which goes beyond the urban poor affecting the young and the old and even the rich. These risks include exposure to air pollution, traffic accidents, noise, congestion, safety questions, and the urban heat island amplification of heat waves.

While public opinion is shaken by disease and the suffering of millions of (peri-urban) poor people, the destruction of well-being results in a disintegration of societies that were on the way to improve their cohesion and responsibility. Now these societies are creating "healthy – wealthy islands", and the mess is left to the public, their authorities and officials, and to the poor.

- The reasons for mass movement have been the same as those in past centuries and continue to be the same. Poverty and social pressure, and in many cases oppression and armed conflicts push people towards the cities where they hope to find a better future, where their own needs and that of their families are met.
- The increasing focus of research on multidisciplinary concepts needs to be strengthened and shared worldwide. All "megacities" across the world are facing similar challenges and needs. Some have learned essential lessons during the last decades, have developed and implemented strategies to create big but healthy cities – centres of welfare, social stability and communication, as well as experimental areas for sustainable development at the urban scale.
- Sharing this experience with other growing or exploding centres of aggregation will need a global approach and global responsibility. However, a big investment in the development of convincing

and consensus based indicators is needed. Again, indicators that open the understanding of coherent approaches and make effects of policies and actions visible are needed.

*Urbanization – The Success of Culture(s)*

Over thousands of years, urbanization has facilitated the development of systems that ensure the supply of goods and services to all citizens in the most effective way. Basic water, food supply and "urban hygiene" (Hygeia, a Greek goddess) made urban life pleasant in ancient Greece, Rome and Mesopotamia, as well as in a growing number of capitals across Europe over the last 1,000 years. Understanding causal connections between urban hygiene and health opened a new dimension of urban life close to the end of the 19th century. At this stage, international exchange became the key to success (e.g. Robert Koch's studies on Cholera distribution in Calcutta, and applications for Cholera and Typhoid control in the exploding mega city Ruhr region in Germany).

Easy access to health care, essential drugs and, of utmost importance, health education helped to reduce infant mortality. In developed and developing countries life expectancy increased between the years 1900 and 1980. Therefore, urbanization is generally associated with good health services, while some of the typical urban health problems have to do with a lifestyle not supportive to individual health (like sedentary life- and work style, excessive eating or drinking combined with social or economic tension and perceived insecurity).

On the other hand, densely populated and (geographically or ecologically) disadvantaged urban and peri-urban areas are associated with negative health. This is mainly due to the concentration of people in these areas with lower education and income. Here, infectious diseases, which have always been associated with urbanization, the concentration and composition of air pollutants, and the decline in water quality in mega cities have led to growing concern and call for improving equal access to all basic services, not only in health care, but much more importantly, especially in providing healthy environmental conditions (Kastrup, 2006).

A comparative assessment of "sustainable cities" is needed to understand the ecological and economic balance of urbanization. The ecological effects of urbanizing areas on their wider surroundings have to be understood in their global economic consequences (e.g. long range transboundary air pollution, acid rain from industrial urban areas, or eutrophication of remote aquatic or mundane systems).

**While the "polluter pays principle" has the clear logic of pecuniary thinking and has consequently never been applied in an effective and sustainable manner, the challenge goes towards developing instruments which convert this well intended but incomplete approach into a knowledge based "prevention rewarding principle".** The "rewards" have to be allocated systematically in the urban area itself, as well as in the areas, which are supplying it with resources (food, water, energy and goods) and are taking care of its various outputs (products, waste, pollutants).

## Moving the Research Agenda from Descriptive-Problem Oriented Towards Strategic-Solution Oriented

What has been missing in water research? Why was the evidence of success over the past decades not applied in urban development strategies? Why did water technology in industry, energy production, agriculture, economy and legislation not combine for a global approach?

The reasons for slow progress may be manifold. However, there are good reasons to change the patterns of reluctance now.

## Millennium Development Goals, new efforts and international cooperation under the UN Decade leading towards better health and well being through improving water and sanitation services: from competitive to partnership oriented

There has been enormous progress in political decision making, and in global conventions and partnerships. This makes us even more aware of the gaps in these areas and the areas where the global community failed to build upon this progress. More than one billion people still lack access to safe water, about 2.5 billion are without provision of any basic sanitation, and supply with sustainable energy is still insecure for more than half of the world's citizens. Simply to focus on these two millennium tasks would not be met by the "business as usual" approach.

However, political awareness is far from adequate dimension of the task. Even the 67th UN General Assembly agenda does not contain any single item related to the water and sanitation challenge. What prevents international assemblies from highlighting the urgent need to find more effective avenues for securing peoples' survival?

Pressures resulting from the living conditions people face, challenge societies and individuals, especially in developing countries under war conditions and civil unrest, people being under threat by hurricanes, tsunamis, floods or earthquakes. However, using the headline of an UNU-EHS-Bulletin "Danger Need Not Spell Disaster", there is good reason for hope and optimism if we improve the mobilization of civil society and its partnership with business that, undoubtedly, have common interest in the prevention of disasters, suffering and disease.

## Where Is Hope?

On the optimistic end of the scale we find the progress in eradicating infectious diseases. Polio has been almost eradicated. From 125 polio-endemic countries in 1988 only seven countries had incidences of polio in 2003. Involved in this success were ten million volunteers, who helped to immunize 600–700 million children, and civil society organizations such as Rotary and donor agencies, which provided an excellent vaccine product and organized the logistics to reach even the most remote villages. This global effort was made possible by the involvement of 100 million informed and motivated parents. 118 countries have successfully implemented vaccination and eradication programs. Many of these countries are experiencing ongoing armed conflict and civil war, and half of these countries have the lowest level of per-capita income (http://www.who.int/whr/2003/en/index.html).

## Make Every Major Health Issue a Public Health Issue

With support from the internationally organized civil society, together the United Nations, governments, and companies have an enormous potential to improve health and well-being by joining forces, and by agreeing on the strategies and tools to enable their people to care for themselves, their families and neighbours.

Some countries have engaged in processes which de-stigmatise disease, identify and name risks, move private suffering up to a public health agenda of national or global scale, and provide concrete help. As reported in the World Health Report 2004, enterprises in African countries began to engage in the distribution of antiviral drugs free of charge to their work force. This was a wise decision, unfortunately it was a step taken years after they learnt and understood how and why their "human resources" were vanishing (http://www.who.int/whr/2004/en/index.html).

Success stories from industrialized countries from the turn of the 19th to the 20th century of improved living conditions give rise to hope. On one hand we might look back and describe what has made progress feasible in the past, on the other side actual case studies and strategies ought to be shared with the maximum possible audience.

There is a need to reach those people now, in order to give their children a chance to survive, and in order for them to learn, for their own survival, how to behave in a health promoting way. Of course, all means for transmitting knowledge need to be applied. We see an increasing potential and an increas-

ing responsibility for the private sector to help expand the audiences reached, for instance those who had no chance to visit a school, and who will never again find an opportunity to do so. Most of these people go to work, earn their living in enterprises, companies, on farms or in mines. Beyond the increasing awareness of the private sector of their responsibility for keeping their workers healthy and safe, there is an increasing willingness to care for the "human resources" with the same reasoning that crossed the minds of business leaders in industrialized countries more than a hundred years ago.

Will the 21st century become the century of good governance? In a global partnership we can make it.

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# 2. SECTION

## VULNERABILITY, HUMAN SECURITY AND EQUITY

# 2.1 Food Vulnerability – Health Vulnerability: Convergence and Common Ground in Global Change Research

*Hans-Georg Bohle*

## From Food Vulnerability to Health Vulnerability in Global Change Research

After long periods of mere co-existence, a clear conceptual convergence can now be observed between food systems analysis on the one hand, and human health research on the other. This convergence is most clearly reflected in the field of vulnerability studies. While food vulnerability research has a rather long history, health vulnerability is a more recent field of enquiry. It is hypothesized that the concepts, theories, and practices that were developed in the field of food vulnerability can now inspire the newly emerging field of health vulnerability. This proposition will be discussed in the context of risks that are posed to food security and human health under the impact of *Global Environmental Change* (GEC). A focus will be put on the recently approved food and health programmes of the Earth System Science Partnership, namely the *Global Environmental Change and Food Systems* (GECAFS) project and the *Global Environmental Change and Human Health* (GEC&HH) project. The Science Plans of these two projects (GECAFS 2005; GEC&HH 2006) show clear indications of conceptual convergence, particularly in the field of vulnerability. The challenge will be to consolidate these still rather separated strands of research and build common conceptual, theoretical, and practical ground for building sustainable food and health security.

## Theoretical Foundations of Food Vulnerability: Implications for Health Vulnerability in Global Change Research

The concept of vulnerability was developed in the early 1980s, both in environmental and social sciences. Pioneering work on environmental vulnerability (Timmermann, 1981) and social vulnerability (Chambers, 1989) soon converged in natural hazards research (Cutter, 1996). It recognized that impacts of hazards on human vulnerability are a function of both the event characteristics (magnitude, duration, frequency of natural hazards) and broader societal conditions. A new focus on famines and food security evolved that viewed vulnerability not as a result of an extreme event but rather as a societal characteristic and process. Emphasis was put on the political causality of human vulnerability to hazards and related phenomena such as hunger and famine. The social space of vulnerability was explored, revealing how food crisis and famine were attenuated by access to resources, power relations, conflicts, and violence (Watts and Bohle, 1993). In theoretical terms, Sen's (1981) entitlement theory became one of the most powerful building blocks for understanding the causality of social vulnerability. Food entitlements, the central focus in Sen's work, refer to legitimate effective control over alternative commodity bundles, i.e. land, water, and workforce. Sen distinguishes between four different types of entitlements: trade-based entitlements, production-based entitlements, own-labour entitlements, and transfer entitlements. Sen (1981) could prove that lack, loss, or breakdown of such food entitlements, not lack of food itself, were the main causes for social vulnerability during famine.

A second and related strand of theoretical discussion contributing to vulnerability research revolved around institutional economics (North, 1990) and the role that institutions play in providing or denying (food) entitlements. The central question that emerged was asking which combination of rules, norms, and regularised practices makes the most difference in terms of livelihood security for the vulnerable. While these strands of discussion are more directed at the structural causes of vulnerability, a third approach focuses on human agency as a major determinant of vulnerability. It argues that the vulnerable are not passive victims of drought, food crises and famine, but rather they actively

monitor, interpret, and shape the physical and social environments around them. Addressing the links between agency and structure in terms of the theory of structuration, Giddens (1995) demonstrated that institutions, rules, norms, and values can emerge and only exist as products of social practices and actions. These structural forms subsequently shape people's actions, not by strict determination but by providing flexible orientation points, which either enable or constrain the livelihoods of the vulnerable, particularly in times of crisis (Brklacich and Bohle, 2005: 59).

It will be argued in the following section of the paper that entitlements, institutions, and human agency are important elements for the overall conceptualization of food and health vulnerability to GEC. A new focus on health entitlements, on the institutional arrangements that secure human health, and on the agency of the health vulnerable will provide more conceptual coherence and help consolidate health vulnerability analysis in the context of GEC.

## Common Ground in Conceptual Developments: Vulnerability Frameworks for Food and Health in the Context of GEC

In the context of GEC, vulnerability frameworks have been developed that concentrate on human-environment interactions and conceptualize these in terms of coupled *Social-Ecological Systems* (SES, Turner et al. 2003). For climate change scenarios, i.e., the *Intergovernmental Panel on Climate Change* (IPCC) (2001 Glossary) has defined vulnerability as a function of the character, magnitude, and rate of climate variations to which a system is exposed, its sensitivity, and its adaptive capacity. Focusing on health vulnerability, the *International Plant Protection Convention* (IPPC) (2001, Vol. II: 457) has also emphasized issues of sensitivity and adaptation to climate-related threats. The GECAFS Science Plan (2005: 11–12) clearly widens its focus. It seeks to conceptualize food vulnerability by coupling concepts of ecological and social vulnerability. While environmental vulnerability refers to stresses to food systems, originating from drought and other natural phenomena, social vulnerability relates to communities' lack of capacity to cope with and recover from all kind of stresses, including, but not limited to, environmental stresses. Food systems vulnerability is therefore conceptualized as the exposure to both GEC (type, frequency, and magnitude of environmental threats) and societal changes (changes in institutions, resource accessibility, economic conditions, etc.) on the one hand, and the capacity to cope with and/or recover from these changes, on the other hand. To conceptualize food vulnerability in this way is certainly a much broader and more "social" approach to vulnerability, with considerable implications for health vulnerability analysis. To be fair, some of these implications were also addressed by the IPCC (2001, Vol. II: 457) when the basic determinants of population vulnerability to climate-related threats to health were summarized. These were the level of material resources, effectiveness of governance and civil institutions, quality of public health infrastructure, access to relevant local information on extreme weather treats, and pre-existing burden of disease, and were all integrated into the GEC&HH Science Plan.

A recent attempt to apply the vulnerability concept to food security and to operationalize and model the relevant components of vulnerability by Lucas and Hilderink (2004) starts from three components of vulnerability: exposure, sensitivity, and coping capacity. While risk exposure is defined as the nature and degree to which human-environment systems are exposed to global change, sensitivity (both environmental and socio-economic sensitivity) is the degree to which the system is affected, either adversely or beneficially. Coping capacity refers to adjustments emanating from the awareness, ability, and actions taken to moderate or offset the potential for damage of a food system or take advantage of opportunities created by global change (Lucas and Hilderink, 2004: 3). This conceptualization offers broad opportunities for health vulnerability analysis, especially in its effort to view food systems as coupled social-ecological systems and to address the agency of food vulnerable populations in terms of awareness, ability, and action. The schematic diagram of the GEC&HH Science Plan (2006, Fig. 1), which indicates the pathways by which GEC can affect human health, includes some of the indicators that are

also used for the food vulnerability model, i.e. land use systems, food systems, water systems, and biodiversity change. Consequently, the diagram links issues of food and nutrition as affected by GEC to problems of human health. What is missing in this diagram is the social dimension of coping and adaptation, and particularly issues of human agency. When explicitly addressing health vulnerability, the GEC&HH Science Plan (2006: 17–18) does define it as a function of exposure, sensitivity, and adaptive resources/capacity. However, the adaptation measures are basically conceptualized as structural and interventionist.

Consolidating the concept of health vulnerability in the context of GEC requires even more convergence with approaches from social vulnerability studies, in general, and food vulnerability studies, in particular. This proposition seems even more relevant as the social problems of hunger and disease are most closely related, and frequently mediated trough environmental factors such as land and water. Both food security and human health are ultimate crosscutting issues (Krafft et al., 2002: 8). Food and health are sensitive to virtually all of the issues identified as being components of global change. The state of food and health, therefore, are solid, dynamic, and integrated indicators for the social and ecological status of a society. Accordingly, integrative and coherent concepts of food and health vulnerability are needed for sustaining food and health security on all levels of society, from the local to the global.

## From Theory to Policy: Securing Sustainable Global Food and Health

According to the Social Protection Unit of the World Bank, the vulnerability literature on food security and on health/nutrition has so far focussed more on outcomes than on risk exposure or response (Alwang et al., 2001: 24 f.). This is in line with the *Millennium Development Goals,* which address food (goal 1) and health (goals 4–6) in terms of desired goals or achievements. The discourse on human security (Gasper 2005) reveals how food security and health security were first conceptualized by *United Nations Development Programme* (UNDP) (1994: 3) in terms of safety from the threats of hunger and disease and put in the larger context of freedom from want and freedom from fear. More recent approaches from the human rights perspective have argued that the requirements for being secure can go far beyond freedoms from want and from fear, but include freedom from humiliation, from indignity and from despair (Robinson, 2003). The Commission on Human Security's report "Human Security Now" (2003) has included Sen's capability approach. Instead of just addressing freedoms "from", it views human security as freedoms "to", especially freedoms to act and to attain. The recent discourse on human security no longer views food and health security as outcomes or goals alone. It rather addresses the ways in which (food and health) entitlements can be secured, capabilities to achieve food and health security can be strengthened, and human rights to food and health enforced. Any policy to attain sustainable global food and health security will have to seriously address these issues.

## Conclusion: Scope for Synergies and Common Ground

Food systems analysis and human health research that aim at providing the scientific base for sustainable food and health security offer much scope for research synergies, especially in the fields of vulnerability, entitlements, capabilities, and human security approaches. This is particularly relevant for achieving research synergies in scientific global environmental change programmes such as GECAFS and GEC&HH. Common ground can be strengthened by taking a more people-centred perspective on health and food, by conceptualizing health and food as social and political processes, by employing sounder theoretical foundations for analysis, by recognizing new approaches in sustainability science, and by fostering social science and environmental science integration for analyzing vulnerabilities and securities in coupled social-ecological systems.

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## 2.2 Socio-Demographic Vulnerability to Environmental Hazards of the Metropolis

*Daniel Joseph Hogan and Eduardo Marandola Jr.*

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### Introduction

The drama of human health in the 21st century will be played out in the world's cities. Already home to half the world's population, cities will house up to 80% of mankind by this century's end. Meeting the challenge of providing health care means understanding the challenge of urban growth, especially in metropolitan areas. In the large, complex, and highly integrated cities of the 21st century, assuring access to health services will require attention to spatial distribution and to the mobility of metropolitan populations. Health problems themselves will change rapidly in the next decades, with a greater burden arising from strains on water services, the superimposing of different stages of the epidemiological transition, and the consequences of global warming. The latter include the vulnerability of a growing elderly population to heat waves and the frequency and intensity of severe weather events. In all of these cases, large metropolitan areas face a particularly difficult future.

The challenge also requires attention to the abilities of individuals and households to respond to the prerequisites for maintaining health as well as to the stress of ill health. Why are some families able to deal better with health problems than others, when excluding basic economic differences? Why is the same health infrastructure in large metropolises more accessible to some families than others? An important part of the answer to these questions is to be found in the determinants of vulnerability among urban populations. Understanding risks and vulnerabilities of 21st century metropolitan populations is an important element in the complex task of improving health.

These issues are explored in this paper in an attempt to widen the discussion of health in the metropolis. In addition to health care itself and the specific health demands of urban populations, the resources mobilized by individuals and families to maintain health and overcome ill health require conceptual understanding and empirical study.

### Vulnerability: Contributions of Demography and Geography

This paper focuses on a set of concepts necessary for the understanding of the environmental hazards of the modern metropolis. Social science researchers have reached for new concepts, or have rehabilitated old ones, in order to deal with problems not foreseen by their established paradigms. This task is fundamental if we are to make progress in this field, all the more so, considering the need for conceptual language that allows different disciplines to communicate with each other. The focus here is on **vulnerability** and associated concepts, within the context of the contribution of geography and demography to this discussion. Both disciplines have given much attention to the state of the world's cities.

In the discussion of vulnerability to environmental hazards, **territory** and **scale** are fundamental starting points. While territory has always been a key concept for geographers, population processes of distribution, concentration and mobility have often treated space merely as a background of demographic change. As absolute population growth has declined, with many developing countries even

reaching zero or negative growth, the migration component of growth assumes a central role in population dynamics. Populations of specific places (continents, regions or cities) will continue to fluctuate according to economic, technological, political and environmental factors. In particular, the sustainability of human settlements (including their size, density, location and mobility within and between them) now requires the incorporation of geographical considerations into demographic analysis. Specific territories acquire added significance for understanding population change.

The issue of scale has been central to both disciplines, but it has not always been addressed at the same hierarchy of analysis. While geographers have focused on factors, demographers organize their analyses in terms of political and social levels: the nation-state, political regions, cities and households have only recently begun to incorporate environmental and geographical elements into their studies. The notion of scalar hierarchy has a central place in demography, however, and it would not represent a major challenge to expand their notion of scale to include physical factors. What is also central to demography but not to geography is the importance of the household. **Place,** according to the understanding of humanist geographers[1], does not capture the same aspect of family organization for social reproduction as **household** does, but brings an additional dimension to the understanding of the most basic unit of social life, from lived space (physical and cultural) and intersubjective (social) relations in the neighbourhood. Likewise, a **household geography** would be enriched by greater approximation to **household demography.**

These possible approximations are important interfaces when focusing on environmental vulnerability. An environmental view encompasses both social and natural processes, and it is this perspective which brings geography and demography closer. While it is a broad concept, which encourages dialogue across different disciplines and scales, the concept of **vulnerability** is especially useful at the micro scale. How do families (or households) organize themselves to face hazard? Especially, what aspects of households contribute to their ability to respond to environmental disasters and health crises – which may often occur together?

## The Vulnerabilities of the Modern Metropolis

With half of the world's population now living in cities, we have recently passed one of civilization's most significant thresholds. Whether this means improved quality of life for the majority of the world's population will be much debated in the course of the following years. In spite of the anti-urban bias of Western thought, which still contrasts scenes of the misery and degradation of city life, especially in developing countries, with an almost mystical view of a more dignified poverty in rural areas, the possibilities of meeting man's needs in cities are potentially enormous.

It is disturbingly clear, however, that cities are not prepared for their new role of harbouring most of mankind. Not only are most of the world's countries still facing daunting **societal** challenges of development – overcoming enormous social inequalities, creating jobs and integrating with the world economy – they also face dramatic problems at the scale of **communities.** Cities, as territorial units spread out over the landscape, have not generally established congenial, compatible arrangements with the territories they inhabit. The search for more sustainable ways of transforming undisturbed (or little disturbed) environments into intensely used environments which answer the needs of the urban population of the 21st century must be intensified. How will urban dwellers, both old and new, accommodate their needs and desires to the new and different limits found in cities?

Fulfilling the daily requirements of men, women and children in dense urban settings will demand not only new institutional arrangements for needs satisfied by smaller scale, and household strategies in rural areas (water, sanitation, garbage), but will also demand social and cultural arrangements to bridge the gap between traditional solutions and urban realities. That cities may go beyond meeting basic

1 On the concept of place in Humanist Geography, see Tuan (1975) and Entrikin (1991).

needs to a fostering of humanity's full creative potential is a still greater and appropriate goal. It is to be hoped (it is the only admissible hope) that the chaotic misfit between man and the natural world, which we now witness in its starkest reality in the world's cities, represents a transitional phase. At the far end of this transition we can envision cities that sit more lightly on the Earth, providing their populations with livelihoods and quality of life, which sustain human dignity. Living through the gap will be facilitated by networks of social relations, which diminish vulnerability to the hazards peculiar to this phase. One important set of hazards, particularly crucial during the transition, are environmental in nature.

What are the environmental hazards encountered by city dwellers, as we become an urban world? What are the signs of the misfit between populations' needs and the environment? What are the risks of exposure to hazards produced by rapid and unplanned urban development? Who is exposed and who is most vulnerable? Who finds solutions and adapts to hazard and risk? And who are the defeated, left by the wayside?

Our questions and empirical grounding are derived from a collaborative research effort underway at the Population Studies Center of the State University of Campinas. Under study are two metropolitan regions of the State of São Paulo: Campinas, 100 km to the Northwest of the City of São Paulo, including 19 municipalities with a population of three million, and the Baixada Santista – nine municipalities centred in São Paulo's port city of Santos (70 km from São Paulo) with a population of 1,800,000. Patterns of urban expansion are being examined for their consequences for socio-demographic and environmental vulnerabilities of metropolitan populations.

The research takes a social capital approach, seeking to identify the set of resources (social assets) held by individuals and households and which contribute to their ability to manage hazard and risk.

## Socio-Demographic Vulnerability

A multifaceted concept such as vulnerability contributes to the science of man's relation to the natural world in many ways. As an overarching *idée force* of the new century, it links different domains and scales in the effort to understand the complexities and uncertainties of contemporary life. Much recent research has also shown it to be useful in empirical studies at local and regional scales. Vulnerability is understood as the capacity to respond to a situation of exposure to a hazard (Hogan and Marandola Jr., 2005). While there are many different understandings of vulnerability, its polysemic character is not an obstacle to scientific understanding. It is, indeed, one of its most positive features.

Our objective in our studies of vulnerability is not to seek the unanimity of a single definition. To the contrary, what is emerging is a universe of related uses of the concept, which, as they are increasingly used in specific research settings, permit a dialogue on a central dimension of contemporary life. What is necessary, however, is that in this context there should be conceptual clarity on how the concept is used in each research.

At the neighbourhood, community or metropolitan scale, it is particularly useful to focus on how **socio-demographic characteristics** diminish or enhance risk from environmental hazards for families. In understanding vulnerability as contemplating the capacity of households to cope with external forces, family demographics become central. The size of the family, the age, sex, migrant status, life cycle status, educational attainment, occupational skills and mobility patterns of its members, as well as the social networks in which they live their lives, generate opportunities for responding to environmental risk.

Examining **social assets** of households is a fruitful way to gauge their vulnerability to hazard. We have much to learn about household behaviour under stress, whether economic, social or environmental, by discovering families' social networks, with their norms of reciprocity, degrees of trust, access to information and associative behaviour.

From geographic and demographic studies, some main points of confluence and of mutual enhancement which we believe could constitute an agenda of dialogue, and which have the objective of constructing this conceptual basis, are the following (Marandola Jr. and Hogan, 2006):

- In both disciplines **risk** is understood as a probabilistic notion that warns of a hazard and calls for action. In demography, risk began as a neutral concept, but it acquired essentially negative connotations in environmental and social studies, whereas it has always had a negative meaning for geographers.
- **Hazard** is an event that causes damage. It is intimately related to risk and vulnerability but has not been a part of the vocabulary of demographers, who commonly confuse it with risk.
- Demographers stress three constitutive components of **vulnerability:** (1) the existence of a risk; (2) incapacity to respond to the risk; and (3) inability to adapt to the hazard. This position of demographers establishes vulnerability as essentially negative. That is, it places it as incapacity and as inability. Although geographers deal with these three components, they see the concept as characteristic of places (not only of persons), and tend to see vulnerability as the **degree** of capacity to respond and of ability to adapt (adjustment). Demographers tend to see vulnerability as characteristic of less favoured populations (fewer socioeconomic resources), whereas geographers tend to have a more marginal perspective, as they focus on vulnerabilities of places.
- **Resilience** and **capacity for absorption** appear in the literature of both geographers and demographers. These concepts have analytic possibilities that can be better explored and delineated for use in research. The aim is to identify mechanisms that foster interconnectivity and flexibility, stimulating stronger resilience against impacts from outside. This approach will allow analysis to be made in terms of individuals, families, communities or the State.
- **Assets** and **opportunity structure** are also notions to be explored and expanded by putting them in the context of broader discussions beyond their socio-demographic dimension. The inclusion of elements from the biophysical environment seems promising for use by both geographers and demographers.
- Discussions on **citizenship, social exclusion** and **poverty** should also be included in this discussion of environmental vulnerability, because many socio-demographically vulnerable groups live in areas of high environmental vulnerability. This fact reinforces the idea of more conjunctive and broader concepts for focusing on problems related to environmental inequality, side-by-side with social inequality.
- The study of **socio-cultural perceptions** and **socio-cultural constructions** concerning risk are also themes that have not yet been adequately explored by demographers. There have been some efforts in this direction, but researchers have still not faced this issue. This lacuna is important to the extent that it directly influences the results of public policies and efforts at prevention, protection and construction of structures of opportunities. In geography, although there is a broad tradition of studies on risk perception and of human experience in relation to environment, greater efforts are still needed to join these approaches to biophysical and socio-demographic issues. This is clearly a major challenge for both areas.
- There has been no systematic effort by either field to relate environments and demographic groups to the dynamics of **risk society.** The effort could be mutually enriching and may increase the explanatory universe, as it builds a bridge between phenomena circumscribed in space with broader dynamics that operate in the sphere of the macro-social production of contemporary society. This is an important agenda for both fields that may provide a theoretical link for the classification of the different perspectives in the study of vulnerability.

- It is important to include **man-made hazards** in this discussion, as well as the social aspects of "natural hazards". The widespread use of pesticides, areas with soil contaminated by earlier industrial products, the proximity of transmission lines or gas and oil pipelines, etc., are spatially located hazards whose consequences are filtered by different vulnerabilities. If the overall objective of the research is to consider quality of life and sustainability, a rigid distinction between natural and man-made hazards is not helpful. Studies of natural hazards have produced an important conceptual framework, but today natural hazards will have to be integrated into academic work that relativises the notion of "natural".
- At the same time, it is necessary to develop **"synthesis" indicators** of hazards and vulnerabilities. The harm caused to the quality of life (of a population, an individual, a domestic group or a place) and to sustainability cannot be estimated by a simple sum total of hazards of floods, hazards of landslides, hazards of exposure to chemical products, etc. One major methodological challenge is to develop indicators that refer to hazards, risks and vulnerability (Cutter, 2003). This effort will not rule out the usefulness of sectoral studies, which will continue to orient policies that are also sectoral. But here, as in environmental planning in general, integrated perspectives are indispensable, even when the necessary interventions are sectoral.
- The consequences of this approach for **public policy** deserve special attention. Prevention, mitigation and recuperation activities, which recognize that effective action requires an integrated, multi-level approach, will meet with greater success in limiting the suffering of those populations facing risk and those for whom the risk materializes. Among other advantages of this approach is that it draws our attention to factors other than poverty, *stricto sensu,* and to the adoption of perspectives that are clearly inter- and multi-disciplinary. Analytical frameworks are enhanced, furthering the understanding of these phenomena.

Population-environment studies have much to contribute to this dialogue. The spatial dimension is at the heart of these discussions, and its theoretical-methodological incorporation requires more refined and precise epistemological foundations (Marandola Jr. and Hogan, 2007).

## Environmental Hazards and Urban Life

These are only a few of the preliminary questions and considerations that will require refinement. Awareness of the different vulnerabilities of populations can contribute to the identification of the assets they require in order to respond more adequately to hazards and thus improve their perspectives and quality of life.

This analysis also suggests the need for further conceptual refinement. As different disciplines face the challenge of understanding non-economic dimensions of household vulnerability, vocabulary must be clarified. We do not seek conceptual unanimity, but coherence and clarity. In this direction, it is useful to observe that different uses of the terms hazard, risk, vulnerability, resilience and adaptation often spring from a point, in a long chain of events, which is the focus of a particular study. There are at least three moments in this chain:

1. **Hazard as potential:** before the occurrence of hazard, which in a particular setting may never actually happen, the discussion is of the risk of a hazard, i.e., the probability of occurrence. This may generate individual, household and community behaviour, but above all it generates fear.
2. **Occurrence of hazard:** at this moment, the focus is on capacity to respond to the hazard event, and the issue is one of **vulnerability,** the diverse factors that make one household more capable of effective response.
3. **Response to hazard:** in the aftermath of hazard, households may experience **adaptation** (transformations which allow the reestablishment of some level of quality of life), resilience (the reestablish-

ment of the status quo ante, without significant transformation) or **failure,** household disintegration and its devastating consequences, found on the streets of every city in the developing world.

Such an outline must be further elaborated and followed by efforts to separate analysis according to different social groups and different types of hazard. The vulnerability of place and socio-demographic vulnerability are important and complementary approaches for research. The focus on place (in a household perspective) permits an integrated view of demographic, social, cultural and environmental factors of vulnerability and resilience. The household perspective of a demographic and geographic approach widens our understanding of the dwelling in the metropolis and of the different vulnerabilities of demographic groups and places.

Risk and insecurity are marks of contemporary urban life, especially in the metropolis. While not endorsing a view of collective panic or a psychology of angst, there is today a generalized, and more intense, perception that cities now carry the mark of vulnerability impressed on their streets, houses and buildings. These large urban areas, where indifference increases to the extent that fragmentation and homogenization dominate processes of production and organization of space, become more and more dangerous, incorporating the sign of risk to the urban way of life.

It is true that cities have always been subject to natural hazards such as floods, snowfalls, storms, droughts and volcanic eruptions. And it is not only natural hazards, of course, which afflict urban man. Fears of the other, of disorder and of the poor have been part of city life since its origins (Tuan, 1979). Modernity brought other hazards to the city, those of unemployment, homelessness, hunger, violence, loneliness. These hazards, instead of being solved by the modernity project, which promised to bring the good life to all by logic and design, have persisted. Modernity has not solved its own problems, much less those inherited from the past.

Contemporary urban man, at the present stage of modernity, accumulates fears and risks faced by city-dwellers of antiquity, the middle ages and the industrial era (fear of the other, of natural hazards and of social inequities), while adding to these his own fears: existential insecurity and a profound crisis of confidence in the systems which have traditionally offered support for decision-making. Religion, science and reason are all questioned for their inability to provide satisfactory guidance on the risks and dangers of contemporary urban life (Giddens, 1991). The intensification of this situation, based on the crisis of confidence and on social and existential disconnectedness, brings to the place and to daily life hazards produced on other scales, compromising even further individuals' capacity to deal with uncertainty in their own lives (Giddens, 1990).

A comprehensive perspective on vulnerability in this context requires that environmental hazards should be understood beyond their biophysical dimension. Hazards are environmental precisely because they include in their dynamics and causal mechanisms elements, which involve different **scales** (from the planetary, societal and market levels to the house, the nuclear family and the place) and multiple **dimensions** (cultural, political, economic, demographic, ecological and psychological), in spaces undergoing rapid social, economic and territorial transformation. For this reason uncertainties and dangers are felt most dramatically in the metropolis, where there is a radicalization of the *risk society* (Beck, 1992).

The issue of the environmental hazards of urban life, then, is related to the classic discussions which involve these phenomena (Cutter, 1996), but which also involve other elements that are linked to the socially lived moment, at both local and international levels. Climate change, for example, will be at the centre of many agendas in the near future (De Sherbinin et al., 2007), and we already have examples of urban planning and administration that include this topic in the formulation of public policy.

A clearly territorial orientation, allied to a profound knowledge of population dynamics at the household, intra-urban and regional scales, is fundamental for understanding the vulnerability of the people and places that form the modern metropolis. Such an approach articulates dynamics, which are at the

same time integrative and fragmentary, requiring the abilities and research paradigms of demographers and geographers in the investigation and understanding of the environmental hazards of urban life.

This discussion of risk and vulnerability has not taken a problem-oriented approach, focusing specifically on the issue of health. Rather, attention was given to the underlying issue of what makes individuals and households more or less resilient to the hazards of metropolitan life. Health hazards are among the most important of these, but need to be seen in the context of a generalized capacity to respond. If this capacity can be promoted as health services evolve in the coming decades, their efficacy will be considerably enhanced.

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# 3. SECTION

# ENVIRONMENTAL CHANGE PATTERNS AND HUMAN HEALTH

# 3.1 Global Change, Health and the Environment: Expanding the Research Agenda

*Sarah A. Lovell and Mark W. Rosenberg*

## Abstract

Arguments in favour of globalization have traditionally emphasized the economic benefits brought about by closer global connections. These economic benefits, in turn, translate into better health outcomes and generally improved standards of living. These health implications are crucial, for health is one of the few 'hard' indicators we have of globalization's impact on quality of life. We call for researchers to pay more attention to the health impacts of globalizing forces. The health effects of globalization explored here are predominantly an indirect result of the social changes emerging out of neo-liberal policies, which have pursued economic growth without due consideration to potential human health implications. We begin by delving into the contested nature of globalization, contextualizing the process that is currently having implications on human health. We then discuss research areas, in which globalization has affected the health of populations. These key areas are: the movement of economic activities, the movement of people, environmental change, and the de-territorialization of healthcare. Our aims are to give the reader an understanding both of how these issues are playing out through global processes at the national and the local scale and, simultaneously, to suggest themes in which the potential for future research is great.

## Introduction

Globalization has had a checkered history, particularly due to depictions of it as a force for cultural homogeneity, and for its use by neo-liberals as a tool for economic reform. This has predominantly occurred within less developed countries (LDCs). The history of globalization may date back to the 1600s but it is only in recent decades that we have experienced profound economic and social shifts, which have transformed the political and economic integration of the globe, and our conceptualizations of it (Wallerstein, 1974). We have experienced a distinct shift in the way we think about our interrelations within the world, a shift towards what Roberston (1992) coins, a 'global consciousness'. For Robertson (1992), global consciousness materializes not in the form of one shared identity but through the tendency to place ourselves – our identity and our history - relative to the global. Global consciousness is an important concept for Robertson (1992), he sees it as inextricably linked to the more widely adopted definition of globalization, as a process of 'global compression'.

Global compression is typically facilitated by technological advancements and trade liberalization. This results in the social, political and economic spread, across space, in new and faster ways, which creates interconnections that transcend national borders (Voisey and O'Riordan, 2001: 26). However, this definition does not acknowledge that globalization is a process that is spatially contingent. Regions experiencing the fastest rate of globalization are doing so because of a heightened availability of technology, which allow people, information and capital to become more connected with the rest of the world. These processes, in turn, create distinct differences in the outcomes of globalization, and result in the emergence of spatial hierarchies in which the developed world is favoured over the still-developing, and the urban over the rural. Such spatial hierarchies are a concept central to this paper.

Globalization is an inherently spatial process, but one which evades attempts to be pinned down to the various scales it transcends (Swygnedouw, 1997). Scale becomes useful when depicting how resistance to and acceptance of globalization plays out in governments, societies and institutions (Swygnedouw, 1997). These activities are embraced in the concept of localization, in which local transformations strengthen self-determination and identity. Rather than undermining the process of globalization, these activities are posited as a consequence of the process (Voisey and O'Riordan, 2001).

This seems somewhat counterintuitive given that the process of globalization is seen as originating in the declining role of the state in economic life. However, in many ways, even these resistances are becoming global in nature through local linkages to global organizations such as People for the Ethical Treatment of Animals (PETA) and the "Live 8" concerts. These tensions, between the global and the local, illustrate the various scales at which the consequences of globalization are experienced, resisted, and reshaped. Taylor, Watts and Johnston (2002) term these globalization consequences as 'economic victims' of globalization.

Arguments in favour of globalization have traditionally emphasized the economic benefits brought about by closer global connections and the economic benefits, which, in turn, translate into improved standards of living and include better health outcomes. It is the health implications that this paper is concerned with. Health is one of the few 'hard' indicators that we have to assess the impact of globalization on individuals' quality of life. Measures such as infant mortality rates are among the most obvious proxy measures that we have to indicate impacts of changing government policy and the marked social shifts resulting from structural adjustment programmes (SAPs). These are factors that have a history of being overlooked in favour of monetary indicators. While the nature of this paper is rather conceptual than statistical, we are calling for researchers to pay more attention to the health impacts of globalizing forces. The health effects of globalization, which are explored here, are predominantly indirect results of the social changes emerging out of neo-liberal policies. These policies have favoured economic growth without due consideration to potential human health implications. Lee et al. (2002) have been very careful to distinguish between international health and global health, and we wish to reiterate this distinction. International health issues are those that involve two or more countries, and which can be addressed at the bi-national level (e.g., through border control). In turn, a global health issue is one which circumvents, undermines, or is oblivious to the boundaries of a nation and will be the focus of this discussion.

Our understanding of the diverse ways in which globalization is impacting on health is rapidly increasing. However, before discussing this accrual of knowledge, we must first discuss the multiple reasons why our current understanding of the health impacts of globalization is incomplete. Firstly, in most cases, the health impacts of globalization are indirect and very difficult to attribute quantitatively to globalization. Secondly, and building upon the first point, the determinants of human health are still being identified and are proving very difficult to pin down due to the sheer number of confounding factors. Our understanding of the process of globalization is still very much contested. Additionally, the understanding of the many possible ways in which globalization may affect human lives is still in its infancy and is very reliant on parallel developments in other disciplines. Thirdly, and finally, globalization is a fairly new focus of research, and consequently, the tools to measure its impacts are still being refined. Furthermore, in many cases, we simply do not have the historical data to enable the attribution of a trend to the process of globalization. Many of the tools used to measure the impact of globalization for example, as a process impacting on the natural environment and the economy, have had short histories and serve to fuel debate over issues such as the extent to which climate change is human-induced.

In the following sections, we identify four ways in which globalization has affected the health of populations: the movement of economic activities, the movement of people, environmental change, and the de-territorialization of healthcare. Our aim is to aid the reader's understanding of both, how these issues are playing out through global processes, at the national and the local scale, and simultaneously, to suggest themes where the potential for future research is great. Examples are used as illustrative devices, but should not be taken as the only research issues of importance or the limits of the research agenda we propose.

## The Movement of Economic Activities

The driving force behind globalization has been the opening up of economies in which trade exports and investments from international corporations are the predominant means of sustaining economic

growth (Woodward, 2001). In response to this driving force we have seen the emergence of multinational corporations and dramatic increases in both the quantity and range of trade crossing national borders. What makes these trends so startling is the comparable difficulty of reversing these practices. The presence of the WTO as a regulatory body creates an 'all or nothing' scenario whereby a country entering a trade agreement is effectively abrogating the right to protect any of their industries from international competition. The exception to this rule is in the instance where trade is in fact a threat to the health of a nation. The following scenarios are examples of the ways in which the global movement of economic activities has impacted on health at the national and local levels, and of the efforts of populations to resist these threats.

*National Level*

One of the most contentious aspects of the WTO's enforcement of trade laws is when trade impacts threaten the health of a population. Governments have had relative freedom to limit the availability and accessibility of alcohol and tobacco but resisting rules of free trade becomes more difficult when the product is not deemed a drug. An example of this is food from the West, which is typically high in fat and refined sugar. Western food is a prime contributing factor in increased rates of obesity and related diseases within developing countries and amongst indigenous populations in developed countries (Spiegel et al., 2004). Rates of diabetes in the Pacific are amongst the highest in the world. The prevalence rate of diabetes in Tonga is estimated at 15.1% (Colaguiri et al., 2002; WHO, 2005). A research by Evans et al. (2001) into the effects of widespread availability of Western food on populations in Tonga offers little hope for resolving this issue within the present limits of free trade agreements. Evans et al. (2001) found out that dietary educational programs have had little effect since foods of poor nutritional value were available at lower prices than their healthier alternatives. Instead, Evans et al. (2001) suggest that the Tongan government has two alternatives available. The first response is to ban the importing of foods that are high in fat and detrimental to a person's diet. This strategy, however, is bound to elicit the wrath of companies whose foods are being banned and this would result in a complex and likely costly rebuttal within the bounds of the WTO. The second response would see renewed support for indigenous dietary practices through sustainable fisheries and farming. This aims at reducing the cost of foods, which have long been a part of the Tongan diet. It is a scheme which may also risk lofty fines within the WTO, should the process involve subsidies deemed to undermine the trading potential of other nations.

*Local Level*

The globalization of economic activities is making developing countries' workers more vulnerable to the profit-driven regulations of multinational corporations. The free trade movement has enhanced the ease with which multinational companies are able to reduce costs by using developing countries as a source of cheap labour for factories. Globalizing and internationalizing the production process enables corporations to take advantage of the cheaper wages and laxer (or an absence of) labour laws of developing countries[2]. While global occupational health standards have been developed within the International Labour Organization (ILO), few of the member countries have ratified these standards (LaDou, 2003). For workers, the jobs often mean long working hours and carrying out repetitive tasks for little pay. These are circumstances that are experienced by workers across the globe.

These practices are most exacerbated in the world's Free Trade Zones, which number more than 850. These regions of counties are intended to attract foreign investment through the alleviation of tax and duty charges, which would normally apply to foreign investors (Drezner 2000). Free Trade Zones, how-

2 LaDou (2003:303) notes that approximately ten percent of populations from developing countries are protected by occupational health and safety laws.

ever, are infamous for their low paying jobs, and the long hours expected of workers. Their location, in the most deprived parts of a country, only intensifies demand for jobs within the internationally owned factories. In the developing country context, occupational illness is seen as a relatively minor contribution to a country's health burden, and little data are collected on workplace injuries (Loewnson 2001). This is true of Haiti where workplace injuries are particularly common within construction and public works industries. However, the high demand for jobs in this country makes it difficult for individual workers to challenge the standards of their working environment (U.S. Dept. of State, 2005). In response to the working conditions within Haiti's Codevi Free Trade Zone, labour movements, such as Batay Ouvriye, have emerged to challenge practices within the zone which they allege, repress unions, prevent government intervention, and promote poverty through low wages (Batay Ouvriye, 2006). Batay Ouvriye was the focus of successful negotiations to have 34 workers reinstated to a factory run by AM Industries following their dismissal for speaking out about working conditions and their involvement with union activities (Maquila Solidarity Network, 2004).

## The Movement of People

The number of refugees, migrants and tourists crossing international borders annually exceeds 700 million and has dramatic implications for the spread of communicable disease (WHO, 2001: 902). Of most interest here is the link between the faster and further movement of people and how this impacts on the health of populations. This is an issue with a long history, originally addressed at the inaugural International Sanitary Conference in Paris, 1851 (WHO, 2001). The WHO (2001:902) reports that travel for tourism, in particular, is leading to the re-emergence of previously controlled diseases, such as Tuberculosis (TB) and cholera, and the contraction of exotic diseases including those from animals (zoonotic diseases). Diseased originating from animals make up an estimated 75% of all new diseases (WHO, 2005), and are believed to include Severe Acute Respiratory Syndrome (SARS) and Avian Influenza (Findlay and Hoy, 2000; WHO, 2001). The threat of new and re-emerging diseases is frequently presented from a developed country viewpoint. This is, in part, because it is often only within the developed countries that these re-emerging diseases have been effectively eliminated. Additionally, the resources to track emerging and re-emerging diseases, and control for disease at borders, are simply not extensive enough in many developing countries. It is an irony of globalization that it is those countries most active in advocating for the declining role of the nation-state that have become most active in protecting their borders from disease. Eyles (2002), however, believes that the present volume of global travel severely constrains the ability of nations to monitor the health of those entering a country. If health were to be monitored, this would lead to prejudice at border crossings against migrants from countries experiencing high rates of communicable disease (Findlay and Hoy, 2000).

*National Level*

To understand how globalization contributes to the spread of disease we must renew the call for an examination of the broader social and economic contexts of disease. This is a practice, which Zulu et al. (2004) apply in their analysis of the spread of HIV/AIDS in Nairobi. The city's population is anticipated to grow by five million in the next 15 years and presently an estimated 60% of the city's population lives in 5% of the city's land. These are conditions that are set to worsen (Zulu et al., 2004). Africa is becoming urbanized and the high rate of growth within its cities is contributing economically to the development of extreme poverty, and spatially to the growing presence of slums. Living in slums is a last resort for those with no money to live elsewhere as they are a vacuum for unemployment and alcoholism. The situation is particularly difficult for women who are least able to gain employment and are often the sole provider for children. Sex becomes a source of both resistance and entrapment for these women when other sources of income do not pan out and men are relied on for money: "Sex becomes the last resort for ensuring that rent is paid and that children do not go to bed hungry" (Zulu

et al., 2004: 170). The authors explain that often women find it necessary to rely on a number of different men as one may have money one day but not the next. If a woman is trying to buy milk for her children she will not be thinking about sexual risk. Men, in turn, recognize when women have a great need for money and may as a result pay them very little. What Zulu et al. (2004) are emphasizing is the social context of the disease. Amidst the state of poverty, women are acting to survive on a daily basis for themselves and for their dependents. While this heightens the risk of HIV infection, we can understand that until women's socioeconomic circumstances are improved they will not be 'safe' from HIV.

*Local Level*

The emergence of Severe Acute Respiratory Syndrome (SARS) in 2003 was our first glimpse of how rapidly and how widely a disease can spread in a globalized world. Air travel and trans-national ties contributed to a diffusion pattern in which SARS spread within months from China to 25 countries infecting over 8,000 people (World Health Organization, 2003; Bowen and Laroe, 2006). During this time 128 cases of SARS were identified in Toronto, the majority of which were transmitted within hospital settings (Varia et al., 2003). These high rates of disease diffusion are better understood when we consider the timeline. The WHO notified global health authorities of the emergence of SARS on the 12th of March 2003. This date was five days after the first SARS case was presented to a Toronto hospital and 16 days before all hospital staff were required to adopt precautionary dress and actions[3]. Infections rates within Toronto were thus sustained largely by caregivers and caused a number of dilemmas regarding how to deal best with unknown infectious diseases when the safety of patients and health care workers are at risk (Affonso et al., 2004).

As Toronto hospital authorities came to realize the threat that SARS posed, to both the general population and its healthcare workers, extreme measures were put in place to control the spread of the virus. Early SARS symptoms are easily conflated with other conditions leading emergency departments to combine screening for the disease with strict visitation and staffing policies (Farquharson and Baguley 2003; Singer et al., 2003). The impact of SARS on Toronto's economy, and particularly the health system, cannot be understated as many workers in the tourism industry were laid off and hospitals overhauled their emergency procedures. In the months after SARS, regional authorities went to great lengths to send the global message that Toronto was again safe. A SARS benefit rock concert in Toronto was attended by 450,000 people. Meanwhile anyone flying into Canada was immediately confronted with the disease via a health survey and a SARS nursing station positioned at the disembarking gates of Toronto's Pearson International Airport.

## The De-Territorialization of Health Care

Where health care was once intrinsically linked to place, both the consumer and the health care supplier are undermining its territorial nature. Consumers unsatisfied with the provision of health care in their own jurisdiction are looking to the internet and other countries for better quality, faster and cheaper health care and pharmaceuticals. Spurring on this trend are the health care and pharmaceutical industries, which are using free trade agreements to challenge their right to a market share in countries where competition in health care is frowned upon. For the pharmaceutical industry, the outcome has been market expansion, of which Findlay and Hoy (2000: 211) comment: "…there is plenty [of] room for scepticism that western-owned drug companies have been only too eager to promote 'global solutions' simply to achieve world markets for their products". Concern and scepticism justifiably surrounds the millions of dollars of research pharmaceutical companies invest in the development of medications such as those to prevent male pattern baldness while many drugs in LDCs are priced out of reach of many in need.

3 Staff dealing with known SARS cases began adopting precautions from the 13th of March 2003.

*National Level*

The North American Free Trade Agreement is a prime example of the manner by which agreements between nation states reduce barriers to trade and structure the process of globalization. Ideals of free trade become unclear when they are applied to national health care industries. This is particularly the case in Canada, which has a public system that is primarily unaffected by international trade agreements (Commission on the Future of Health Care in Canada, 2002). To ensure the integrity of the public health care system the Canadian Liberal government chose to reduce the risk of exposing its system to competition from other countries by retaining its publicly funded basis. This thereby prevented private health care providers from other countries using international trade agreements to set up shops in Canada. The Liberal government worried that opening up the health care system to commercial competition would add enormously to the cost of providing public healthcare, and any decision to privatize would likely face lofty fines under the North American Free Trade Agreement, should it be retracted at a later date (Commission on the Future of Health Care in Canada, 2002a):

> If a parallel private system and two-tier health care system is permitted to evolve, Canada's capacity to justify its departure from market imperatives to support a universal, comprehensive, accessible, portable and publicly funded Medicare system would become much more difficult. Without changes to the applicable trade treaty rules, the longer that creeping commercialization and privatization is allowed to proceed unchallenged, the more difficult it will become to intervene to reverse it. (Commission on the Future of Health Care in Canada, 2002a: 22).

Complicating this issue is the fact that Canada's healthcare, with the exception of the indigenous and military populations, is provided at the provincial level where dedication to the public health care system varies substantially. The biggest threat is seen to come from Alberta where private health care is actively being pursued by the provincial government. The health insurance system has already become open to foreign investments as a result of the General Agreement on Trade in Services (GATS): "…and some observers contend this could eventually have an impact on our governments' ability to expand or alter our publicly funded healthcare system (Commission on the Future of Health Care in Canada, 2002:4)."

*Local Level*

Globalization has allowed the more rapid global spread of medical technology that is led by the dispersion of Western medicine. While the same technology that is used in New York may also be available in Nairobi, we see marked differences when it comes to the accessibility, utilization, and the implications of these technologies. The use of antenatal diagnostic technologies is a useful case study as these technologies are framed medically within the context of well-health yet their implications are clearly socially and culturally determined. Ultrasound (obstetric sonography) is commonly used to assess the status and health of a foetus and, in conjunction with other antenatal diagnostic tests, is effective in detecting health problems and conditions (e.g., Down's syndrome). While these tests are a routine component of pregnancy for many women (Williams et al. 2005) a positive test can lead to a difficult decision of whether to abort the foetus. Despite the perspective of disability advocates (including those with the very conditions being screened for) that genetic variation should be embraced, abortion in these circumstances is becoming medically easier as diagnostic tools are being developed to detect abnormalities earlier in the pregnancy.

In light of medical procedures to detect Down's syndrome in the first trimester, Williams et al. (2005) carried out interviews with 14 pregnant women faced with the decision to undergo an ultrasound. The authors found that the meanings and implications of the screening process varied dramatically across participants and most were torn as to what they would do were the test to indicate an abnormality with the foetus. Meanwhile, in Germany, a similar study carried out by Erikson (2003) found that women's social and historical background strongly influenced their views of post-diagnostic abortion. West Ger-

man women who had been exposed to the cautionary narratives of genocide in Nazi Germany were subsequently more aware of the moral and social implications of these diagnostic technologies. They were as a result less likely to pursue (at least hypothetically) an abortion should tests be positive.

## Environmental Change

While we do not subscribe to an economic deterministic perspective, it is difficult to discuss global environmental change without considering the significant economic shifts that have taken place in consumer demand and production. Globalizing processes have led to a substantial shift in the size and distribution of produced goods, while heightened competition is pushing prices down. Environmental practices, in turn, are put at risk as producers attempt to shave overheads from their production costs. The effects are severe yet extremely diverse. They range from the emergence of Creutzfeldt Jakob Disease, a result of animal by-products being included in cattle feed (Johnston et al., 2002), through to the pollution of lakes and oceans via mishaps in the transportation of products such as oil which can contaminate seafood and make swimming unsafe. Both of these examples are symptoms of attempts to reduce production costs, while one of the end products of production itself is urban waste, which Eyles (2002) reports is fostering the urban vermin population that has long been a vector in the spread of disease.

Yet, it is research into the health impacts of environmental change that presents perhaps the most significant opportunity for research into the relationships between globalization and health. In no other area of research do the natural and social sciences have such a close relationship. However, natural and social scientists have not jumped at the chance to collaborate on this issue. It is, of course, common knowledge that the Intergovernmental Panel on Climate Change (IPCC) (2001: 8) predicts a 1.4 to 5.8 degree increase in the average global temperature between 1990 and 2100. Aside from rising sea levels, climate change is anticipated to cause greater extremes in weather, such as the heat waves experienced in France in 2003, and the expansion of mosquito breeding environments [already West Nile virus has extended into North America (Eyles, 2002)], and changes in food producing environments. Excellent discussions of the potential health impacts of climate change have been written by Eyles (2002), Johnston et al. (2002), and McMichael (2001).

### *National Level*

The profit-driven movement of industries in pursuit of low wages and low business tax rates, and few environmental restrictions, is typically occurring in developing countries. Increasingly multinational corporations are choosing to locate manufacturing in developing countries, where they are able to take advantage of cheap labour, limited regulation of workplaces, and tax benefits (McMichael, 2001). Gertler (1997: 48) goes so far as to assert that what emerges is "a process of locational blackmail", in which governments compete for the economic opportunities which investment by global corporations brings to a country. This practice, of course, increases the likelihood of the endorsement of industries paying subsistence wages, conducting environmentally unsound behaviours and paying only minimal taxes to the host country.

Global trade agreements have contributed to these practices by limiting the ability of governments to act on environmental threats when trade might be adversely affected. The rights of human and environmental health, established by the Global Agreement on Trade and Tariffs (GATT), are, in reality, difficult to enforce, given the often conflicting rights of industry which must also be upheld (Shaffer et al., 2005). The US-Mexico border is subject to both GATT and the *North American Free Trade Agreement* (NAFTA) regulations. This leads many US manufacturing companies to move across the border to

4 Maguiladora are foreign-owned assembly plants and a major employer along the border. They contribute significantly to the Mexican economy.

Mexico where wages and environmental and occupational standards are lower (Perry et al., 1990; Shaffer et al. 2005). Perhaps one of the biggest juxtapositions of the maquila industry[4], given the extent of occupational health injuries arising from the repetitive work, is the attraction of the low health care costs associated with a company's location in Mexico (Ruiz-Beltran and Kamau, 2001). While large numbers of Mexican border residents have been employed they are primarily working long hours for low wages (Guendelman and Silberg, 1993). Homedes and Ugalde (2003) argue that the experience of globalization at the border has been one of economic interdependence from which companies have primarily benefited.

*Local Level*

We have long associated the air pollution of cities directly with the development and exacerbation of a range of health problems. These health problems include the reduced functional capacity of a child's lungs as they mature, increasing the likelihood of respiratory deaths in babies, aggravation of asthma, and increases in bronchitis (WHO, 2004). A number of US cities have now begun to take a global perspective by acknowledging the contribution of high rates of carbon dioxide emissions and human-made halocarbons from dirty industries, which are making on overall climate change. Increases in global temperatures are leading to sea level rises which in turn threatens the shear existence of low-lying cities such as New Orleans. This city has opted to make the political move of adherence to the Kyoto Protocol, despite the decision of the US government not to ratify it. The initiative was first instigated by Seattle mayor Greg Nickels. He was concerned about the potential present and future reductions in snow cover and the effect it would have on his city's power system. Seattle is heavily reliant on the melting snow pack as a source of water and power in the summer months (Little, 2005).

## Discussion and Conclusion

The numerous definitions and theories of globalization differ in their emphasis on variables such as the economic, political, and technological attesting to the deep interconnections inherent to the causation of the concept. While advances in technology have made the present levels of globalization possible, it is the economy that is consistently identified as driving the process. When we look to the health implications of globalization these lines become increasingly blurred as we see that the economic, the political, and the human elements have all contributed to creating circumstances such as environmental change. When we consider the ideologies driving many of these forces, we come back to deprivation and the desire for growth. These factors are easily blamed on economic forces if we do not consider, for example, that a free trade zone is potentially created to bring jobs to a particularly deprived part of a country. This multifaceted process of globalization has impacted on numerous aspects of human health such as obesity and heart disease, which have become global by-products of the edible consumer culture, the spread of disease reaching new speeds through air travel, and increased weather extremes brought on by climate change are posing new health threats. Meanwhile, our health systems are under threat of global competition with unknown impacts on government and personal budgets. Regardless of the intentions behind globalization, it is the economic imperative that has become cemented into global policies such as those of the WTO.

The difficulties of studying the health effects of globalization go some way toward explaining why research is only starting to make an impact on the links between globalization, the environment, and health. We see the need for researchers to engage further with the global, social and structural influences on human health. Recalling the move of many US mayors to independently ratify the Kyoto protocol – they recognized that the strongest move they could make to be heard nationally was to act globally, something G8 protesters figured out long ago. Perhaps this is the beginning of a new rally cry for research – 'think local, act global' in expanding our research agenda to global change, health and the environment.

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## 3.2 Land-Use and Land-Cover Changes and the (Re) Emergence of Diseases in Brazil

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### Introduction

Within more than 8.5 million square kilometres, Brazil encompasses five highly diverse biomes:

- Amazon Forest – with some 4.5 million square kilometres (60% of the country's land area), it is the largest continuous rainforest on the planet and contains nearly one third of the Earth's biodiversity. The Amazon Forest is also the location of the largest river system on the planet, with one fifth of its freshwater, and where some 20 million Brazilians live (12% of the Brazilian population) (Soltani and Osborne, 1997).
- Cerrado – has almost two million square kilometres of savannas which range over central Brazil between the southern edges of the Amazon Rainforest, the south-eastern part of the Caatinga, the eastern borders of the Pantanal, and the western limits of the Atlantic Forest; where the three main Brazilian watersheds are born. It is at this point that the ecosystem is most affected by cattle ranching and crop-producing extensive agriculture.
- Caatinga – encompasses almost one million square kilometres of semi-arid region on the north-eastern part of the country and is characterized by dry/thorny vegetation and little rainfall.
- Pantanal – covers 154,884 square kilometres of wetlands and has a predominantly flat rolling terrain that is periodically flooded. Although native vegetation still covers 97% of its area, it is under pressure from cattle ranching and neighbouring extensive agriculture.
- Atlantic Forest – was originally an area of approximately one million square kilometres ranging from the Brazilian cost to the inland, and is situated where 80% of the country's population lives. There is currently only about 7% of its forest cover left.

During the last five centuries, large amounts of each of these biomes have changed, mainly due, to the expansion of agriculture and urbanization. This paper will present examples of (re) emerging diseases and their associated land-use and land-cover changes (LUCC) in western Amazonia and central Brazil.

### 'LUCC' and the (Re) Emergence of Diseases

Historically, the laws related to land tenancy in Latin American countries have required landowners to make "adequate" socio-economic use of their land by engaging in activities such as ranching or farming. Failure to make "adequate" socio-economic use of the land could result in government expropriation, or invasion by colonists. By encouraging the clearing of land to establish good title, these laws have driven extensive deforestation throughout Latin America (Doornbos et al., 2000). In Brazil, this has been no different.

Patz et al. (2004) underline that anthropogenic change to the environment (human-induced land use changes, including deforestation, road construction, and dam building) are the primary drivers and modifiers of the transmission of endemic infections, which can be entirely new to a specific location. This may occur either from "spill-over", cross-species transmission or simply by extension of geographic range into new or changed habitats. Changes to the physical environment, together with movement of populations, are the main mechanisms that are implied to have the greatest impact on public health. This is due to an exponential growth in human-wildlife interaction and conflict. The authors support that a pervasive process (encompassing road building, human migrations, land use change through

logging and forest fires, and biodiversity loss) will not only affect vector breeding, but will also bring people, sandfly vectors, and wild reservoirs into overlapping areas, fostering the emergence of zoonoses. The situation of *Cutaneous Leishmaniasis* in Latin America (Desjeux, 2001; Patz et al., 2000) is a prime example of this.

Soltani and Osborne (1997) viewed environmental degradation as a common result of "business-as-usual" infrastructure mega-investments. Vaux and Goldman (1991) who review the impacts of dams, include, as their direct impacts, the displacement of human populations, the loss of wildlife habitat and extinction of species, and the decrease in the number of fish caught downstream from the dam (leading to malnutrition among local communities). They also highlight important indirect impacts. These include the increase in migration and the integration of previously isolated regions into national and so-called 'globalized' economies, changes in local market structures and in income distribution, and increases in conflicts between the local population and migrants.

According to Carvalho et al. (2001), if the historical relationship between roads and forest loss continues, then planned road paving will cause additional deforestation as well as further biodiversity losses as a result of logging and forest fires over the next two or three decades. Schneider (1995) recognizes that "the most direct way to reduce the rate of forest conversion is to control the rate of expansion of the road network in the Amazon". Kaimowitz and Angelsen (1998) consider that "roads are the single and most robust predictor of frontier expansion and accompanying deforestation in tropical forest regions". This opinion is complemented by the studies from Nepstad et al. (2001) and Alves (2002) who state that the great majority of the deforestation in the Brazilian Amazon region takes place within 50 kilometres of recent paved roads. The Commission on Development and Environment for Amazonia – CDEA (1992) affirms:

> Highway construction in the Amazon region has had a heavy impact on the environment because of migratory movements, destruction of forests all along the roadways, and pressure on resources. The most neglected aspects have been land management, preparing the local population for change, and upgrading local government in the newly opened zones. Much of the highway infrastructure is expensive to maintain and has either been abandoned or is in very poor condition, making it a burden rather than an advantage to settlers. Another factor warranting serious consideration is the high percentage of land connected to highways that have either been abandoned or yields very little. It would be irresponsible to think of building more highways that would simply replicate the same problems already experienced elsewhere.

Ribeiro (1992) alerts that "roads and other infrastructure work, financed by the state and implemented by powerful companies under government contracts, absorb large labour contingents, but on a temporary basis – no conditions are usually created for the permanent settlement of workers". He also suggests that historically, from the 1970's onwards, the jobs offered to migrants have been deforestation, wood extraction, cattle ranching, agriculture, and road and dam building. These traditional jobs are likely to trigger disruptions of biological processes through clearing, forest fragmentation and conversion, and forest fires (Chomitz and Thomas, 2000). An alternative option to these more traditional forms of employment is for labourers to migrate back to nearby cities. However, this increases unemployment and contributes to the worsening of urban violence. Another factor to bear in mind is the failure of migrants to adapt to their new environment. Their difficulty in living off regional resources is compounded by their lack of familiarity with their new environment. For example, certain types of malnutrition are due to changes in eating habits. A phenomenon that raises great concern is the probable increase in migration. Migration is a relatively uncommon practice in the Andean-Amazon region that appears to be rising. Incoming border migrants can be subject to the precarious, and in some cases, illegal living and working conditions that hamper their complete economic and social integration (UN International Organization for Migration, 2000). "The peripheral zones – especially the Andean – are also plagued by poverty (at times, extreme poverty), and migrants come into the Amazon

unprepared to cope with the new life that awaits them and unable to better their condition", states the Commission on Development and Environment for Amazonia – CDEA (1992).

## Vector-Borne Protozoa in Western Amazonia

According to Cesario and Cesario (2006), 66% of all Brazilian malaria cases in the 90's occurred in the two Brazilian Amazon states with the greatest environmental degradation (Para in eastern Amazonia and Rondônia in western Amazonia). At the beginning of this century, the west Amazon region went from being a Medium Risk to a High Risk of malaria transmission. The Annual Parasite Index (API) in Rondônia has doubled (from 40, in 2001, to almost 80, in 2005) and in the Acre State the API increased in 2001 from below 15 to more than 50 in 2004. This number soared to more than 80 in 2005. At the beginning of the Nineteenth and Twentieth Centuries, these two states were responsible for 14% of the total cases of malaria in the Brazilian Amazonia. These states are now responsible for more than 30% of the reported cases and consequently the western Amazon region represents the greatest concentration of malaria cases.

According to Chamberlin et al. (2002), *"Bartonella bacilliformis* has caused debilitating illness since pre-Incan times, but relatively little is known about its epidemiology". Ihler (1996) pictures Bartonella *bacilliformis* as a "dangerous pathogen slowly emerging from deep background", and argues that "it was perhaps the most lethal human pathogen in the pre-antibiotic era". Since pre-Colombian times Bartonellosis has been a disease confined to the Colombian, Ecuadorian, and Peruvian high-altitude Andean valleys. In Colombia, Bartonellosis is no longer a public health problem as over the last 60 years only two cases have been reported. In Ecuador cases have been reported from the costal zone, only 150 metres above sea level, while in Peru there has been an alarming spread of the disease during the last decade. The incidence increased eight-fold, from 5/100,000 inhabitants in the year 2000 to 42/100,000 inhabitants in 2004 (Peru, 2006; Peru, 2007). The number of regions infected rose from four in 1995 to 14 in 2004. Laboratorial evidence for this was found in native Amazonian communities at just 150 metres above sea level. The growing importance of the Department of Cusco (which will be linked to the western Amazon tri-national frontier by a paved road in the near future), in regards to the transmission of the disease, has been a focus of attention for medical researchers. In 2004 Huarcaya et al. suggested that ENSO (El Niño Southern Oscillation) could have influenced the epidemiology of Bartonellosis in the Departments of Ancash and Cusco between the years of 1996 and 1999 (this study assessed only the 1997–1998 El Niño episode). However, what seems more robust is the correlation made by the Peruvian Regional Epidemiology Office (Peru, 2006; Peru, 2007) between the spreading of Bartonellosis in Peru and the increased "temporary migration" and land use/cover changes caused by agricultural pressures. Ellis et al. (1999) corroborate this finding with the literature evidence that the region had 9–29% of asymptomatic individuals. However, at the beginning of their study, Chamberlain et al. (2002) found out that only 0.5% of the 690 participants monitored had asymptomatic bacteraemia. In 2004, for the first time, 175 cases were reported in the Department of Madre de Dios (Peru, 2006; Peru, 2007). This Department is bordered by both Bolivia and Brazil, countries where the expertise to diagnose or treat the disease is not yet available (Cesario and Cesario, 2005).

Unfortunately, the emergence of Bartonellosis and malaria in western Amazonia is not a novelty, neither are their links with LUCC, which are promoted by infrastructure "development" projects. According to Barrett (2002), the acute form of Bartonellosis – the Oroya Fever – got its name from an outbreak that occurred in 1871 near La Oroya, Peru. The Lima – La Oroya Railway was built during the years 1870–1875 and 1890-1893, and resulted not only in the highest railway in the world (152 km long, with 61 bridges and 65 tunnels), but also in the death of more than 7,000 of its immigrant workers (during the 1871 outbreak). A number of survivors later developed the skin disease *"verruga peruana"* (Peruvian wart). These skin lesions were observed prior to the 1871 outbreak, perhaps as far as back as the pre-Columbian and Incan eras, but a connection to the Oroya Fever was not established until 1885. It was

at this time that a young Peruvian medical researcher, Daniel Carrion, inoculated himself with blood from a Peruvian wart in order to study the course of the skin disease, and subsequently died from fever and anaemia. Bartonellosis (including both forms, the acute Oroya Fever and the chronic Peruvian Wart) is often called Carrion's Disease in honour of his fatal experiment.

At the end of the nineteenth century, the high value of rubber was the stimulus for legions of migrants to move from north-eastern Brazil to western Amazonia, characterizing the first rubber tapping rush. In the beginning of the twentieth century, after their closure by English and American companies, the works for the Madeira-Mamore Railway were restarted. These two initiatives involved massive migrations and environmental changes. According to Erney Camargo, this resulted in the first two Amazonian malaria epidemics. In 1910 the Brazilian hygienist Oswaldo Cruz reported that the sanitation of the "world's unhealthy region" was not achievable, since it would cost two times the value of the railway itself. For the building of this railway more than 20,000 immigrant workers were brought in from various parts of the world, and more than 6,000 of them perished from malaria and other so-called "tropical diseases". This event fostered the legend which states that each tie of the "Devil's Railway" corresponds to a lost life! (Cesario, 2005; Cesario, 2006).

## Spotted Fever in Central Brazil

Brazilian Spotted Fever (BSF) is an infectious disease caused by the bacterium *Rickettsia rickettsii,* and is transmitted by *Amblyomma sp.* ticks. It is similar to the North American Rocky Mountain Spotted Fever (RMSF) and both are maintained in nature in a cycle involving ticks and mammals. Initial signs and symptoms of the disease include the sudden onset of fever, headache, and muscular pain, followed by the development of a rash (Lemos et al. 1996b). Without early diagnosis and prompt and appropriate treatment this disease can be fatal.

Brazilian spotted fever was reported for the first time in Brazil by the São Paulo State in 1929 (Dias and Martins, 1939). Since then, it is estimated that nearly 400 cases of BSF have been reported in Brazil, and the São Paulo State was initially considered the endemic area. The disease has been recently reported in the states of Minas Gerais, Rio de Janeiro, Espírito Santo and Santa Catarina. One characterizing feature of BSF is that it is a re-emerging disease (Lima et al. 2003; Del Guercio et al., 1997). Lima et al. (2003) recovered data from several public health services from the period between 1985 and 2000 and used this to analyze incidence patterns. From this data, they observed that the transmission area expanded and that the number of suspected cases increased, especially after 1996, when mandatory reporting was established. Deaths due to BSF were observed in most of the studied years with a median lethality of 41.9% for São Paulo State, which was observed between 1985 and 2004, and a case-fatality ratio of 30% for patients admitted to the UNICAMP Hospital (Angerami et al., 2006).

Sangioni et al. (2005) have performed a study in areas of BSF transmission in the São Paulo State of Brazil, comparing the rickettsial infection status of *Amblyomma cajennense* ticks, humans, dogs, and horses in both BSF-endemic and – non-endemic areas. From the BSF-endemic areas, most of the horses and a number of the dogs were positive for *Rickettsia rickettsii*. Although they were continually exposed to A. cajennense ticks, no dogs or horses from BSF-non-endemic areas were positive for *R. rickettsii* antigens. The authors propose that BSF endemicity has been associated with the presence of large populations of free-living capybaras *(Hydrochoerus hydrochaeris)*. This large rodent has been associated with the cycle of BSF, as they have been found positive for *Rickettsia rickettsii* and serve as host for ticks from the genus *Amblyomma* (Estrada et al., 2006). The high infestation rates of this host and its associated environment by both *A. cajennense* and *A. dubitatum* have been well reported (Evans et al., 2000; Labruna et al., 2002; van der Heijden et al., 2005; Souza et al., 2006; Szabó et al., 2007).

Capybaras are widely distributed in the Neotropics, living in both natural and anthropogenic habitats. The typical capybara habitat is composed of three components: water, a patch of forest or woodland,

and a grass field for foraging (Escobar & González-Jiménez, 1976). In south-eastern Brazil, the most capybaras-concentrated areas in demographic terms are habitats which are generally fragmented, small and relatively isolated. Capybaras are generalist herbivores that normally feed on grassland and aquatic plants (Ojasti 1973), although they can easily adapt to feed on crops, such as corn, rice, beans, soybeans, and sugar cane. Verdade and Ferraz (2006) studied capybara population density and biomass in an anthropogenic modified wetland in a São Paulo State. They found that its population density and biomass are significantly higher than in pristine habitats. Possibly, their flexibility in relation to feeding habits, facilitates their occurrence in anthropogenic habitats such as agricultural ecosystems, which offer a more abundant food supply.

Tick infestation of capybaras and associated BSF risk seem to be increasing in central Brazil (Galvão et al., 2005; Souza et al., 2006). Capybaras can develop massive tick infestations in captivity (Pereira and Labruna, 1998), however, it has also been reported that free-living capybaras carry many ticks (Lemos et al., 1996a; Van der Heijden et al., 2005). Furthermore, the distribution of *A. cajennense* seems to be increasing due to the shrinkage of non-permissive biomes such as the Amazonian and Atlantic rain forests, and the increase of secondary vegetation (Estrada-Peña et al., 2004; Labruna et al., 2005; Szabó et al., 2006).

Anthropogenically altered ecosystems may support a considerably higher population density of free-living capybaras than those found in pristine habitats (Verdade and Ferraz, 2006). Thus, probably due to an abundant food supply and lack of natural predators, free-living capybara populations are growing particularly well in anthropogenic habitats. The increasing abundance of the semi-aquatic capybaras and associated tick species in anthropogenic habitats, has led to an overabundance of environmental tick infestations close to water sources such as rivers and lakes. Such places that are within or close to towns are frequently sites for human leisure activities and therefore become tick-bite prone locations.

Land-use and land-cover changes have led to an ecological disequilibrium in the food chain. This comes as a result of local extinction of large predators and has resulted in capybara population increases and has, in turn, increased the transmission risk for BSF in central Brazil.

## Concluding Remarks

The pristine and historically isolated tri-national region known as western Amazonia is now subject to an unprecedented globalization process. The ongoing implementation of mega-infrastructure projects (Chavez et al., 2005), represented by two hydro-electric dams and roads that link the Soya-bean producing areas in central Brazil to the Pacific ports (CAF-IIRSA, 2005), the fostering of commerce and allowing the transportation of goods and people, is expected to greatly increase the changes in land-use and land-cover. On the other hand, the central area of Brazil is now being called to serve as the main producing area for biofuels. Unprecedented changes in land-use and land-cover such as the ongoing implementation of dams, hydro-ways and roads, affect not only hydrological systems and biodiversity, but also drive changes in livelihoods and lifestyles which lead to increasing human mobility, urbanization and migration (Chavez et al., 2005). Over the next decades, this is expected to have great impacts on the epidemiology of human diseases. Lifestyle changes will not only stress the social fabric, but may also increase incidences of malnutrition and associated non-communicable diseases, such as obesity, hypertension, and diabetes. Increased migration and urbanization will affect the spread and transmission of communicable diseases such as sexually transmitted diseases and zoonoses.

It is fundamental to understand which anthropogenic drivers (personal choice and behaviour, policy-oriented decision making processes, legal frameworks, economic incentives) maintain the repetitive and perverse process [deforestation - (re)emergence of infectious diseases – decrease in quality of life – unsound development projects – deforestation …], found not only in western Amazonia and in the

central area of Brazil, but rather worldwide. It is equally crucial to identify the responses (sustainable public policies and sound governance, social- learning and knowledge) that should be fostered to mitigate the health burden associated with land-use and land-cover changes.

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# 4. SECTION

## URBANIZATION

## 4.1 Urbanization and Urban Health Inequalities in India

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### Urban India – Rapid Uncontrolled Growth

With less than 30%, India's urbanization rate is still comparatively low. However, "if urban India was considered a separate country, it would be the fourth largest in the world after China, India and the United States" (Singh, Taneja and Agarwal, 2004: 1). Since 1951, the urban population has increased from 62 million to more than 300 million and this is expected to almost double by 2025 (Registrar General of India, 2006). The number of 'million–plus' cities is expected to increase from currently 35 to 75 by 2021. This growth is not just limited to the large urban agglomerations. The number of middle-sized cities with more than 100,000 inhabitants is also expected to increase from 393 (2001) to over 500 (Sivaramakrishnan and Singh, 2003).

A large share of urban growth in India can be attributed to immigration. Migration of rural poor significantly adds to the ever-growing urban slum population, which has doubled between 1981 and 2001. The 2001 census put the number of slum dwellers in urban India to be above 60 million. These official numbers must be viewed with some caution, since unrecognized settlements, pavement dwellers, and marginal settlements at construction sites or at the urban fringe are not always included. The Indian demographic development dilemma has been described as 2-3-4-5 syndrome: while between 1991 and 2001 India's annual population growth rate was 2%, urban India grew at 3%, megacities at 4% and the urban slum population increased by 5%. Already, one fourth of India's urban population is considered to be poor, lacking access to basic amenities and services (Agarwal et al., 2007).

### Urban Health Divide

Urbanization is viewed as a way to create opportunities and promote better standards of living. More often for the urban poor in India, urbanization is associated with increased vulnerability. During the last

| Indicator | Summary definition | Rural | | Urban | |
|---|---|---|---|---|---|
| | | Poorest | Richest | Poorest | Richest |
| IMR | Deaths under age 12 months per 1 ,000 births | 108.9 | 51.3 | 121.2 | 41.9 |
| U5MR | Deaths under 5 years per 1000 live births | 155.0 | 63.9 | 143.6 | 51.5 |
| Children stunted % | Below -2 sd z -score, height for age, children under 4 years | 55.2 | 28.5 | 69.3 | 31.8 |
| Age specific ferti lity rate (15-19 years) | Births per 1 ,000 live woman age 15 -19 years | 135.0 | 57.0 | 145.0 | 41.0 |
| Immunization coverage with all vaccines % | Children age 12 -23 months by vaccination card or mother 's report | 17.1 | 66.0 | 16.6 | 64.7 |
| % Deliveries at home | | 93.5 | 42.8 | 80.5 | 24.9 |
| Use of modern contraception: women % | Currently married persons using a modern method of contraception | 24.9 | 50.5 | 27.0 | 50.6 |

*Table 1: Health Indicators and Poverty by Urban-Rural Residence 1992/1993 (World Bank, 2002; modified)*

two decades, the booming Indian economy has lead to a higher social mobility in a traditionally rigid hierarchical society. This economic growth has also been associated with rising income inequalities. Recent figures indicate that inequality is higher and rising faster among urban residents compared to the rural population (cf. Economic Times, 2007: 8). However, it is poverty rather than mere income inequality that drives poor health and mortality (cf. Deaton, 2006).

General health indicators have persistently been better for urban populations than for rural. This holds especially true for indicators covering the availability of comprehensive health services. "However, these summary figures disguise the intrinsic inequities that exist between subgroups within urban settings" (World Bank, 2002: 14). A recent World Bank report showed that health status indicators for the urban poor are as bad as or even worse than that of the rural poor population (World Bank, 2002: 15). Multiple factors contribute to a higher vulnerability of the urban poor and to a lower health status (cf. Table 1 and 2). Socio-economic barriers such as low income, gender, social status, language or religion/culture limit or even prevent access to health care for the urban poor. The lack of environmental and health education reduces the ability to make timely and informed decisions on identifying symptoms or on seeking appropriate care.

| Factors | Situation affecting health vulnerability in slums |
|---|---|
| Economic conditions | Irregular employment, poor access to fair credits |
| Social conditions | Widespread addiction , gender inequity, p oor educational status |
| Living environment | Poor access to safe water supply and sanitation facilities, overcrowding, poor housing and insecure land tenure |
| Access and use of public health care services | Lack of access to primary health care services, poor q uality of health care, high private health expenditures |
| Hidden/unlisted slums | Many slums are not notified in official records and are not covered by civic and health services |
| Mobility | Temporary migrants have difficulties to access health services or othe r development programmes, provision of follow -up treatment is difficult |
| Morbidity | High prevalence of diarrhoea, fever and cough among children |
| Education | Lack of education among urban poor hinders the ability of using health care or preventing diseases |
| Negotiating capacity | Lack of organised community efforts in slums |
| 'Urban literacy ' | Migrants from rural areas are unfamiliar with the urban context and social mores |

*Table 2: Factors Contributing to Higher Vulnerability of the Urban Poor in India (Agarwal et al., 2007; World Bank, 2004; modified)*

## Urban Health Risks

The unprecedented scale and rapidity of the urbanisation process in India is associated with environmental degradation and deficiencies in urban infrastructure and services that together have severe impacts on the health and quality of life. For the urban poor, low and unstable incomes, overcrowding and unhealthy housing conditions along with industrial and commercial occupational risks exacerbate the already high environmental health risks.

*Water and Sanitation Systems*

Water shortage, water pollution and contamination, and water logging are all inherent risk factors of the urban water crisis. In Mumbai, Delhi and Chennai, the average tap water availability is between four to five hours per household per day, with huge variations depending on location and neighbourhood (Sivaramakrishnan and Singh, 2003). If existing infrastructure cannot support the demand of clean water, illegal tapping of water occurs which often contributes to the contamination of the lines. As water becomes scarce, groundwater is increasingly tapped, and already many of the groundwater aquifers have reached critical conditions. Contamination of groundwater is a rampant problem in all big cities. Water treatment and purification plants are an essential part of the urban infrastructure that needs to be developed and maintained. Sewerage systems exist in only 60 cities out of almost 400 that have more than 100,000 inhabitants. The existing systems do not cover the entire urban area and only 30–40% of the sewerage is treated properly (Sivaramakrishnan and Singh, 2003). With water logging in the monsoon season and failure of the drainage systems, the incidence of vector-borne diseases is rising. Especially in recent years, the risk of Dengue has increased due to deficient water management, including improper water storage practices by the water-starved urban population, making Dengue an important urban health problem (Government of India, 2007).

The hygiene and sanitation conditions of most Indian cities are still very poor. Waste and garbage disposal systems are inadequately developed and implemented. This is an issue that plagues the civic authorities (Köberlein, 2005). Collection of garbage varies between 97% in Mumbai, 75% in Kolkata and Hyderabad, 68% in Bangalore and 50% in smaller towns (Sivaramakrishnan and Singh, 2003). As a result, garbage often accumulates throughout the city. Roadside vendors and hawkers sell food in this same environment and often contribute to the poor sanitation of the city. The infestation of flies, rodents, cockroaches, etc. manifests from here and adds to the unhealthy environment of the city.

*Land Management and Transport Planning*

Substandard housing conditions for the urban poor contribute to severe indoor air pollution. This results in approximately 500,000 premature deaths in India every year, mostly affecting women and children. Respiratory conditions (chronic obstructive pulmonary disease and asthma) due to pollution from congested traffic hot spots lead to a constantly increasing disease burden. Regardless of size, air pollution is apparent in almost all Indian cities. This is mainly a result of poor governance of the vehicular traffic and the emissions from industry. While air pollution affects everyone in the city, the sections of society who travel by two-wheelers, rickshaws or who live alongside roads are the ones who are most affected. Respiratory and cardiovascular problems resulting from air pollution are estimated to cause 40% of emergency hospital admissions. In 2002, road traffic contributed 72% to the pollution load in Delhi, industry and power plants contributed 20%, followed by domestic sources with 8% (cf. Krafft, Wolf, Aggarwal, 2003). Following a ruling of the Supreme Court in 2001, CNG (Compressed Natural Gas) was strictly enforced as fuel for public road transport (busses, taxis, rickshaws) in Delhi. The positive effect on the air quality in Delhi is a vivid proof to the potentials and importance of urban environmental governance for dealing with these health issues (Centre for Science and Environment, 2006). In addition, the urban environment can be made more conducive to the hectic and complex urban lifestyle by providing green spaces and recreational spaces for urban communities as part of comprehensive land management.

Traffic accidents contribute increasingly to the large health burden. Between 2003 and 2005, the Delhi Traffic Police reported annually more than 1,800 deaths and more than 10,000 injuries. The lack of organized and state-of-the-art emergency medical care further increases the avoidable burden of disease resulting from accidents and injuries.

Lifestyle-induced disorders are a growing urban health threat leading, in combination with environment-related infectious diseases, to a double burden of disease. Changing food habits and sedentary and/or high stress lifestyles are the main cause of these problems. The prevalence of diabetes mellitus has risen more rapidly in South Asia than in any other region of the world, with a much higher prevalence in urban areas (World Health Organization, 2002). 11% of India's urban population above the age of 15 are estimated to be affected by diabetes. Increasingly, mortality, morbidity and disability are attributable to major non-communicable diseases. For instance, cardiovascular diseases are on the rise especially in urban populations (Nishtar, 2002). Since the burden of non-communicable diseases occurs already in the mid-life period, or even earlier, it has a serious adverse effect on workforce productivity and economic development. The costs of lost productivity due to diabetes and cardiovascular diseases are estimated to be approximately 210 billion US Dollars per year, increasing to 335 billion during the next decade (The Times of India, 2007). The more affluent part of the urban society will be able to seek appropriate medical care and is therefore likely to develop chronic but manageable diseases. The urban poor with less awareness and limited access to care "will develop rapidly progressive disease with early and sudden fatal outcomes" (Ghaffar, 2004: 810).

Though general health trends indicate that urban dwellers are increasingly affected by mental disorders, the issue of mental health is not yet sufficiently acknowledged or addressed. No mental health support is available for the majority of the urban population (cf. Pathare, 2005).

## Access to Health Care

Health care has never been a strong point of the country's planned development. The Indian federal system has made it very difficult to implement and enforce a comprehensive national health policy. This has resulted in huge differences of health status indicators among the different states. The initial phases of the five-year plans placed great emphasis on input indicators such as target figures of doctors or hospital beds per defined population size. This inevitably leads to a political focus on rural primary health with the intention to overcome the unequal distribution of health care facilities, as these are mainly concentrated in urban areas. Urban health and the urban health crisis have only very recently emerged as a priority in government policies and plans. Under the current Tenth Five Year Plan, the Ministry of Health and Family Welfare has allocated financial resources for the development of citywide urban health projects. However, efforts to create a sufficient health service delivery for the urban poor have so far remained limited to pilot schemes in few selected cities.

In the post-liberalization period, privatization and corporatization, especially in the hospital sector, have driven major changes within India's health care system. While the private health sector has been allowed to grow almost without any check on the level and quality of care, or its financial implication on the weaker sections of society, the public sector has been neglected. There is no sufficient social security system, and health insurance has failed to gather momentum. Therefore, health remains a major cause of financial insecurity and one of the most significant causes of households falling into poverty. In 2005, the government covered only 18% of all health expenditure within the country, 82% had to be borne by the public out of their own pockets (World Health Organization, 2007). Theoretically, health care should, at least for the poorest, be provided by governmental services. In reality either these services are not available or people have no trust in them. This leads to low utilization rates for governmental health services and to high utilization rates of private practitioners. A 2006 household survey for urban Pune showed a clear preference for private health services across all income groups (Figure 1). The survey also highlighted that service orientation and reliability of medical staff, waiting times and opening hours, cleanliness, and available equipment and medicines were important issues influencing the treatment-seeking behaviour. According to the respondents, governmental services seem to be poorly managed or more often ill prepared to serve the needs of the patients.

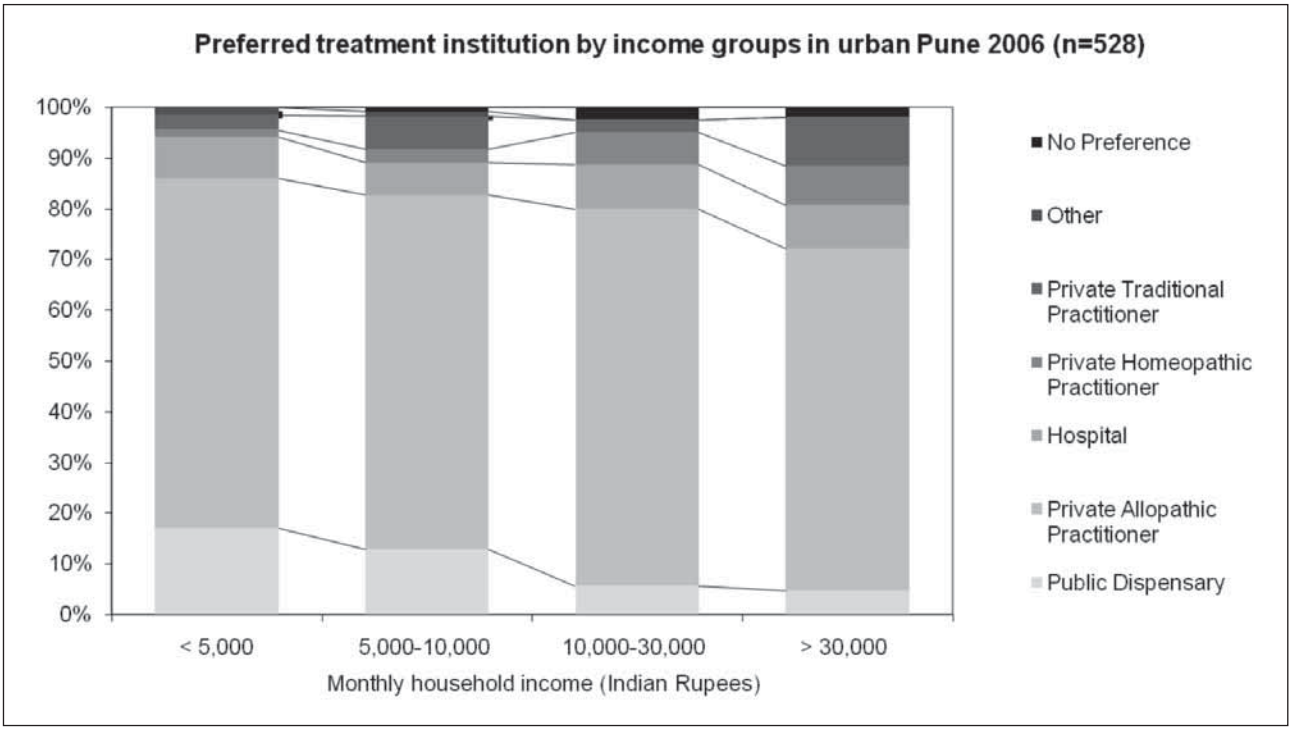


*Figure 1: Access to Health Care: Self Reported Treatment-Seeking Behaviour of Different Income Groups in Urban Pune 2006 (Unpublished Household Survey Results)*

## Reducing Health Inequalities among Urban Indians

In 2004, the World Bank's Human Development Unit South Asia published recommendations for improving the health of the poor in urban India (cf. Box 1).

- The most vulnerable of the urban poor, located within and beyond slums, need to be identified and targeted as a special group requiring additional attention.
- The state is constrained in responding fully to local needs, and in implementing legislated positive action for the marginalized.
- Significant efforts are required to orient health services and financing to the actual conditions, preferences and constraints of the poor in urban areas.
- The required package of services would need to include primary preventive care through community-based programs. It would also need to include basic curative care, diagnostic services and support for catastrophic illness.
- Creative strategies are needed to develop community insurance and other mechanisms to protect the urban poor from the impact of financial loss during illness.
- Collaboration and cooperation with a more regulated private sector will help improve the quality of health care services available to the urban poor.

*Box 1: Recommendations given by the World Bank's Human Development Unit South Asia for improvement of the health of the poor in urban India (cf. World Bank, 2004: viii)*

In a more general policy research working paper, Yusuf, Nabeshima and Ha (2007) come to the conclusion: "If the objective is better health outcomes at the least cost and a reduction in urban health inequity, our research suggests that the four most potent policy interventions are: water and sanitation

systems; urban land use and transport planning; effective primary care and health programs aimed at influencing diets and lifestyles; and education."

The authors of this paper would like to further stress three aspects:

**A monitoring system that will serve as a guidance tool to help to understand and analyse the trends and patterns in urban disease prevalence.** The diseases that effect the urban population are not new in nature. However, their incidence and prevalence change due to the effects of urbanization on human health. The mechanism to ascertain the burden of disease caused due to urbanization needs a data collection and monitoring system in order to estimate the extent of disease brought about by urban problems and to identify local vulnerability differences. Indian cities lack such a monitoring system. This in fact poses the largest health risk because the trends and patterns of urbanization, related health problems, cannot be ascertained. Kremer (2004) confirmed in her study on urban Pondicherry that the use of Geographic Information Systems is an important component of a monitoring system for detecting inner-urban differences in vulnerability and risk perception of residents.

**Good governance including effective public participation is the only mechanism available to ensure equitable distribution of resources.** Indian cities lack governance at the administration level and existing policies are inadequately implemented. All basic resources are overexploited and city infrastructure deteriorates due to population pressures. The basic requirements of a city, roads, space for housing, water, public transport system, and a safe road traffic system are lacking in almost all Indian cities. This lack in infrastructure is a large contributor to urban health risks. While the present pattern of urban planning has failed to create healthy environments in cities, there is a further gap at the management level in developing the infrastructure at comparable pace with the cities' growth.

**The lack of education and awareness itself is a major health risk as the knowledge of prevention is absent.** The local authorities and the health ministry have not been able to bring preventive medicine or community medicine to a desired level for the people of India. In urban settings where natural resources are scarce and population density is ever increasing, people do not recognize the health challenges they face or the ways in which they can protect themselves and their families. The health risk perception of people differs from the measurable objective risk. Issues such as hygiene practices, seasonal health hazards, and caution on communicable diseases are all poorly addressed. While the middle and upper socio economic sections gain the benefits of education and media, the poor, who are also the more vulnerable, are not equipped with information about protecting for their health and well-being.

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## 4.2 Urbanization and Health – Challenges for China

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### Introduction: Urbanization in China

Both in terms of the net increase of urban population and the absolute scale of urbanized areas, China has emerged as one of the fastest urbanizing countries in the world. Chinese urbanization has gained momentum since the economic and political reforms in the late 1970's. The level of urbanization jumped from 17.92% in 1978 to 43.9% in 2006, with an average annual increase rate of 0.94%. In 1978, there were only 193 cities in China. This number had increased to 663 by the end of 2002. Now, the urban population in China is close to 600 million, ranking first in the world. However, the urbanization process shows significant regional variations with urban areas mainly concentrated in the coastal regions. In the period from 1990 to 2000, the urbanization process in the east and the south of China was very high, while that of the north and the west was comparatively slow. Three mega-urban agglomerations have emerged: the Yangtze River Delta Area (approx. 90 million inhabitants), the Pearl River Delta (approx. 50 million inhabitants), and the Beijing-Tianjin Megacities Area (more than 20 million inhabitants) (Lu and Liu, 2006).

### Urbanization and Health Challenges

With the largest population and the fastest growing economy in the world, the rapid urbanization process in China is changing natural and social environments, with far reaching consequences both for China and beyond. Industrial transition, and rapid reduction of farmland and open spaces, lead to ecological risks such as biodiversity loss, soil erosion, water shortage, desertification and sandstorms, wetland shrinking and degraded natural vegetation while overpopulation, migration and ageing increase the population's vulnerability. Serious air and water pollution pose major public health threats and modern health hazards associated with the economic development and lifestyle changes put additional burden on the already overstrained health care system. The huge migrant population in urban areas, constituting an important factor of the rapid economic development, generates an additional and often underestimated risk for social and health security.

In October 2005, the Chinese National Committee for the International Human Dimensions Programme (CNC-IHDP) and the German National Committee on Global Change Research (NKGCF) suggested a Sino-German Global Change research agenda identifying urbanization as one of four major research foci of joint Global Change research. Following this suggestion, a joint Sino-German Workshop on "Global Change, Urbanization and Health" was organized at the Sino-German Centre in Beijing to identify major trends and research needs in this field. This paper draws, to some extent, on the deliberations of this workshop (cf. Wang et al., 2005).

*Health Challenges Related to Urban Environmental Degeneration*

*Air Pollution*

Air pollution has become a worldwide public health problem, particularly in many large cities of the developing world. In China, urban air pollution constitutes one of the most severe environmental health problems. According to recent data from the State Environmental Protection Administration of China (SEPA, 2006), the annual concentrations of $PM_{10}$, $SO_2$ and $NO_2$ in the 113 largest cities reach 0.100, 0.053, and 0.035 mg/cubic metre respectively. Among the 559 cities monitoring air quality, 37.2% did not meet

the national Grade II standard of ambient air quality. The main pollutant was particulate matter (PM10). In addition, 18.3% of the monitoring cities exceeded the national standard of Grade II for $SO_2$. More than half of the urban residents were regularly exposed to severe air pollution.

The China Green National Economic Accounting Study Report 2004, jointly issued by the State Environmental Protection Administration of China (SEPA) and the National Bureau of Statistics of China (NBS), stated that air pollution caused 358,000 deaths and 640,000 hospitalization cases of respiratory and cardiovascular diseases in 2004. This means that in 2004 an average of six deaths and ten hospitalizations per 100,000 urban residents resulted from air pollution. A case study for Beijing showed, after having adjusted for temperature, humidity and air pressure, a strong relationship between air pollutants and daily mortality in eight urban and suburban districts from 1998 to 2002. As SO2 increased each year, mortality, resulting from cardiovascular, cerebrovascular and chronic obstructive pulmonary disease, increased by 4.21%, 3.97%, 10.68% and 19.22%, respectively. At the same time it was observed that with the increase in Total Suspended Particles associated respiratory deaths increased significantly and cardiovascular and cerebrovascular deaths also increased (Chang et al., 2003).

*Water Shortage and Pollution*

Rapid urbanization, population growth and the ever-increasing water demand have put pressure on the water resources and the water supply system in China. According to a forecast from the State Environmental Protection Administration of China, more than 70% of the cities in China are lacking sufficient fresh water supplies (SEPA, 2006). The demand-supply-gap of water is forecasted to reach about 3.2 billion cubic metres in 2010 (Yao et al., 1999). In addition, urban inhabitants are also confronted with water pollution. According to the 2006 SEPA report, more than 60% of surface water (rivers, lakes) in China is polluted. In the 107 largest cities, about 30% of drinking water resources do not reach the national standard. The quality of groundwater in 21 of 125 cities is decreasing (in contrast, only nine cities are improving). For example, in Beijing the average amount of water supply is only 1/8 of the national average in China and 1/30 of the world average (World Bank, 2000). Tap water supply for urban Beijing is 2.45 million cubic metres per day, 40% drawn from groundwater and 60% from surface water (Chen and Qian, 2006). However, due to a variety of human activities such as agriculture, sanitation, industry, traffic or waste disposal in Beijing, the groundwater is often contaminated both with pathogenic micro-organisms and with hazardous chemicals. Monitoring data of groundwater quality shows that 142.5 square kilometres of groundwater aquifers in Beijing are polluted (Liu et al., 2006). Cleanliness indexes including ammonia and other nitrate, total hardness, chloride and sulphate, have exceeded the national standards for groundwater, resulting in severe health consequences. In 2005, 25 outbreaks associated with drinking water were officially reported in Beijing affecting approximately 281 persons, of which 270 people reported diarrhoea (Liu et al., 2006).

In southern urban areas, such as the Pearl River Delta and the Yangtze River Delta, regions that are rich in fresh water, the concentrations of ammonia, nitrate and aerobic organic materials in most water bodies highly exceeded the thresholds. The quality of water in most inner city watercourses within the Yangtze River Delta can be classified either as the second highest, highest, or even exceeding the highest category of pollution. Water crises caused by poor water quality have been reported for instance, in the cities of Shanghai, Suzhou, Wuxi, Guangzhou, Shenzhen, and Dongguan. In the summer of 2007, increased growth of blue algae in Taihu Lake contaminated the drinking water resources of Wuxi and Suzhou.

The accumulation of toxic trace elements in water bodies, such as heavy metals, or organic materials that only partially decompose, is becoming a new risk. The pesticides benzene hexachloride (BHC) and dichlorodiphenyl trichloroethane (DDT), which have been prohibited now for 20 years, are highly present in the sediment of the Yangtze River, Pearl River and Tai Lake.

*Urban Heat Island*

Especially since the 1980s, rapid urbanization and climate change increase the frequency and intensity of the urban heat island (UHI) effect in China. Studies have shown that the UHI intensity and frequency is positively correlated with urban population growth (Wang and Hu, 2006; Ji et al., 2006). For Beijing, Ji et al. (2006) showed that the UHI intensity at different times of day increased, in most instances, between the 1970s to the 1990s. Observing temperature developments for Beijing during July and August, Wang and Hu (2006) found that the average urban heat island intensity in July in the first decade of the 2000s is much higher than that of the 1970s. Since the year 2000, this intensity has increased year by year. Additionally, the number of UHI days in July and August increased from 1993 to 2003 (Figure 1). Wang and Hu (2006) also showed that for Haidian, a district of Beijing, the number of extreme heat days (temperature exceeding 35°C) in July and August increased from about two days in 1993 to 12 days in 2002, that is about three days more than in Beijing's suburbs. At the same time, the scope of the UHI in Beijing is extending following the urban expansion. Similar results have also been found in other cities, especially in the Pearl River Delta area (Wang and Pan, 2007) and the Yangtze River Delta area (Xie et al., 2007).

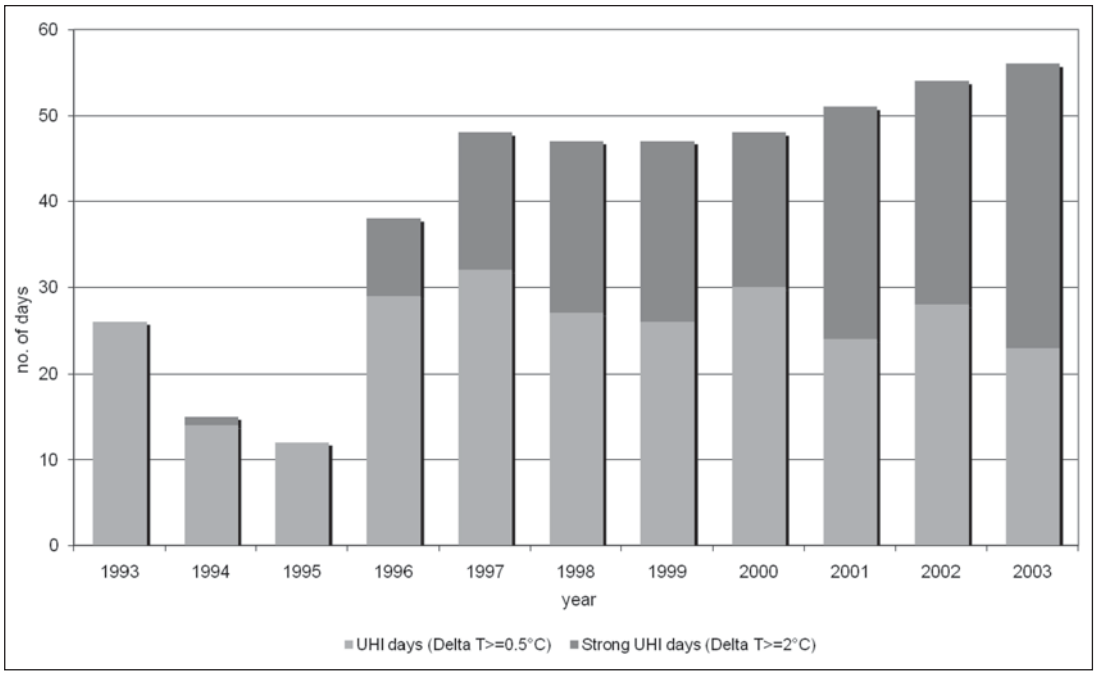


*Figure 1: Days with UHI (July & August) from 1993 to 2003 in Haidian (Beijing)*

The heat island effect and increased number of extreme heat events lead to a significantly higher health risk, especially for vulnerable population groups such as children, elderly or those with chronic conditions. During Beijing's severe heat wave in 2003 there were both very high daily maximum and minimum temperatures from July 7-15. At this time, a 30% increase of emergency hospital admissions or ambulance responses resulting from classical heat-related illnesses (heat stroke, heat exhaustion) in Friendship Hospital occurred.

*Health Challenges Related to Urban Life Style Change and Social Re-structuring*

Changes in dietary habits, smoking behaviour, alcohol consumption, and physical inactivity have increased the incidence of various non-communicable diseases. Additionally, mobility, crowding and high concentrations of people have optimized conditions for the spread of traditional as well as the new emerging communicable diseases (e.g. SARS, avian influenza).

*Chronic Diseases*

The changes of lifestyle and environmental degeneration have increased the prevalence of major risk factors for chronic diseases such as hypertension, cardiovascular diseases, diabetes mellitus and cancer in China (Wang et al., 2005). Chronic diseases account for an estimated 80% of total deaths and 70% of total disability-adjusted life years in China. The major causes of death in China are cardiovascular disease, cancer, and chronic respiratory disease.

Dietary habits and lifestyles in China are rapidly "westernizing" and are accompanied by the rapid globalization and urbanization of phenomena such as the increased availability and rapid spread of Western fast food restaurants. Such changes are likely to induce alterations in food behaviour and nutrient intakes, which consequently change the prevalence of hypertension, diabetes, overweight and obesity. These health problems have particularly become an important public health concern (Wang et al., 2006). According to the National Nutrition and Health Surveys in 2002, the incidence rate of hypertension in the adult population (above 18 years) in the large and small-medium sized cities in China was 20.4% and 18.8%, respectively, much higher than in rural areas. The mean incidence rate of obesity and the percentage of the adult population in China considered overweight were 7.1% and 22.8% respectively. However, in large cities the incidence was 12.3% and 30.0% respectively (Wang et al., 2006; Yang et al., 2006).

*Migration and Infectious Diseases*

From the 1950s onwards, together with economic development and improvement of the sanitation level, the morbidity and mortality resulting from infectious diseases has decreased in China. In the list of major death causes, communicable diseases moved from the first rank to the eighth (MOH, 2007). The morbidity as well as the mortality of infectious diseases is much lower in cities than in rural areas. However, with high population migration into urban areas, and high concentrations of people in urban areas, the risk of infectious disease outbreaks has increased and could further increase: In the 1990's, the schistosomiasis was found to spread in the newly developed urban areas of Changsha, Zhuzhou, and Yueyang in the Hunan Province (Meng, 2004). The areas in Inner Mongolia Municipality and Liaoning Province, in which avian influenza cases were reported, are situated close to the Beijing-Tianjin urban area (Yang et al., 2006). Rabies ranks first in the list of mortality caused by infectious diseases (MOH, 2007). Microbial traffic is facilitated specifically by the increased intensity and diversity of human mobility in urban areas. The recent outbreaks of Severe Acute Respiratory Syndrome (SARS) in Beijing, Guangzhou and other cities clearly highlight the vulnerability of large urban agglomerations to rapid infectious disease diffusion. Since 2000, the incidence of sexual-transmitted infectious diseases is increasingly affecting the health of urban residents. For example, gonorrhoea is ranking first in the list of incidence rates of infectious diseases (Zhang, 2005).

More and more former peasants are moving into the cities and joining the urban labour force as part of the so-called "floating population". The majority of these migrants live in crowded and environmentally hazardous settlements close to solid-waste disposal sites, the railway line corridors or unauthorized industrial clusters. In general, the migrant community is more affected by infectious diseases, such as HIV/AIDS, tuberculosis, pneumonia, and diarrhoea (Figure 2, 3) (Deng et al., 2004), but the social and legal position excludes the majority of the migrants from appropriate health care and comprehensive prevention strategies.

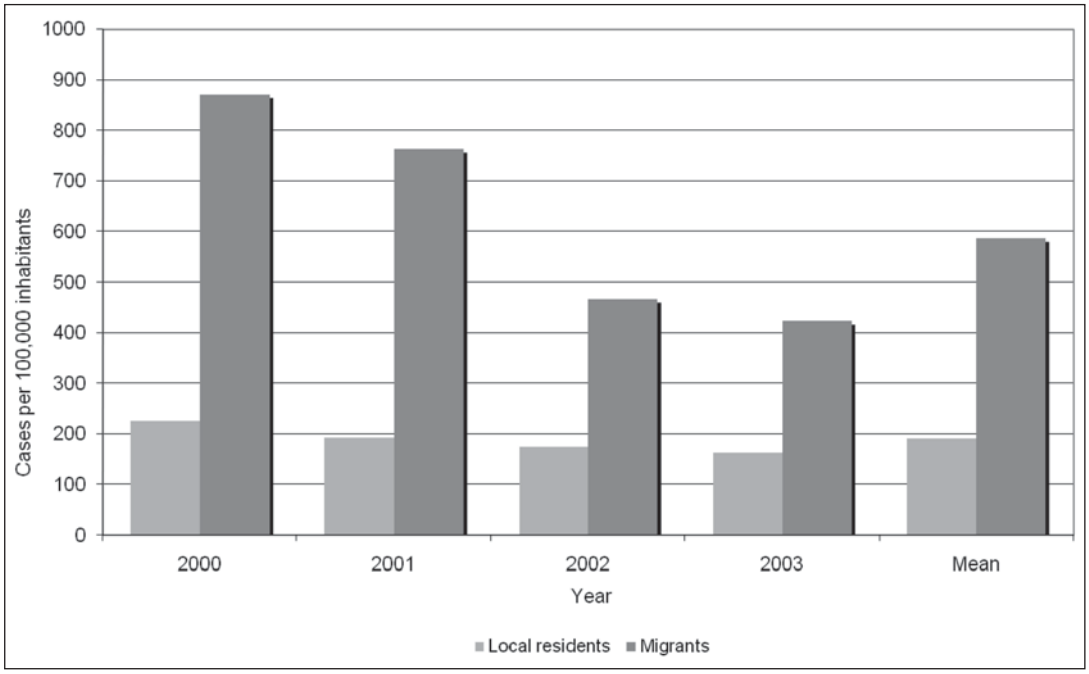


*Figure 2: Infectious Disease Prevalence Among Migrants and Local Residents in Putuo District, Shanghai 2000–2003 (Cases per 100,000 Inhabitants); Source: Deng et al., 2004*

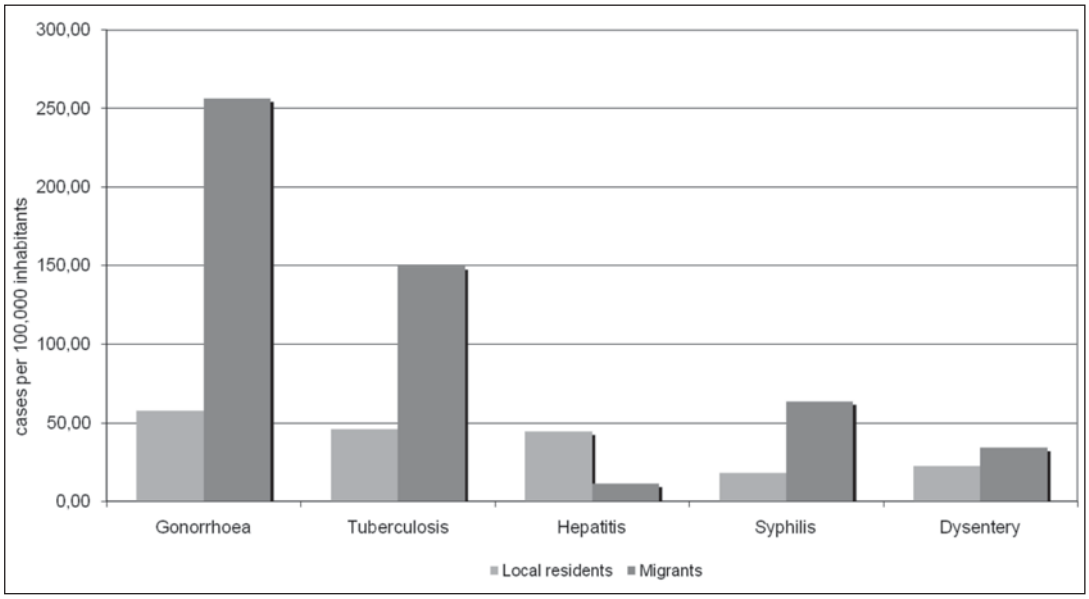


*Figure 3: Prevalence of Major Infectious Diseases among Migrants and Local Residents in Putuo District, Shanghai (cases per 100,000 inhabitants); Source: Deng et al., 2004*

### *Inequality of China's Urban Health Care System*

The present market-oriented health care system in China has been much criticized for both the inequality of its health service and for the inefficiency of its health investment (DRC, 2005). Before the 1980s, the health care system in China was composed of three parallel strands, the state health care system, a comprehensive occupational health care system and the rural cooperative health system. The state health care system was a free governmental medical system covering urban residents (and part of their families) who worked in public departments such as administrations, schools and hospitals. The occupational health care system was funded by corporations/factories, providing health care coverage for their employees and their families. The rural cooperative health system was a special health care

system in rural areas of China based on the collective economy. All farmers and their families were covered by their corporations.

In the aftermath of the breakdown of the collective economy and the subsequent privatization of enterprises after the 1980s, the necessary restructuring of the health care system received little attention. Now, as the problems resulting from an insufficient health care system have become apparent, the government of China has started to rebuild three new health insurance systems: the basic medicine insurance system for urban employees, the basic medicine insurance system for urban residents and the new rural cooperative medicine system.

The basic medicine insurance system for urban employees has been in existence since 1998. The insurance fees are partially paid both by the employees and the employers (State Council, 1998). It is intended that this insurance shall cover all employees including migrant workers (floating population). However, salaries of migrants are often too low to allow them to pay the health insurance fees by themselves. Their employers are usually reluctant to pay the health insurance fee, thus, a significant number of migrant employees are, ten years after the reform has started, still not sufficiently covered by health insurance. According to the five cities survey (Cai, 2006) health insurance provided by employers for migrant labourers is only 7.74%, contrasting with 67.56% of local labourers covered.

The fees for the basic medicine insurance system for urban residents are paid partly by the local government and partly by the insured persons. It is still in a very early experimental phase and was so far mainly tested in few provinces. Consequently, most of the unemployed residents, students, children and elderly are currently not covered by any health insurance.

The new rural cooperative medicine system is a voluntary mutual medicine system (MOH et al., 2003). Farmers pay one part of the fee and the central/local government or other social institutions subsidise the other part. The system could cover the migrated farmers working in urban areas, but in most incidences, a patient must return and utilise the hometown health facilities to be eligible for health insurance coverage. At present, 40% of urban residents do not have any medical insurance. 48.9% of ill persons do not see a doctor, as they cannot afford the treatment (Wang et al., 2006). At the same time, private health care providers are booming in Chinese metropolises. They aim, with cutting-edge medical technology and luxury hospitals, at providing care for the winners of the free market economies, but also at the growing sector of worldwide 'health tourism' (Krafft, 2006).

## Conclusion

China's rapid urbanization and the fast economic development, which is linked with serious environmental implications for urban areas, have lead to significant health threats. Particularly, migrants, elderly and children are exposed to the multiple stresses resulting from urbanization.

Science, policy and practice must therefore strengthen their efforts to identify appropriate pathways for sustainable urban development and to identify the potentials and opportunities for better living conditions under the condition of rapid urbanization. Besides the need for more efficient and sustainable land and energy use, for "green" technical innovations, and for the provision of clean water, access to appropriate health care for all sections of society and comprehensive prevention and public health strategies will be essential to meet the challenges for China's urban system.

## Acknowledgements

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# 5. SECTION

# GOVERNANCE

## 5.1 Governance and Health

*Wolfgang Hein*

In a very short-hand definition, globalization can be characterized as the intensification of cross- and trans-border flows of people, goods and services, and ideas. This process has been accompanied by innovation in many fields and new opportunities for economic and social development, but also growing inequalities and risks, in particular, due to a decreasing control of governments on the national levels. This has led to increasing attempts for more effective collective action by governments, business and civil society for a better management of these risks and opportunities, which, however, also has opened up new fields of political conflicts in an arising arena of global politics.

In this context, health is also increasingly affected by trans-national dynamics and by factors outside of the health sector – trade and investment flows, communication technologies, collective violence and conflict, illicit and criminal activity, environmental change and various regimes which, by aiming at a regulation of these factors, have a more or less profound impact on health policies and health outcomes. Furthermore, as in other policy fields, we can observe a process of trans-nationalization with non-state actors such as trans-national corporations, civil society organizations, private foundation and Public Private Partnerships. These have a growing impact on the rules, norms, institutions and organizations that govern health policy and practice at the sub-national, national, regional and global levels.

Compared with the situation in the 1970s, in which the World Health Organization (WHO) shaped global health policy (in keeping with its mission statement), these developments linked to globalization have led to fundamental changes in the requirements for improving the global health situation, and to changes in the institutional characteristics of global health policies (Lee, 2003; Lee and Collin, 2005). The entry of a large number of new actors into the field of global health, and the changing role of established institutions, have led to a situation which we might call, together with David Fidler, an "unstructured plurality" of actors and concepts in global health (Fidler, 2007: 3–4.) The tightening fabric of social relationships in an emerging world society has important consequences, both in terms of the rapid global spread of disease and in terms of the significance being attributed to the social and economic consequences of the poor health situation of a considerable proportion of the world population. A whole range of aspects point to the fact that health has become a key global concern:

- A more rapid spread of health problems can be observed: on the one hand, as a result of the expansion and acceleration of global mobility (this particularly affects rates of infectious disease), and on the other hand, from the globalization of consumer habits as a consequence of global advertising and cultural assimilation (for example smoking, changing nutritional patterns). HIV/AIDS represents a global threat and new, hitherto unknown diseases, such as Ebola and SARS, are being viewed as examples of the new global health risks.
- The increasing resistance of pathogens to antibiotics holds great dangers. Dangers result, not only from the excessive use of these drugs by the middle and upper classes and as an outcome of incomplete courses of treatment among poorer people, but also from inadequate medical supervision, and as a consequence of the widespread use of antibiotics in livestock production. The emergence of pathogens resistant to most antibacterial agents has now become a serious problem in the treatment of tuberculosis and malaria.
- The accelerated spread of drugs and medical technology to virtually all corners of the globe has the potential to help the fight against disease worldwide. However, as the income-based inequalities in healthcare are becoming ever more evident, this is increasingly posing ethical problems.
- In the face of the debt crisis and when priority was given to macroeconomic restructuring in the 1980's ("getting the macroeconomic fundamentals right"), socio-political programmes (such as

health policy) were no longer considered a primary focus of development cooperation. The crisis manifesting itself in primary health care became clearly visible during the 1980's. At this time, in the poorest countries, even the most basic types of provision (vaccinations, pre-natal care) were increasingly inhibited by lack of funding (Werner and Sanders, 1997).

- Linked to these processes, the supporters of comprehensive systems of primary health care also lost ground within the WHO in the 1980's and 1990's. During this time, organizations refused to take a strong position in support of grassroots strategies to develop local health care (which were frequently backed by civil society organizations (CSOs)).
- The liberalization of international trade (including the international regulation of intellectual property rights by the TRIPS Agreement) reduced the level of control individual nations had over the production of and access to drugs, medical equipment, and, with the advent of the General Agreement on Trade in Services (GATS), this also reduced their control to a certain extent over the range of medical services offered (Werner and Sanders, 1997).
- Since the mid-1990's, there has been evidence of growing apprehension about the vicious circle of rising poverty and greater vulnerability to health problems in an increasingly global society. People are becoming ill more frequently due to poverty, while the illness in turn simply makes them even poorer particularly, when there is no adequate public health service.

In the face of the international health situation, the governments of the OECD countries are becoming ever more concerned with both the spread of infectious disease across borders and the possible political and economic instability that is associated with a high incidence of poverty-related disease in some regions of the world (such as HIV/AIDS). This is one reason for the increasingly important role played by health since the 1990's. Prime examples of this role include the G7 and G8 summits and the declarations adopted at these (Cooper et al., 2007, part IV). The WHO sponsored Commission on Macroeconomics and Health has produced a huge amount of evidence on the importance of health as a precondition for economic development and has stressed a high rate of (long-run) returns on investments in health.

Certainly, the health of people does not only depend entirely on investments and interventions in the health sector. It is important to take into consideration broad conceptual frameworks of the health impacts of globalization such as those proposed by Huynen et al. (2005, also in this volume). Looking at health from a governance perspective, however, implies looking at efforts of various actors to improve the health situation of a given population or some health-related issues (like fighting diseases of improving access to specific health services) and analyzing how, in a specific environment formed by more general determinants of health, interactions among actors concerned produce a specific health outcome. As such, governance is a self-organizing process that a number of actors try to manage.

In order to understand how health issues, beyond the nation state, are governed in times of globalization, we need to look closely at the ongoing changes in the character of international relations. These are briefly outlined in the first paragraph of this paper. In a number of publications these changes have been described in terms of a transformation from a Westphalia[5] system of nation states to a Post-Westphalian system of global politics, a transformation, which is still far from being completed. This means that also the shape of global (health) governance is still not fully developed (or may in fact never reach that definite shape which is suggested by the term "global health *architecture*"). Global Health Governance (GHG) must be seen as an ongoing process of institutional change. GHG is part of the transitional process from a Westphalian structure of international relations between sovereign nation states to a post-Westphalian global political system. David Fidler (2004, 2005, 2007) has thoroughly analyzed 'Post-

5 Referring to the role of the Westphalian Peace in 1648 in the development of a system of international relations between sovereign nation states.

Westphalian Public Health' with respect to the global reaction to SARS and the revision of the International Health Regulations (IHR).He concludes that the new IHR constitute a shift towards 'an expanded governance strategy that integrates multiple threats, actors and objectives in a flexible, forward-looking and universal manner' (2005: 68). In a recent article Fidler also challenged the term "global health architecture", stressing that "architecture" is not an adequate metaphor for understanding the current "open-source anarchy" which is characterizing the current broadening and deepening of the normative basis for global health action (2007: 9f.). "Anybody can access, use, modify and improve" (ibid.: 9) GHG as in the case of open-source software.

The discussion on global governance has contributed many elements towards an understanding of this transformation to post-Westphalian politics. However, we are still quite far from understanding the newly emerging and still incomplete system. Figure 1 illustrates this transformation of international relations into a system of global politics. It is not intended as a model of global governance but rather as a scheme to characterize the dissolution of the 'old' structure of international relations in the process of a rapidly increasing density of trans-border social, economic, and political relations. The scheme is also used to highlight the importance of newly arising nodes of power beyond the political structures of states and interstate cooperation in traditional international organizations. Compared to the Westphalian system of international relations, Post-Westphalian politics are characterized by a much more complex and flexible system of interfaces, which constitutes a challenge to any analysis of global governance. Governing the flexibility and fluidity of such processes might in fact be better characterized by a "source code, producing an expanding network of actors, processes, ideas, and initiatives that shape global health governance" (ibid.: 9) than by the metaphor of architecture which seeks for a "structure" of governance activities (ibid.: 3; see also Hein, 2003: 408).

The traditional Westphalian system of international politics was based on an aggregation of interests at the national level (see figure 1: A1, A2 and A3 represent the various interest groups – business, unions, CSO – in nation A, and so on). Thus, negotiations at the international level were led by governments on the basis of these nationally aggregated positions, which in the first instance reflected power relations within nation states; social groups without much leverage in national politics had little chance to find their interests represented in international politics. Consequently, the outcome of international bargaining was a result of power relations between nation states, either mediated by decision-making procedures within International Governmental Organizations or various characteristics of specific countries (or group of countries) within the international system. In Figure 1, the larger circle around country B reflects its central position within the system and points to its hegemony.

With the intensification of international economic and social relations the Westphalian system has been profoundly transformed. Globalization, the liberalization of markets, and the increasing need to deal with trans-national/global problems, created the opportunity for the direct interaction of non-state actors. Thus, new trans-national spaces of interests and power have been established, which prevent a full aggregation of interests on the national level but which produce dynamics and opportunities through a trans-national cooperation of non-state actors, which increasingly limit the political options of nation states.

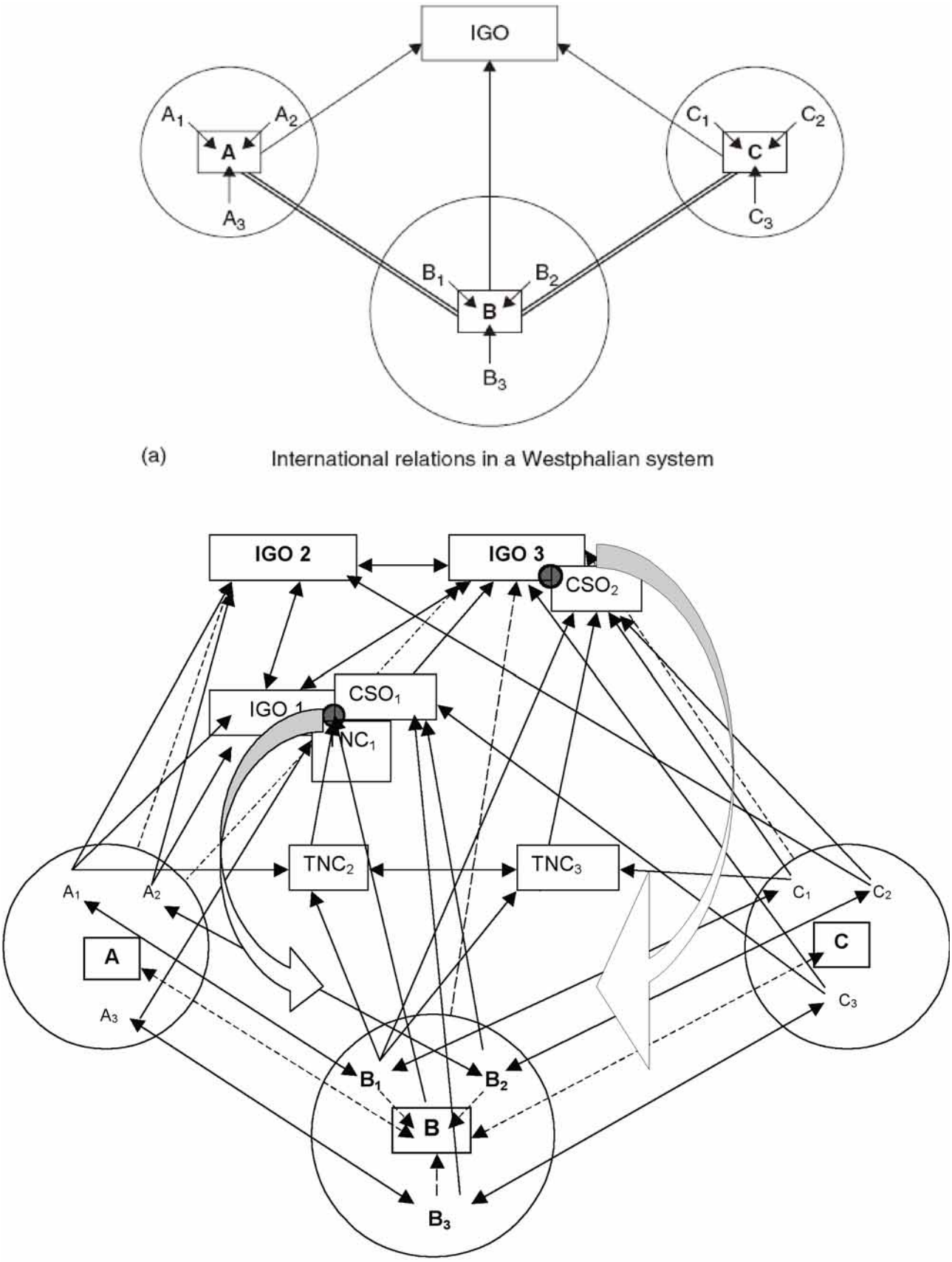


*Figure 1: Transformation of International Relations into a System of Global Politics*

Figure 1 shows that simply by designing hypothetical trans-national relationships for three different non-state actors, from three national societies, we arrive at an extremely complex structure of interactions. In the ideal Westphalian system there are basically only two alternatives between cooperation/conflicts in an IGO on the one hand or bilateral or multilateral relations between states on the other. However, in post-Westphalian politics there are many possibilities for cooperation and conflicts among nation states, IGOs, CSOs, and trans-national corporations. The 'old' actors of the Westphalian systems do certainly continue to play a powerful role, but their roles are transformed by seeing their former political monopoly challenged through the emergence of new, genuinely trans-national actors. Now, non-state actors, who had few chances to see their interests represented by national governments, could gain access to global politics, represented by advocative organizations. This explains the growing complexity of the concept of "governance" in the analysis of post-Westphalian politics. At this point it should suffice to say that we define global governance as the totality of collective regulations to deal with international and trans-national interdependence problems (Mayntz, 2005; Bartsch and Kohlmorgen, 2005). This includes the political endeavors of all types of collective actors who aim to solve specific problems and to shape a specific field of global politics, taking into account power relations within the global polity (see below for this concept).

New nodes appear in the trans-national political space (see Burris, Hein and Shearing, 2008 for the concept of nodal governance), which coordinate power resources and compete for shaping global governance processes. These nodes, which might be CSO networks linked to IGOs but also specific coordinating bodies within IGOs integrating other trans-national actors, interfere with the aggregation of interests at the level of the nation state in a threefold manner:

1. They are centres of trans-national discourses and of a transfer of resources which is less directly linked to national governments than in the Westphalian system.
2. They constitute power vectors with a significant impact on national decision-making processes.
3. International governmental organizations tend to regain importance as nodes of interaction between states and trans-national private actors and, as they constitute fora where the latter – with an inherent deficit of legitimacy concerning decision-making in public affairs – interact with state actors to influence the evolution of international law and regulatory processes.

As many IGOs have a sectoral focus, links between different IGOs will intensify to clarify issues, which transcend a sectoral policy field such as the impact on trade-related regulations on health matters. In this context, it is important to develop tools to analyze how different actors interface with each other in producing global health outcomes. Obviously, this is a matter of the relative power of different actors. "Power", however, is a highly aggregated concept. There is a lot of evidence that the power relations between different types of actors are quite different, whether they interact in legal, organizational, resource-based or discourse interfaces (for the concept of interfaces see Hein et al., 2007). A group of actors disposing of a high degree of organizational power (e.g. developing countries if they act as a bloc in IGOs with a one country-one vote decision-making system) might not be able to prevail, if they lack resource-based power (e.g. the power to accept or to reject increases in the organization's budget); on the other hand, actors with a high level of resource-based power might face difficulties if they are challenged at discoursive interfaces (e.g. by the impact of CSOs on public opinion).

Thus, for the fight against social injustice and the governance of social affairs, national states tend to play a decreasing role, just as social and political risks are more and more globalized. The *rise of a global polity* (Ougaard, 1999; Ougaard and Higgott, 2002) relates to this dialectics of inequality and the reactions of wealthier actors to risks, and to problems of global equity inherent in problems of global health. Structures of conflict and compromise, which are the aggregation of political interests, are also increasingly globalized and linked to the need of an effective reaction to global challenges. On the other hand, the nation state will also remain the centre of legitimate law making, as long as this role is

not formally transferred to another institution (as in the case of the European Union in specific policy fields). The state sets the rules for the internal and international redistribution on the basis of taxation based on laws. The nation state is still perceived as the central public instance, representing the interest of the "national community" - as fictitious as that might be. Quite independent from the question of sovereignty, the different levels of state organization (local, provincial, national, possibly global) play a central role in the organization of public services, therefore also on the development of effective health systems in poor countries.

These developments, of course, also have an impact on shaping health politics on the national and global level. While in the first decades after WW2, "international health governance" was dominated by the WHO (see Loughlin and Berridge, 2002) – as far as nation states agreed on common concepts on priorities in world health – now an increasing number of trans-national actors intervene to shape "global health governance". Certainly the state needs to be well organized in order to develop coherent health systems (Fidler calls it the "hardware" of health governance (2007:13)), but the fact that this will be occurring in a framework of post-Westphalian global politics should be considered to be an advantage at least for poor countries. Though on the one hand, nation states, in organizing their health systems, have become more and more dependent on conditions they cannot control, on the other hand, global markets and global political cooperation have a huge potential for improving health care. Since the early 1990's, a large number of new actors has emerged in the international health landscape to respond to these new challenges and fill gaps left unattended by older institutions. Global health governance is about how to realize this potential in a world, in which certainly the nation state will remain the most deeply organized institution of public policies for the foreseeable future. Nevertheless, the transformation of health into a global issue with an increasing number of actors involved will have important consequences:

1. It creates a growing consciousness of global responsibility for global health, which – though it does not easily translate itself into a coherent system of resource transfers – will help to mobilize resources through the multi-faceted system of global health governance. International agreements could give implementing power to international organizations (WHO) and create some form of reliable flows to poor country governments in order to improve the hardware in form of local health infrastructure. Large networks of independent actors play the role of watchdogs, pressing donor countries to disburse promised resource transfers and recipient countries to make use of these transfers according to accepted norms. Certainly, results depend upon power structures and are subject to conflicting interests and perceptions, according to the anarchic character of the constantly evolving field of institutions. In this context, by initiating and hosting important global commissions, the WHO, as a broadly legitimized international institution, has begun to use the chance of structuring discourses on the "source codes" of global health governance (GHG) and of linking them to institutions of international law making.
2. GHG will put pressure on governments which for whatever reasons do not give a high priority to financing their national health systems or are developing some specific idiosyncrasies such as the South African government with respect to HIV/AIDS. In effect, the successes of the Treatment Action Campaign (TAC), against the Pharmaceutical Corporations in court and against their own government in the political field, to a large degree depended upon support by CSOs.
3. So far, the complexity of GHG actors makes it quite difficult for national health systems to make an efficient use of the resources transferred by dozens of different foreign organizations, which sometimes conflict with each other. All these organizations demand the attention of local administrations, demand reports and, as a whole, create a flexible but chaotic system.

In light of these developments, the concept of GHG has become a subject of growing interest and debate in the field of international health. In 2002–2003 three volumes were published which opened up the discussion on issues relating to global health governance. These reports examined the impact

of globalization on health policy-making (Lee et al., 2002), global public goods for health (Smith et al., 2002), and the health impacts of globalization (Lee, 2003). Since that time there has been a great deal of research on issues of global health governance (see e.g. Fidler, 2004, 2005; Lee and Collin, 2005; Hein et al., 2007; Cooper et al., 2007), which is also reflected by the appearance of a number of new international journals (Global Public Health; Globalization and Health; Global Health Governance).

In the following paragraphs I will shortly introduce the most important processes and institutional developments in global health governance by giving a short overview of four problem areas, which are central to shaping global health governance during the last two decades.

## The International Health Regulations: Successful Cooperation to Combat the Threat of Global Epidemics

The issue of how to fight the spread of infectious diseases without unduly interrupting travel and trade has been a central focus of international health cooperation since its beginnings in the mid-nineteenth century (First International Sanitary Conference in 1851). In 1951, the World Health Assembly adopted the International Sanitary Regulations (since 1969: International Health Regulations). These regulations, however, became increasingly unimportant. The key reasons for this were the improved control of infectious disease in the developed world and a sharp decrease in the incidence of, or complete eradication of, the diseases which the IHR were concerned with (such as plague and smallpox). In 1995, talks were begun to revise the Regulations. These negotiations initially dragged on for a considerable while.

The fact that the negotiations were brought to a speedy conclusion between the years 2003 and 2005 can be attributed primarily to the experience of the outbreak of SARS (Severe Acute Respiratory Syndrome) and its successful control. This control was due mainly to good management by the WHO. The agreement, adopted in 2005, will come into force in April 2007. It can therefore be described as groundbreaking, since, in the event of a public health emergency of international significance, the WHO is granted far-reaching powers and non-governmental organizations are assigned key roles (Fidler, 2005). The fact that the new IHR are not restricted to previously stipulated diseases is also of fundamental importance. The regulations also cover international health risks from biological, chemical or radiological sources. As in the prior agreement, the aim is both to limit the effects of international dangers to health and to avoid unnecessary restriction of transport and trade.

The WHO has the right to require that member states develop appropriate capacities for monitoring possible international health risks. It can, however, also use non-governmental information sources and, as required, issue recommendations for the restriction of travel and trade without the consent of the government concerned. In the case of SARS, the new IHR model, whose main features had already been agreed upon, was tested successfully, so to speak. In the case of bird flu (the H5N1 virus), it can be said that there was at least successful containment.

In this context, a short note should be added to the other successful negotiation of a piece of international law in the context of The Framework Convention on Tobacco Control developed by the WHO and concluded in 2003 (entering into force in February 2005). This can be seen as a landmark as the WHO used its position of IGO to create a basis of international law for cooperation in a global health issue. This is similar to the IHR insofar as it reacts to a global threat where equity considerations are not at the forefront, but is new insofar as it reacts to the propagation of a health risk related to economic and communicative globalization and the spread of unhealthy lifestyles, which also do not stop at national borders.

## Access to Drugs and the Significance of New Stakeholders for Global Health Policy

Drugs have always played a central role in the treatment of disease and in most societies they have long been developed and manufactured by private stakeholders. Hence, they have also frequently been

the cause of conflict between public authorities responsible for health policy and private enterprises pursuing quite different interests. The latter naturally bases research and development on the chance of bringing to market those products that promise a profitable rate of return. With regard to medicines, this causes two kinds of problems which are closely linked to an uneven spread of technological progress in pharmaceutical research and development and also to international trade rules designed to support globalization based on a liberalization of markets:

1. On the one hand, small profits can be made from drugs or vaccines for illnesses found only in poor countries. This means that research in this area has long been neglected by the technologically more advanced trans-national pharmaceutical corporations (TNPCs). This even holds true for very widespread diseases such as malaria and tuberculosis, where the funding provided for research has fallen far short of the relative significance of these diseases. The problems surrounding these so-called "neglected diseases" increasingly became the topic of debate from the late 1980's onwards. In the 1990's, this resulted in the development of a range of Global Public Private Partnerships (GPPPs). These cooperative ventures were, for the most part, set up on the initiative of the WHO, and were mainly financed by state contributions and later, increasingly by large charitable trusts (particularly the Bill & Melinda Gates Foundation). Pharmaceutical companies were responsible for the scientific and technical aspects of the operation. In the case of the Drugs for Neglected Diseases Initiative (DNDi), a civil society organization, Doctors without Borders (Médecins Sans Frontières), took the initiative to develop a cooperative framework to bring together international organizations, government institutes (in the field of drug research and production), and private manufacturers of pharmaceuticals to work on various projects to develop drugs for these diseases.

2. On the other hand, drugs developed by pharmaceutical companies in response to demand in developed countries are sold at such a high price during the period of patent protection (generally 20 years) that the costs of research and development are easily recovered. In the developing world, however, few people can afford these drugs. As long as no internationally enforceable patent protection was in place, it was still possible to produce generic versions of these drugs in technologically more advanced countries such as India and Brazil. This changed when the TRIPS Agreement came into effect in 1995, even though its cover was at first not comprehensive due to transitional arrangements.

In the case of HIV/AIDS and the antiretroviral (ARV) therapies developed due to demand in the industrialized countries, the situation arose whereby drugs were available that, for practical purposes, turned AIDS into a chronic illness, but at a price which the majority of those affected worldwide could not afford. The problems surrounding access to drugs was highlighted by the fact that Indian pharmaceutical companies were manufacturing generic versions and offering them at less than one tenth of the price of the original versions. However, these could not be sold in many developing countries in which a TRIPS-compatible patent law was already in force. Conflicts arose around the Brazilian HIV/AIDS program, which at an early stage guaranteed universal access to ARV treatment, but which had to fight hard with TNPCs for licenses and imports of drugs at prices that allowed the country to carry on with its program. Diverse initiatives by CSOs supported the demands of developing countries so that they were able to make use of the flexibilities in the TRIPS Agreement (linked to the right of member states "to protect public health" (Art. 8.1)) and to do so safely. These flexibilities made it possible to import generic versions of drugs (via so-called parallel imports) and grant compulsory licenses for the production of generic drugs (Doha Declaration of 2001 and subsequent negotiations). In December 2005, the TRIPS agreement was amended to allow countries unable to produce generics themselves to issue compulsory licenses to foreign producers. This was the first amendment of any of the Uruguay Round agreements which created the WTO in 1994. In 2007, Thailand and Brazil issued compulsory licenses to allow access to affordable medicines for AIDS and heart diseases. This demonstrated the increasing self-confidence of developing country's governments to use compulsory licensing.

The basic set of problems surrounding the issue of access to drugs arises from the relationship between the global requirements for drugs and the manner in which intellectual property rights stimulate pharmaceutical research. In its General Comment No. 14, the UN Committee on Economic, Social and Cultural Rights (CECSR) emphasizes that the right to "the highest attainable standard of physical and mental health" obliges member states to make available those drugs that are indispensable (as stipulated in the WHO list of essential drugs). For this obligation to be taken seriously, either the TRIPS Agreement has to be fundamentally changed, or the international community has to find other ways of orienting the criteria for research and access to vital drugs towards global requirements. In 2004, in response to these problems, the WHO set up the Commission on Intellectual Property Rights, Innovation and Public Health (CIPIH). Following the final report of CIPIH, there was a general recognition of the need for changes in the global system of innovation on drugs. In 2006 this led to the establishment of the Intergovernmental Working Group on Public Health, Innovation and Intellectual Property under the auspices of the WHO with the mandate "to prepare a global strategy and plan of action on essential health research to address conditions affecting developing countries disproportionately".

HIV/AIDS played a pivotal role in the development of conflicts around intellectual property rights and access to medicines and, in fact, in the unfolding of GHG in general.

## HIV/AIDS as a Catalyst for Developing Global Health Governance

The problems and conflicts surrounding access to medicines have clearly pointed, on the one hand, to the close interdependence of international regimes hitherto regarded as separate (not only trade and health, but also human rights and health), and on the other hand, to the growing importance of new stakeholders and institutional forms. This has brought about diverse forms of cooperation between civil society, governmental (national and international) and private sector stakeholders. Given the high number of those affected in the developing countries (in 2006, there were approximately 40 million people infected with HIV, of whom around 37 million were in developing countries) and the perception of HIV/AIDS as a global threat, this illness has become an effective catalyst for developing new structures in international health policy.

Reference was made to the disputes surrounding access to antiretroviral drugs. Since 2000, the sharp reduction in the cost of first-generation antiretroviral therapies has for the first time placed treatment within the financial reach of those infected with HIV in developing countries. Still, poor countries could only finance treatment with foreign aid and in addition, other measures necessary to combat the disease (prevention, diagnosis and monitoring) require considerable funds that far exceed the amounts traditionally provided as aid in the health field.

Since the mid-1990's, this situation has been leading to innovative approaches such as those mentioned above. For one, an attempt was made to create synergies: UNAIDS (the United Nations Programme on HIV/AIDS) was founded in 1995/96, with the primary aim of improving coordination between the organizations involved in the fight against HIV/AIDS (including CSOs). However, this attempt largely failed, due basically to the relative inflexibility of the international organizations involved. The key developments (the G8 Initiative and the establishment of the Global Fund, the mobilization of CSOs to improve access to drugs) took place outside the sphere of UNAIDS.

The establishment of the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) represents the farthest reaching initiative in terms of international health funding. The purpose of this fund, which was supported by the UN General Secretary Kofi Annan, stems from the G8 proposal to make considerable funds available for the fight against HIV/AIDS. Since some G8 members refused to allocate funds via a UN organization (which was seen as not sufficiently "result-oriented"), an independent fund was established, based on the PPP model (state governments, representatives of private enterprise and civil society organizations as decision makers; IGOs only as non-voting members of the Executive Council).

PPPs (particularly the so-called Accelerated Access Initiative) were also established as a vehicle for enabling pharmaceutical companies to make drugs cheaply available to developing countries in the spirit of Corporate Social Responsibility (CSR) without affecting patent rights. In addition to this, the US programme PEPFAR[6] should be mentioned. This is a bilateral programme, which makes considerable funds available for combating HIV/AIDS. In the end, the WHO more actively engaged in this process through the "3 by 5 Initiative" (aiming to treat three million people in 2005). When it became clear that, despite a considerable increase in treatment levels, this target could not be achieved, the plan became that of "universal treatment by 2010".

The very problems surrounding the treatment of HIV/AIDS, however, have again strongly highlighted the importance of properly functioning health systems (even though the WHO and World Bank have long been making reference to this again). Despite the considerable increase in international aid to combat HIV/AIDS since the beginning of this decade, the inadequate infrastructure of the health service in many countries receiving aid has increasingly proved a problem (accessibility of medical facilities, diagnostic capacity, shortage of health service staff, etc.). Aid coming from many different institutions has created problems with coordination and has not exactly made it easier to develop integrated national health systems.

## Healthcare Systems and Sanitary Conditions in Poor Countries: The Basis of Global Health Policy

Since the late 1990's, the need to promote all aspects of health, particularly in developing countries, has come more strongly to the fore in matters of international cooperation, along with the focus on reducing poverty. The strong emphasis on health as part of the *Millennium Development Goals* points to the growing importance of this area. The Commission on Macroeconomics and Health, set up by the WHO, has made a convincing case for the importance of health as a precondition of economic development. Strategies for combating and controlling infectious disease, the most important cause of illness in poor countries, are not far-reaching enough. This is in part because diseases traditionally associated with the developing world, such as cancer and cardiovascular disease, are on the increase in most developing countries. The large differences in income between the rich and poor regions of the world demand a considerably greater transfer of resources in the global health field. This is not only to enable the combat of infectious diseases such as HIV/AIDS, but also to make overall, countrywide improvements to the health situation in poor nations. To this end, in recent years, a range of initiatives has come into being that analyzes the problems of global health financing against the backdrop of the complex structures of global health governance and exerts increasing pressure on the developed world to rethink its role in global health policy (the Alliance for Health Policy and Systems Research; the Health Financing Task Force; the Global Health Financing Initiative).

## Conclusion

This brief outline on the developments in global health policy indicates that, in particular in the socio-political fields of global governance, foreign policy has become very complex. The reality of having to deal with political constellations involving a mesh of various and very different stakeholders with greatly divergent interests does not make it easy for governments to develop a coherent approach. These multi-stakeholder constellations also cause well-known coordination problems for developing countries. These problems have become an issue in the debates over the effectiveness of development cooperation.

6 PEPFAR stands for The President's Emergency Plan for AIDS Relief. This bilateral US programme of massive funding to combat HIV/AIDS came as a surprise, since it takes possible funds away from the GFATM, the establishment which was also supported by the US.

Seen from another perspective, this development gives non-governmental stakeholders the chance to exert an influence on global governance that is not possible within a system of intergovernmental relations (based on the aggregation of interests at the level of each nation state). They can do so by not only driving a global debate within civil society but also by participating in political processes. It is now becoming possible to mobilize resources (not only financial resources, but also expertise) that would not generally be made available to traditional international organizations. Beyond this, there is the possibility of much greater flexibility of political processes, including the overcoming of political barriers within these organizations. The development of a complex political field of global health governance has undoubtedly placed global health problems more firmly at the centre of international and trans-national political processes. Certainly, GHG is no process which is steered by an overall strategy, but which is producing results in the course of political conflicts between different stakeholders within GHG in a narrower sense, but also among actors in different fields of global governance. Certainly the outcomes, in terms of global population health, are dependent upon processes of economic and social development and strategies of distributional justice beyond what normally is understood by health politics. However, this is a complex interrelationship, as directly health-related interventions also play a central role in promoting social and economic development.

In 2006 the WHO established the Commission on Social Determinants of Health (CSDH) which further broadened its focus to stress the importance of social and environmental context and of governance fields which were formerly considered outside the area of GHG, like the WTO. The Commission's Interim Statement published in 2007 refers to the various levels of global development affecting health and tries to pull together the advantages of a huge diversity of stakeholders in GHG with the need for coherent action: "Action is needed on the determinants of health – from structural conditions of society to the more immediate influences, at all levels from global to local, across government and inclusive of all stakeholders from civil society and the private sector. Key to multilevel action is coherence (WHO, 2007)". To preserve the chances of flexibility and the mobilization of a large variety of actors, while steering a coherent course of action, this in fact, quite generally characterizes the challenges of Post-Westphalian global politics.

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## 5.2 How Useful are Existing Adaptation Guidelines for Reducing the Health Risks of Climate Change?

*Hans-Martin Füssel*

### Abstract

Climate change adaptation assessments aim at assisting policy-makers in reducing the health risks associated with climate change and variability. This paper identifies key characteristics of the climate-health relationship and of the adaptation decision problem that require consideration in climate change adaptation assessments. This paper further analyzes whether these characteristics are appropriately considered in existing guidelines for climate impact and adaptation assessment. The review finds three assessment guidelines, based on a generalized risk management framework, to be most useful for guiding adaptation assessments of human health. Since none of these guidelines adequately addresses all key challenges of the adaptation decision problem, actual adaptation assessments need to flexibly combine elements from different guidelines.

### Introduction

Anthropogenic climate change is an important risk factor for human health (Confalonieri et al., 2007). Current health problems may become more (or less) urgent due to climate change, and new health risks may be introduced to currently unaffected regions. The most recent Global Burden of Disease assessment estimated that in 2000, 166,000 deaths and 5.5 million disability-adjusted life years (DALYs) could be attributed to global climate change (McMichael et al., 2004).

Most adverse health impacts of climate change can be prevented, in principle, by appropriate adaptations. The term 'adaptation to climate change' is used here to refer to any actions by individuals, social groups, or institutions that are undertaken to avoid, prepare for, or respond to, the detrimental impacts of observed or anticipated climate change (Parry et al., 2007, Glossary). The focus of this paper is on 'planned adaptation', which involves the conscious use of information about current and future climate change to reduce current and future climate-sensitive risks.

The reduction of climate-sensitive health risks touches upon issues that have traditionally been discussed by the distinct communities concerned with climate and climate change, risk management, public health, and environmental health. Anthropogenic climate change has many unfamiliar characteristics that limit the applicability of established methods and tools. For instance, scholars with an environmental health background are confronted with the large spatial scale of the hazard, its long time horizon, its complex spatiotemporal pattern, and the large uncertainty of future hazard levels. Recently, efforts to integrate public health with adaptation to climate change and variability have increased. Most importantly, Ebi et al. (2005) present a number of insightful essays on the links between these two domains, and some chapters in McMichael et al. (2003) also address this link.

The present paper complements this literature by evaluating existing assessment guidelines in terms of their relevance for informing planned adaptation to the health risks of climate change and variability. Section 2 provides an introduction to climate impact and adaptation assessments, and identifies key features of the adaptation decision problem that need to be considered in adaptation assessments for human health. Section 3 evaluates existing assessment guidelines in terms of their relevance for assessing adaptation to the health risks of climate change. This evaluation is based on the criteria developed in Section 2 and on the experience of past vulnerability and adaptation assessments. Section 4 summarizes the key findings.

## Adaptation to the Health Risks of Climate Change

Adaptation to the health risks of climate change should be based on an assessment of those risks, and of potential adaptations to reduce these risks. Such vulnerability and adaptation assessments are conducted with different scientific and/or policy objectives, applying a wide range of assessment methods and tools. Füssel and Klein (2006) distinguish climate impact assessments, first-generation and second-generation vulnerability assessments, and adaptation policy assessments. Kovats et al. (2003a) distinguish four increasingly complex stages of adaptation assessment for human health: from identifying a list of adaptation options without evaluation to policy analysis that addresses the feasibility of specific adaptation strategies. Burton et al. (2005) distinguish four approaches to climate change adaptation assessment: hazards-based approach, vulnerability-based approach, adaptive-capa city approach, and policy-based approach. The relative suitability of these approaches in a specific assessment context depends on a multitude of factors, including the current level of climate-related health risks, the time horizon of relevant adaptation options, and the availability and reliability of model-based climate change scenarios and relevant epidemiological data.

*Prerequisites for Planned Adaptation*

Based on Last (1998), Füssel and Klein (2004) have suggested the following prerequisites for planned adaptation to the health risks of climatic change to be effective:

(1) Awareness of the problem
(2) Availability of effective adaptation measures
(3) Information about these measures
(4) Availability of resources to implement these measures
(5) Cultural acceptability of these measures
(6) Incentives for implementing these measures.

Vulnerability and adaptation assessments can potentially address each of these prerequisites by identifying significant problems and raising awareness of them (1), by identifying effective adaptation measures (3), by identifying co-benefits of adaptation or facilitating the provision of additional resources (4), by educating people in order to raise the acceptability of certain measures (5), by advising on the creation of incentives for actually implementing these measures (6), and by triggering research that may develop new adaptation options (2).

Effective planned adaptation requires that all prerequisites are fulfilled to a certain degree. Since the main obstacles to successful adaptation vary from one decision context to another, scientific analysis and political efforts should be targeted at those elements that are most in need of improvement. Adaptation policy assessments are least relevant if all prerequisites are already fulfilled or when insurmountable obstacles exist to inhibit the fulfilment of certain prerequisites.

*Ten Characteristics of the Adaptation Decision Problem*

The following characteristics of the decision problem, encountered in planning adaptation for the health risks of climate change, have important implications for adaptation policy assessment (see also McMichael et al., 2003, chapters 4 and 12):

*1. Climate change is a complex and uncertain hazard.*
Climate is a complex phenomenon involving many variables that vary on different spatial and temporal scales. The ability to forecast future climatic conditions is limited by uncertainties about future greenhouse gas emissions and about their effects on the regional climate. While changes in average climate parameters such as seasonal temperature can often be described by (subjective) probability distributions, this approach becomes increasingly difficult for extreme weather events and complex

climatic stimuli. Consequently, the applicability of established methods from quantitative health risk assessment in climate impact and adaptation assessment is often limited.

*2. Climatic changes affect human health along very diverse causal relationships.*

Climate-sensitive health risks include those occurring as a direct consequence of exposure to climatic stimuli (e.g., heat stroke, drowning during flood), those mediated via climate-sensitive ecological systems (e.g., water-borne and vector-borne diseases), and those resulting from the wider social implications of climate change (e.g., malnutrition). A variety of quantitative and qualitative methods need to be applied for assessing future risk levels and the effectiveness of potential adaptations. Furthermore, a comprehensive climate change assessment for human health needs to review the main effects of climate change on other sectors since this information may be crucial for assessing indirect health effects of climate change.

*3. The causal relationship between climate and health can be extremely complex, and relevant epidemiological data is often scarce.*

The effect of climatic hazards on the health of individuals and populations is determined by a variety of non-climatic factors, such as wealth, nutritional status, accessibility of health services, acclimatization, and behavioural factors. As a result, the epidemiological relationship between climatic factors and specific health outcomes is highly population-specific, limiting the informative value of epidemiological data from spatial analogues. Temporal analogues are often not available because anthropogenic climate change exposes populations to climatic conditions that they have never experienced before. The less epidemiological data which is available, the more important it is to actively seek for and include the experiential knowledge of regional stakeholders, and to resort to semi-quantitative and qualitative assessment approaches.

*4. Uncertainty in future risk projections is generally large but it varies across regions and health outcomes.*

The uncertainty in projections of climate change impacts is generally large but it varies widely across health outcomes and regions depending on the complexity of the climate-health relationship and the availability of relevant climatic and epidemiological data. Adaptation policy assessments need to address key uncertainties from the outset and evaluate their implications for the robustness of policy decisions.

*5. Adaptation involves a diverse group of actors.*

Some climate-sensitive health impairments can be addressed largely within the public health sector, but many of them require concerted actions with other sectors (e.g., meteorological services, urban and spatial planning, development and housing, agriculture). Adaptation policy assessments should identify key adaptation actors from all relevant sectors early in the process and consider their specific information needs, including appropriate spatial and temporal scales.

*6. The lead time of adaptation options varies widely across regions, health outcomes, and measures.*

Anthropogenic climate change unfolds over a time scale of several centuries. Adaptations to reduce its adverse health effects have shorter, but highly variable lead times. Some measures can be implemented quickly if need arises (e.g., stocking up of medical supplies), others require a number of years (e.g., establishing a heat-wave warning system), and still others take decades before they are fully effective (e.g., changes in town planning to reduce the urban heat island). The temporal scope of an adaptation assessment should be decided based on the policy horizon of potential adaptations.

*7. Human health is already strongly managed.*

Since most countries have a public health system in place to reduce major risks to population health, the most efficient way to reduce climate-sensitive health risks is generally by building upon existing policies and institutions.

*8. Most adaptations to future climate change also reduce vulnerability to current climate variability.*

Adaptations aimed at reducing climate-sensitive health risks that are already prevalent today will also reduce current health risks. Their effectiveness should be evaluated under current as well as changed climate conditions.

*9. Social conditions for adaptation vary widely across regions.*

Different regions vary widely with respect to the level of socioeconomic development, the availability and accessibility of public health infrastructure and services, the current health status of the population, the availability of data and expertise to produce and/or use sophisticated climate scenarios, the infrastructure and financial resources for the implementation of adaptation measures, the time horizon of policy decisions, and cultural preferences. Consideration of these factors is crucial in adaptation policy assessments as they determine the importance of current health risks versus future health risks, the feasibility of specific adaptation options, and the suitability of different assessment approaches.

*10. Adaptation and adaptation assessment is subject to resource constraints.*

Adaptation to the health risks of climate change competes with other public health policies for limited resources. Adaptation policy assessments should therefore attempt to evaluate different options in terms of their effectiveness and urgency, and they should focus on those health risks, regions, and population groups where additional information is most important for supporting good policy. In general, this goal can be best achieved by a multi-tiered assessment.

The discussion above implies that adaptation policy assessments should: integrate adaptation to climate change and variability with existing management policies (denoted as 'adaptation mainstreaming'),

| | IPCC<br>1994<br>3.1 | USCSP<br>1996<br>3.2 | UNEP<br>1998<br>3.3 | UKCIP<br>2003<br>3.4 | UNDP<br>2005<br>3.5 | WHO<br>2003<br>3.6 |
|---|---|---|---|---|---|---|
| Clear procedural structure | + | + | o | + | + | o |
| Flexible assessment procedure | o | o | o | + | + | o |
| Prioritization of assessment efforts | o | o | o | + | o | o |
| Identification of key information needs | – | – | – | + | o | o |
| Inclusion of key stakeholders | – | o | o | o | + | + |
| Choice of relevant spatial and temporal scales | – | o | o | + | + | o |
| Balanced consideration of current and future risks | – | o | o | o | + | + |
| Management of uncertainties | o | o | o | + | + | o |
| Policy guidance in the absence of quantitative risk estimates | – | – | o | + | + | o |
| Prioritization of adaptation actions | – | o | o | + | + | - |
| Mainstreaming of climate adaptation | – | o | o | + | + | + |
| Cross-sectoral integration | o | o | + | – | + | + |
| Disease-specific methods and tools | – | o | + | – | – | + |
| Assessment of key obstacles to adaptation | – | – | – | – | o | o |

*Table 1: Suitability of Major Guidelines for Climate Impact and Adaptation Assessment for National and Regional Adaptation Assessments of Human Health. Top rows: Responsible Institution; Publication Year; Cross-Reference to Relevant Subsection. Symbols Indicate the Degree to which a Specific Criterion is Met (+: good; o: partial; –: weak)*

whereby the relative importance of climate change compared to other risk factors needs to be considered; address uncertainties explicitly; and focus on additional information that is most relevant for policy decisions. Guidelines for human health adaptation assessment need to be flexible enough to accommodate the substantial diversity of health outcomes as well as regional socioeconomic and environmental conditions.

## Guidelines for Adaptation Policy Assessment

Several international and national organizations have developed guidelines for climate change impact and adaptation assessment. These guidelines describe the main steps involved in assessing vulnerability to climate change and developing effective adaptation strategies. Additionally, they provide guidance on the implementation of these steps. Some guidelines are generic (i.e., intended to be applicable to any climate-sensitive impact domain anywhere in the world) whereas others are targeted at specific systems, sectors, or world regions. Earlier guidelines tend to focus on assessing potential impacts of climate change whereas later guidelines put more emphasis on adaptation planning. Adaptation guidelines have also been developed by some organizations responsible for managing or funding climate-sensitive resources (e.g., Global Environment Facility Program, 2006).

This section briefly reviews six major guidelines for climate impact and adaptation assessment in terms of their ability to provide guidance for national and regional adaptation policy assessments for human health. Table 1 summarizes the results of this review by indicating the degree to which each guideline meets several criteria derived from the discussion in the previous section. Several caveats should be mentioned in this context. First, the review does not judge the "general quality" of these guidelines, which have been developed for different audiences and with different objectives. Second, the review has been influenced by the practical experience with climate impact and adaptation assessments described in the literature. This experience depends not only on the suitability of the underlying guideline but also on factors such as resource availability. Third, the applicability of a guideline may change with scientific progress, e.g., when the ability to project climate change on the regional level improves. Of course, any such evaluation unavoidably contains subjective elements. The remainder of this section discusses each of the guidelines in more detail.

*Intergovernmental Panel on Climate Change (IPCC) Technical Guidelines*

The IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations (Carter et al., 1994; Parry and Carter, 1998) constitute the first comprehensive approach for guiding impact and adaptation assessments. They aim at guiding analysts through the various methods that can be used to assess the impacts from, and adaptations to, climatic changes, and at structuring the assessment process. The Technical Guidelines implement the hazards-based (also known as scenario-based) approach to climate change impact and adaptation assessment (see Burton et al., 2005, for a discussion of different assessment approaches). Their development was heavily influenced by the experiences of various modelling groups who combined model-based climate scenarios with biophysical climate impact models to project the impacts of climate change on food production, natural ecosystems, and freshwater hydrology. Health impacts are addressed but the focus is cursory and mainly centres on scenario-driven modelling.

Adaptation needs in the hazards-based approach follow exclusively from the incremental effects of anthropogenic climate change. As a result, this approach provides little guidance to countries and regions that lack the data, models, expertise, or resources required to conduct quantitative impact assessments, and it is of limited help if the uncertainty in climate impact projections is very large. Several reviews conclude that the hazards-based approach has yielded few results that are immediately useful for the purposes of adaptation policy design (Klein et al., 1999; O'Brien, 2000; McMichael et al., 2001; Burton et al., 2002; Kovats et al., 2003a). These reviews agree in the importance of using

methods for adaptation assessment that can deal with various levels of uncertainty, and of designing adaptation policies that are effective under different plausible climate and socioeconomic scenarios.

*USCSP Handbook*

The United States Country Studies Program (USCSP) has developed a handbook for climate vulnerability and adaptation assessment that was intended to be used in tandem with the IPCC Technical Guidelines. Its main innovations are the emphasis on involving stakeholders throughout the assessment and the recommendation that impact/vulnerability assessment and adaptation assessment are conducted largely in parallel.

The original USCSP Handbook (USCSP, 1994) focuses on agriculture and forestry, water resources, and coastal zones. The book version of the USCSP Guidelines (Benioff et al., 1996) also includes a chapter on human health vulnerability assessment but no specific guidance is given on assessing adaptation options for human health. Evaluations of the USCSP Handbook for adaptation assessments largely agree with those of the IPCC Technical Guidelines.

*UNEP Handbook*

The UNEP Handbook on Methods for Impact Assessment and Adaptation Strategies (Feenstra et al., 1998) was designed to assist developing countries and economies in transition to conduct climate impact assessments and identify adaptation options. The UNEP Handbook consists of two parts. The generic part largely follows the scenario-based approach presented in the IPCC Technical Guidelines. The sectoral part provides specific advice on methods and tools that can be applied in various climate-sensitive impact domains, including human health. The focus of the UNEP Handbook remains on assessing impacts and vulnerability rather than facilitating adaptation.

The UNEP Handbook does not suggest a generic procedural framework for climate impact and/or adaptation assessment. Due to the large uncertainty in projections of future health risks, the health chapter emphasizes the importance of linking climate adaptation with the management of current climate-sensitive health risks. Actual assessments following the UNEP Handbook have faced similar problems as those reported above for the IPCC Technical Guidelines (O'Brien, 2000; Kovats et al., 2003a).

*UKCIP Framework for Climate Adaptation*

The United Kingdom Climate Impacts Programme (UKCIP) has developed a framework for adaptation decision-making that casts the assessment process in terms of risk management under uncertainty (Willows and Connell, 2003). Key characteristics of this framework are that it is circular, allowing the performance of decisions taken to be reviewed, and decisions revisited through time; it is iterative, allowing the problem, decision-making criteria, risk assessment and options to be refined prior to any decision being implemented; and certain stages within the framework are tiered, allowing the decision-maker to undertake screening, evaluation and priority-setting of climate risks and adaptation options before moving on to more detailed risk assessments and options appraisals. The UKCIP report includes several case studies related to coastal management and natural resource management. Treatment of climate impacts on human health is only cursorily.

The UKCIP Framework provides comprehensive and detailed guidance on climate adaptation decision-making. Since the framework was designed for application in the UK it does not reflect the diversity of regional adaptation contexts, e.g., in terms of the availability of sophisticated regional climate scenarios and of economic resources. The framework does not provide specific guidance on identifying decisions that are potentially sensitive to climate change, on identifying relevant stakeholders, or on raising awareness of the issue of climate change.

*UNDP – GEF Adaptation Policy Framework*

The Adaptation Policy Framework (APF) project initiated by the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF) aims to provide guidance to developing countries for conducting adaptation policy assessments in any sector. It was developed in response to the experience gained from applying the hazards-based approach to climate impact and adaptation assessment that treatment of adaptation has rarely gone beyond the listing of potential adaptation options. The APF consists of a User's Guidebook and nine Technical Papers (TPs) published in a single volume (Burton et al., 2005). The technical papers refer to different steps in the assessment approach. However, the amount of sector-specific information is limited.

Key characteristics of the APF are that it treats policy as the overarching purpose, it starts by assessing the effectiveness of coping with recent climate experiences rather than by developing model-based climate scenarios, it links adaptation to future climate change to coping with current climate variability and extremes, it assesses climate adaptation in the context of sustainable development, and it emphasizes the importance of the stakeholder process through the adaptation assessment.

The APF addresses most of the challenges of the adaptation decision problem discussed in Section 2. As a generic framework however, the APF cannot address the specific concerns of human health adaptation, such as providing guidance on the most appropriate methods and tools for assessing future health risks. Furthermore, the APF does not specifically advocate a tiered approach to assessing future risks where the importance of future changes in risks is assessed qualitatively before more detailed assessments are made.

*WHO–Health Canada Assessment Framework*

The WHO, in collaboration with Health Canada, UNEP, and the WMO, has developed "Methods of assessing human health vulnerability and public health adaptation to climate change" (Kovats et al., 2003b), which aim at providing flexible instructions for conducting a human health vulnerability and adaptation assessment to climate change. The WHO–Health Canada Framework is targeted specifically at national and regional government agencies responsible for assessing the health risks associated with global climate change and for developing adaptations to them. It begins with current health risks and their determinants but also includes, when available, model-based climate and impact scenarios. As a health-specific framework, it provides guidance on assessing vulnerability and adaptation for the most important climate-sensitive health impairments. It also gives useful recommendations on project management, and on dissemination and communication strategies. The main limitations of the WHO Health Canada Framework are that it presents three different assessment approaches without providing guidance on how they might be integrated into an actual assessment; additional adaptation measures are considered only in the final step of the assessment; it lacks coherent information on how the suitability of different approaches can be determined based on regional and disease-specific factors; there is limited guidance on assessing and planning adaptations when uncertainties are too large for quantitative risk assessment; and it lacks guidance on prioritizing potential adaptation measures in terms of their efficiency and urgency.

*Summary and Conclusions*

Human health adaptation policy assessments aim at facilitating planned adaptation to the health risks associated with climate change and variability by providing information to policy-makers on the health risks associated with climate variability and change, on the effectiveness and costs of feasible adaptations, and on ways to overcome obstacles to their implementation (Sect. 1). Several scientific and professional communities can provide guidance for human health adaptation assessments, including those concerned with climate change, risk management, public health, and environmental health. However, assessing and planning adaptation to the health risks associated with climate change

presents several challenges to analysts. Unfamiliar aspects include the diversity of climate-sensitive health impacts; the complex interaction of climatic, environmental, socioeconomic, demographic and behavioural factors in the causation of diseases; large uncertainties in projections of future climatic and socio-economic conditions; and the scarcity of epidemiological data on the relationship between climatic conditions, non-climatic factors and health outcomes (Sect. 2).

Various frameworks have been developed to provide guidance for climate change vulnerability and adaptation assessments but their application so far in human health adaptation assessments has been limited. Most early studies of climate change and human health have followed a hazards-based approach, as described in the IPCC Technical Guidelines, the USCSP Handbook, and the UNEP Handbook. These studies evaluated and extended the scientific knowledge about the relationship between climatic factors and human health and provided indispensable information on the scale of the problem and on particularly vulnerable regions. However, they offered only limited guidance to stakeholders concerned with adaptation. The main reasons for this are the mismatch in spatial and temporal scales between climate impact projections and typical adaptation decisions, and the limited consideration of scientific uncertainties, current climate-sensitive health risks and socio-economic factors.

Recognizing the limitations of the hazards-based approach in providing policy-relevant knowledge to adaptation decision-makers, recent guidelines for adaptation assessment emphasize approaches that integrate adaptation to future climate change with current climatic risks and other policy concerns (see Figure 1). The most important generic guidelines are the UKCIP Framework, which is targeted at adaptation stakeholders in industrialized countries, and the UNDP-GEF Adaptation Policy Framework (APF), which focuses on the adaptation needs of developing countries. The WHO–Health Canada Framework specifically addresses adaptation to the health risks of climate change and variability.

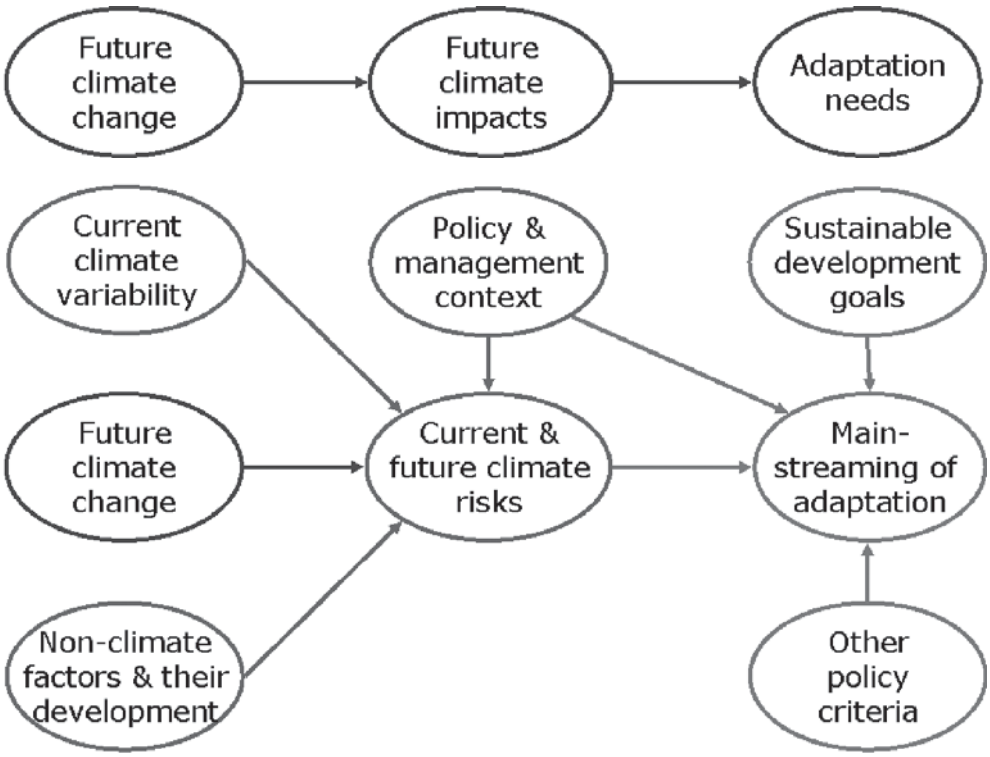


*Figure 1: Evolution of Approaches for Determining Adaptation Needs. Top: Linear Hazards-Based Approach; Bottom: Complex Integrative Approach. Source: Füssel (2007)*

The APF advocates a flexible assessment approach, it provides criteria for choosing between alternative assessment approaches, and it presents and discusses a wide range of pertinent methods and tools. There is, however, only limited guidance on focusing the assessment on the most relevant information

in a given decision context. The UKCIP Framework recommends an even more flexible approach to adaptation decision-making. Earlier decisions can be revised based on new information, and a multi-tiered approach helps focusing assessment efforts on the most critical impacts and/or regions. The UKCIP Framework is most useful when current climate-sensitive risks are satisfactorily controlled, and when decisions that are potentially sensitive to global climate change have already been identified by relevant decision-makers. Despite their regional foci, both the APF and the UKCIP Framework can provide valuable guidance for adaptation policy assessments in any world region. However, neither framework addresses the specific challenges of planned adaptation for human health. The WHO–Health Canada Framework presents a variety of methods and tools for assessing vulnerability and adaptation to climate change for the major climate-sensitive health risks. Compared to the generic frameworks, however, this framework provides little guidance on integrating the various concepts presented and on focusing the assessment on the key information needs of adaptation stakeholders. In summary, none of the assessment guidelines reviewed here satisfactorily addresses all challenges of adaptation policy assessments for human health. For this reason, actual adaptation assessments should seek guidance from the different sources reviewed here according to their respective strengths (see Table 1).

Of course, good guidelines for adaptation assessment are only one precondition for effective prevention of climate-related deaths and diseases. In addition, resources need to be made available for conducting comprehensive vulnerability and adaptation assessments at different scales. Finally, and most importantly, it is crucially important to come up with the resources and the political will to implement proven public health measures to reduce the burden of disease now and in the future. Stronger action is particularly relevant in those countries and regions with a high burden of avoidable disease today, which are also in the worst position to effectively manage the health risks from climate change in the future.

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## 5.3 The Health Impacts of Globalization – A Conceptual Framework

*Maud M. T. E. Huynen, Pim Martens and Henk B. M. Hilderink*

### Introduction

Achieving good health has become an accepted international goal. In our attempts to realize this goal, however, we have to recognize that our (future) health increasingly depends on the processes of globalization. This was clearly demonstrated by the rapid global spread of SARS in 2003. As Dr. Margaret Chan, the current Director-General of the World Health Organization (WHO) stated: 'SARS was an excellent example in demonstrating to countries that because infectious diseases do not respect borders...an outbreak in one country one day can very rapidly become a problem for countries on the other side of the world…' (WHO, 2006). Fortunately, the actions taken by the WHO played a decisive role in fighting the uncontrolled spread of this disease. In the aftermath, the question was raised if this outbreak was a sign of things to come.

In the past, maintaining and augmenting good health has been recognized as one of the key elements in achieving a sustainable form of globalization (Lee, 2003). The link between global mobility, of goods and people, and the spread of infectious diseases is perhaps the best-known health effect of globalization. However, it is just one example of the many possible health effects of globalization. As the pathways from globalization to health are various and mediated by a multitude of factors, a clear conceptualization of the system under investigation is required.

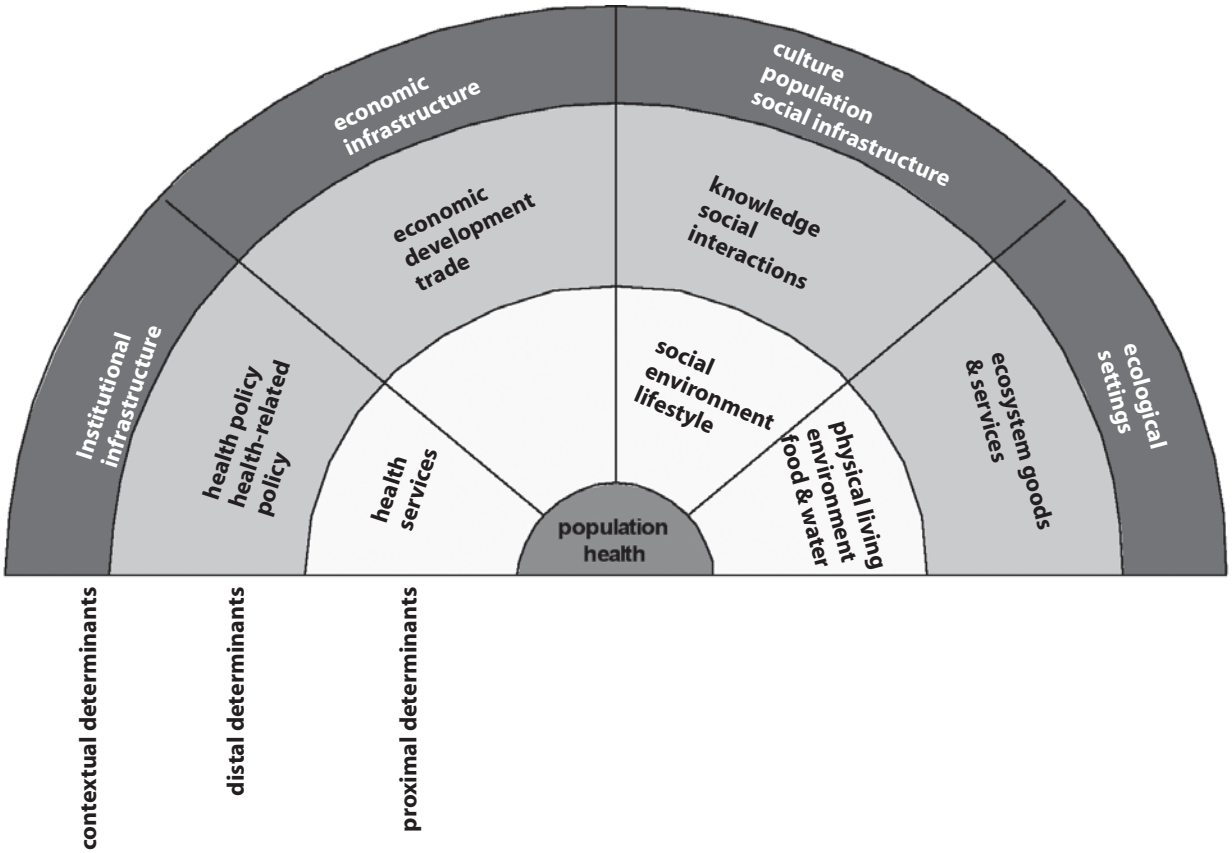


*Figure 1: Multi-Nature and Multi-Level Framework for Population (Huynen et al., 2005b; Huynen, 2008)*

| Level/ Nature | General determinants | More detailed determinants |
|---|---|---|
| Contextual level | | |
| Institutional | Institutional infrastructure | Governance structure |
| | | Political environment |
| | | System of law |
| | | Regulation |
| Economic | Economic infrastructure | Occupational structure |
| | | Tax system |
| | | Markets (incl. demand and supply) |
| Social-cultural | Culture | Religion |
| | | Ideology |
| | | Customs |
| | Population | Population size |
| | | Structure (incl. age) |
| | | Geographical distribution (incl. urbanisation) |
| | Social infrastructure | Social organisation |
| | | Knowledge development (incl. technology) |
| | | Social security |
| | | Insurance system |
| | | Mobility and communication |
| Environmental | Ecological settings | Ecosystems |
| | | Climate |
| Distal level | | |
| Institutional | Health policy | Effective public health policy |
| | | Sufficient public health budget |
| | Health-related policies | Effective food policy |
| | | Effective water policy |
| | | Effective social policy |
| | | Effective environmental policy |
| Economic | Economic development | Income/wealth |
| | | Economic equity |
| | Trade | Trade in goods and services |
| | | Marketing |
| Social-cultural | Knowledge | Education and literacy |
| | | Health education |
| | | (Healthy) technology |
| | Social interactions | Social equity |
| | | Conflicts |
| | | Travel and migration |
| Environmental | Ecosystem goods and services | Habitat |
| | | Information |
| | | Production |
| | | Regulation |
| Proximate level | | |
| Institutional | Health services | Provision of and access to health care services |
| Economic | - | - |
| Social-cultural | Lifestyle | Healthy food consumption patterns |
| | | Alcohol and tobacco use |
| | | Drug abuse |
| | | Unsafe sexual behaviour |
| | | Physical activity |
| | | Lifestyle related endogen factors: high blood pressure, obesity, high cholesterol levels |
| | | Stress coping |
| | | Child care |
| | Social environment | Social support and informal care |
| | | Intended injuries and abuse/violence |
| Environmental | Food and water | Sufficient quality |
| | | Sufficient quantity |
| | | Sanitation |
| | Physical environment | Quality of the living environment (e.g. housing, work, school): biotic, physical and chemical factors |
| | | Unintended injuries (e.g. disasters, traffic accidents, work-related accidents) |

*Table 1: Determinants of Population Health (Huynen et al., 2005b; Huynen, 2008)*

## Conceptual Framework for Globalization and Health

As the world around us is becoming progressively interconnected and complex, human health is increasingly perceived as the integrated outcome of its diverse determinants. A recent analysis of existing health models concluded that the nature of these determinants and their level of causality can be combined into a basic framework that conceptualizes the complex multi-causality of population health (Huynen et al., 2005a, 2005b). In order to differentiate between determinants of different nature, we will make the traditional distinction between institutional, socio-cultural, economic, and environmental factors. These factors operate at different hierarchical levels of causality. The chain of events leading to a certain health outcome includes both proximal and distal causes – proximal factors act directly to cause disease or health gains, while distal determinants are further back in the causal chain and act via intermediary causes (WHO, 2002a). In addition, contextual factors also play an important role. These can be seen as the macro-level conditions shaping the distal and proximate health determinants; they form the context in which the distal and proximate factors operate and develop. Figure 1 and Table 1 show the wide-ranging overview of the health determinants that can be fitted within this framework.

In the past, globalization has often been seen, more or less, as an economic process characterized by increased deregulated trade, electronic communication, and capital mobility. However, it is now becoming increasingly perceived as a more comprehensive phenomenon that is shaped by a multitude of factors and events, and which is reshaping our society rapidly. Based on the work by Scholte (2000), Held et al. (2000), and Rennen and Martens (2003), we define globalization as "a process characterized by a growing intensity, extensity and velocity of institutional, economic, social-cultural and ecological interactions, resulting in trans-border processes and effects" (Huynen et al., 2005b). In order to focus the conceptual framework, however, the following important features of globalization are identified:

- Global governance structures: globalization influences the interdependence among nations as well as the nation state's sovereignty leading to (a need for) new global governance structures.
- Global markets: globalization is characterized by worldwide changes in economic infrastructures and the emergence of global markets and a global trading system.
- Global mobility: global mobility is characterized by a major increase in the extensity, intensity, and velocity of movement and by a wide variety in 'types' of mobility.
- Cross-cultural interaction: globalizing cultural flows result in interactions between global and local cultural elements.

Global environmental changes: global environmental threats to ecosystems include global climate change, loss of biodiversity, global ozone depletion, and the global decline in natural areas.

Based on Figure 1 and Table 1, it can be concluded that these features all operate at the contextual level of health determination, influencing the distal health determinants. In turn, the changes in distal factors have the potential to affect the proximal determinants and, consequently, health. Figure 2 links the above-mentioned features of the globalization process with the identified health determinants (Huynen et al., 2005b).

## Globalization and Distal Health Determinants

Figure 2 shows that the processes of globalization can have an impact on the identified distal health determinants. Below, the implications of the globalization process on these distal determinants will be discussed in more detail (Huynen et al., 2005b).

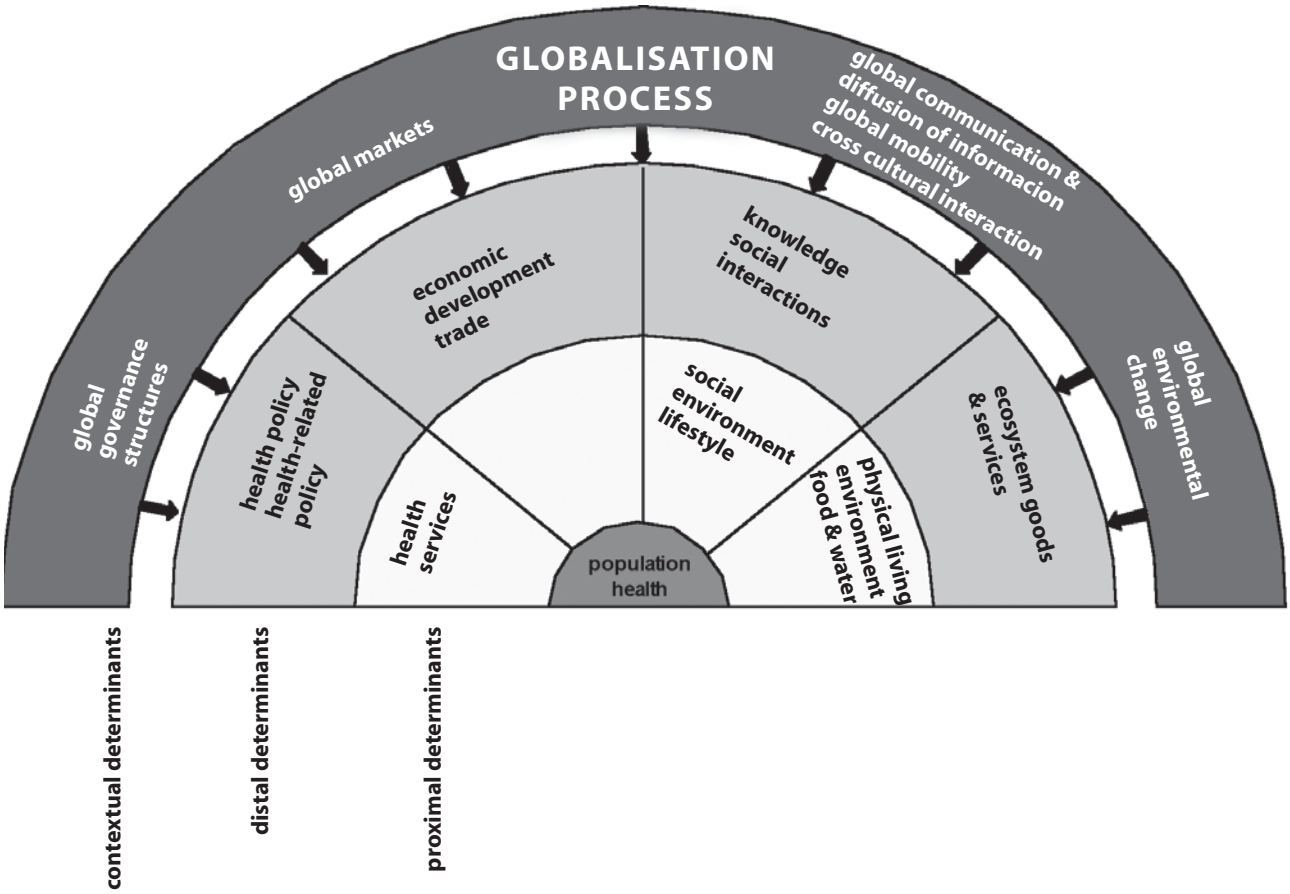


*Figure 2: Conceptual Framework for Globalization and Population Health (Huynen et al., 2005b; Huynen, 2008)*

*Health (-related) Policies*

Global governance structures are increasingly gaining importance for the formulation of health (-related) policies. Significant institutions in global health governance include the World Health Organization (WHO) and the World Bank (WB) (Dodgson et al., 2002). The latter plays a key role in the field of global health governance, as it acknowledges the value of good health for economic development and focuses on achieving the Millennium Development Goals. The WB also influenced health

(-related) policies together with the International Monetary Fund through the Structural Adjustment Programmes (Hong, 2000) and the Poverty Reduction Strategy (IMF, 2004). In addition, the policies of the World Trade Organization (WTO) are also increasingly influencing population health (Hong, 2000; Walt, 2000; WHO and WTO, 2002). Fidler (2002) argues that "from the international legal perspective, the centre of power for global health governance has shifted from the WHO to the WTO". Opinions differ with regard to whether or not the WTO agreements provide sufficient possibilities to protect populations from the adverse (health) effects of free trade (Singer, 2002). In 2001, the WTO ruled that the French ban on the import of all products containing asbestos was legal on health grounds, despite protests from Canada (WTO, 2000, 2001). However, protecting citizens against health risks in cases of scientific uncertainty is still difficult, as the WTO is reluctant to accept precautionary trade restrictions (Mbengue and Thomas, 2005).

*Economic Development*

Opinions differ with regard to the economic benefits of globalization. On the one side, "optimists" argue that global markets facilitate economic growth and economic security, which benefits health. They base their opinion on the results of several studies that conclude that inequities between and within

countries have decreased due to globalization (e.g. Frankel, 1999; Ben-David, 2000; Dollar and Kraay, 2001). Additionally, it is argued that, although other nations or households might become richer, absolute poverty is reduced and that this is beneficial for the health of the poor (Feachem, 2001). On the other side, "pessimists" are worried about the health effects of the global market. Baum (2001) states that "the current forms of globalization are making the world a safe place for unfettered market liberalism and the consequent growth of inequities…posing severe threats to people's health". The 2005 Human Development Report (UNDP, 2005) argues that one of the prevailing "myths" of economic globalization is that open markets will result in an era of convergence; trade liberalization "has done little to slow down the marginalization of Sub-Saharan Africa' and the current "trading system favours the developed world". In fact, notwithstanding some spectacular growth rates, especially in East Asia, incomes declined between 1965 and 1997 in 16 of the world's poorest countries (Melchior et al., 2000).

*Trade*

Due to the establishment of global markets and a global trading system, there has been a continuing increase in world trade. According to the WTO, total trade multiplied by a factor 14 between 1950 and 1997 (WTO, 2003). More recently, the year 2004 saw an impressive growth in trade, which exceeded average growth recorded over the preceding decade (WTO, 2005). Today, all countries trade internationally and they trade significant proportions of their national income. The array of products being traded is wide-ranging; from primary commodities to manufactured goods. Besides goods, services are increasingly being traded as well (Held et al., 1999).

*Social Interactions: Migration*

Due to the changes in the infrastructures of transportation and communication, human migration has increased at unprecedented rates. According to Held et al. (1999), tourism is one of the most obvious forms of cultural globalization. However, travel for business and pleasure constitutes only a fraction of total human movement. Other examples of people migrating are missionaries, merchant marines, students, pilgrims, militaries, migrant workers and Peace Corps workers (Held et al., 1999; Wilson, 1995). Besides these forms of voluntary migration, resettlement by refugees is also an important issue. The UN Population Division estimated that the global migrant population in 2005 would be between 185–192 million people (UN, 2003). However, the concerns regarding the economic, political, social and environmental consequences of migration are growing (UN, 2004), and many governments are moving towards more restrictive immigration policies.

*Social Interactions: Conflicts*

In the aftermath of the terrorist attacks on 11 September 2001, many people questioned the possible links between globalization and the risk on conflicts. On the one side, globalization can decrease the risk of tensions and conflicts, as societies become more dependent on each other. Others argue that the resistance to globalization has resulted in religious fundamentalism, and worldwide tensions and intolerance (Frenk et al., 1997). According to Huntington (1993), the increasing cross-cultural interactions will result in a 'clash of civilizations'. Nassar (2005) describes globalization as a process that leads to a 'migration of dreams' in which the world's poor are able to learn of the luxuries of the western world; the increased degree of relative deprivation results in growing tensions. In addition, Zwi et al. (2002) identify several other factors that are associated with both globalization and the risk on conflicts, such as increased global trade in arms, and inadequate policies.

*Social Interactions: Social Equity and Social Networks*

Global communication, global mobility and cross-cultural interaction can also influence the cultural norms and values of social solidarity and social equity. It is feared that the self-interested individualism

of the marketplace spills over into cultural norms and values resulting in increasing social exclusion and social inequity. Exclusion involves disintegration from common cultural processes, lack of participation in social activities, alienation from decision-making and civic participation and barriers to employment and material sources (Reid, 2004). On the other hand, however, the geographical scale of social networks is increasing due to global communications and global media. The women's movement, the peace movement, organized religion and the environmental movement are good examples of such trans-national social networks. Besides these more formal networks, informal social networks are also gaining importance, as like-minded people are now able to interact at distance through, for example, the internet. In addition, the global diffusion of radio and television plays an important role in establishing such global networks (Held et al., 1999). The digital divide between poor and rich, however, can result in social exclusion from the global civil society.

*Knowledge*

The knowledge capital within a population is increasingly affected by global developments in communication and mobility. Millions of people now acquire part of their knowledge from trans-world textbooks. Most universities work together with academics from different countries, students have ample opportunities to study abroad and 'virtual campuses' have been developed. In addition, television, film and computer graphics have greatly enlarged the visual dimensions of communication. Many people today 'read' the globalized world without a book' (Scholte, 2005). Overall, it is expected that these developments will also improve health training and health education (e.g. Feachem, 2001; Lee, 1999).

*Ecosystem Goods and Services*

Global environmental changes are affecting the provision of ecosystem goods and services to mankind. The Intergovernmental Panel on Climate Change (IPCC) (2007) concludes that climate change can result in significant ecosystem disruptions and threatens substantial damage to the earth's natural systems. In addition, several authors have argued that maintaining a certain level of biodiversity is necessary for the proper provision of ecosystem goods and services (Chapin et al., 2000; Schulze and Mooney, 1994; Schwartz et al., 2000; UNEP, 1995). The Millennium Ecosystem Assessment warns that the ongoing degradation of ecosystem functions poses a growing health risk (Corvalan et al., 2005). Several ecosystem functions are important to sustain our physical health. First, ecosystems provide us with basic human needs such as food, clean air, and clean water. Second, they prevent the spread of diseases through biological control. Finally, ecosystems provide us with medical and genetic resources, which are necessary to prevent or cure diseases (Huynen et al., 2004).

## Globalization and Proximal Health Determinants

Figure 2 shows that the impact of globalization on each proximal health determinant is mediated by the above-discussed changes in distal factors. The most important relationships will be discussed in more detail below (Huynen et al., 2005b).

*Health Services*

Health services are increasingly influenced by globalization-induced changes in health care policy, economic development, trade, knowledge, and migration. Although the WHO aims to assist governments to strengthen health services, government involvement in health care policies has been decreasing and, subsequently, medical institutions are more and more confronted with the neo-liberal economic model. This has undermined the financial security of medical institutions, which are thus pressured to explore "free-market" alternatives. Some argue that market-based financing will increase

health care efficiency, while others are concerned that health will increasingly be perceived as a private good. This, in turn, implies that the marketplace alone should determine the distribution of good health, based on the criterion of whose health is profitable for investment and whose is not. According to Collins (2003), populations of transitional economies are no longer protected by a centralized health sector that provides universal access to everyone and some groups are even denied the most basic medical services.

The increasing trade in health services also has some profound implications. Although it is perceived as to improve the consumer's choice, some developments are believed to have long-term dangers, such as establishing a two-tier health system, movement of health professionals from the public sector to the private sector, inequitable access to health care and the undermining of national health systems (Hong, 2000; Walt, 2000). The illegal trading of drugs and the provision of access to controlled drugs via the Internet are potential health risks (Lee and Collin, 2001). In addition, the globalization process can also result in a 'brain-drain' in the health sector as a result of labour migration from developing to developed regions (Pang et al., 2002). However, increased economic growth is generally believed to enhance improvements in health care. Increased (technological) knowledge resulting from the diffusion of information can further improve the treatment and prevention of diseases.

*Social Environment*

One central mechanism that links the social environment to health is 'social support,' which is the transfer from one person to another of instrumental, emotional and informational assistance (House et al., 1988). Social networks and social integration are closely related to social support (Berkman et al., 2000). As a result, globalization-induced changes, in social cohesion, integration and interaction, can influence the degree of social support in a population.

Another important factor in the social environment is violence, which often is the result of the complex interplay of many factors. The WHO (2002b) argues that globalization gives rise to obstacles as well as benefits for violence prevention. It induces changes in protective factors like social cohesion, knowledge and education levels, and global prevention activities. On the other hand, it also influences important risk factors associated with violence such as income inequality, collective conflict, and trade in alcohol, drugs or firearms.

*Lifestyle*

Due to the widespread flow of people, information, ideas, and lifestyles also spread throughout the world. It is already widely acknowledged that several modern behavioural factors such as an unhealthy diet, physical inactivity, smoking, alcohol misuse and the use of illicit drugs are having a profound impact on human health (Beaglehole and Yach, 2003; WHO, 1999, 2001, 2002c). Individuals respond to the range of healthy as well as unhealthy lifestyle options and choices available in a community (Murray and Smith, 2001), which are in turn determined by global trade, economic development and social interactions. Although the major chronic diseases are not transmittable via an infectious agent, the behaviours that predispose to these diseases can be communicated by advertising, product marketing and social interactions (Marks and McQueen, 2001). Global trade and marketing developments drive, for example, unhealthy developments in diet (Beaglehole and Yach, 2003; Murray and Smith, 2001), tobacco use (Beaglehole and Yach, 2003; Cunningham, 1996), and alcohol consumption (Jernigan, 1997).

However, health education can play a role in promoting healthy lifestyles by improving an individual's knowledge about the health effects of different lifestyle options. Besides health education, (global) policies can also directly discourage unhealthy behaviour by means of economic incentives (e.g. charging excise on tobacco) or other legislation. An effective implementation of the WHO Framework Convention on Tobacco Control (FCTC) (WHO, 2003) is expected to have profound implications on tobacco related-policies and, hopefully, tobacco use.

*Physical Living Environment: Infectious Diseases Pathogens*

The spread of infectious diseases is probably one of the most mentioned health effects of globalization and past disease outbreaks have been linked to factors that are related to the globalization process (e.g. Newcomb, 2003). The SARS outbreak demonstrated the potential of new infectious diseases to spread rapidly in today's world. The combination of movement of goods and people, and profound changes affecting ecosystem goods and services all contribute to increased risk of disease spread. For example, the globalization of food production, trade and consumption has been associated with the increased spread and transmission of food-borne diseases (Hodges and Kimball, 2005).

The global spread of knowledge and technologies, however, can improve the outbreak surveillance and monitoring of antibiotic resistance (Feachem, 2001), increasing the speed of responses in some cases. Wilson (1995) states that responding to disease emergence requires a global perspective. Hence, the policies and actions undertaken by the WHO are becoming increasingly important in controlling infectious diseases at a global level. For instance, the WHO played a critical role in controlling SARS by means of global alerts, geographically specific travel advisories and monitoring (Fidler, 2004).

*Food*

Food trade has become an increasingly important factor with regard to food security worldwide. Economic liberalization policies are expected to have profound implications, both good and bad, on food trade and, subsequently, on food security. The FAO argues that free trade could potentially create access to better and cheaper food supplies via food imports and could stimulate more efficient use of the world's resources as well as the production of food in regions that are more suitable to do so. On the other hand, the FAO acknowledges that increasing dependence on food imports goes hand in hand with a higher vulnerability to shocks arising in global markets, which can affect import capacity and access to food imports. Many food-insecure countries are not able to earn enough with exporting goods to pay for needed food imports (FAO, 1996, 2003).

Several authors (Lang, 1996; Stevens, 2003; Shiva, 2004; Smaller, 2005) have expressed their concern about the adverse consequences of food trade resulting from current asymmetric imbalances in the global market. At present, the developed countries still impose protectionist trade policies by, for example, subsidizing their domestic agricultural sectors (allowing domestic producers to sell their products cheaper than their foreign competitors) and imposing relatively high agricultural tariffs on imported goods (making them less competitive with domestic goods). Stevens (2003) argues that the protectionist policies of the OECD countries, together with stricter food standards, are expected to affect Africa's food security; Africa is being 'squeezed', as the price of cereal imports could increase, while the volume and price of agricultural exports could decline.

In case of extreme food insecurity and insufficient import capacity, international food aid may be provided in order to supplement the scarce food imports. One can also deal with the mismatch between demand and supply by increasing food production in food-short regions. The globalization process can facilitate the worldwide implementation of better technologies and improved knowledge. At the same time, however, the natural resource base for food production is increasingly threatened by global environmental changes.

*Water*

Globalization also raises concerns over water security. The globalization process is accompanied by privatization policies affecting the provision of water. Governments and international financial institutions promote privatization, as they believe it will promote market competition and efficiency. Others are less optimistic about the effects of privatization. In fact, some cases show that prices and inequalities in access even rise (Olivera and Lewis, 2004). The virtual trade of water is also believed to be of

increasing importance. The water that is used in the production process of a commodity is called the 'virtual water' contained in that commodity. Therefore, the increasing global trade of commodities is accompanied by an increasing trade in virtual water. The global volume of crop-related international virtual water flows between nations is estimated at 695 G cubic metres per year for the period 1995–1999 (13% of total water use for crop production) (Hoekstra and Hung, 2005).

In addition, the globalization process can increase water security by facilitating the worldwide implementation of better technologies and improved knowledge. At the same time, the natural resource base is increasingly threatened as, for example, global climate change and deforestation profoundly affect our ecosystems ability to provide us with sufficient and adequate fresh water. On a global scale, there are increasing efforts to set up global guidelines or policies with regard to fresh water, however, none of the international declarations and conference statements requires states to actual meet individual's water requirements.

## Global Health: A Priority for the International Agenda

Global health research addresses the ways in which globalization is impacting on both health determinants and outcomes (Lee, 2003). This is a rather new, but very exciting research field. The discussed framework provides valuable insights in how to organize the various factors involved in addressing global health. It clearly demonstrates that an integrated approach is needed, drawing upon the knowledge from relevant fields such as epidemiology, sociology, political sciences, (health) education, environmental sciences and economics. This will require integrated initiatives organized around the health challenges posed by globalization rather than around specific research disciplines or policy sectors.

Although further research is required, the international agenda urgently needs to reflect the reality that the globalization process is an increasingly important (contextual) health determinant. We need to step away from business-as-usual attitudes, sector-based solutions and short-term remedies. Looking at current international policy efforts and commitments, improving health worldwide is an important part of the United Nations Millennium Declaration (UN, 2000) and the associated *Millennium Development Goals* (MDG) to be reached by 2015. The recent MDG Report 2007 (UN, 2007) states that there has been a clear progress towards implementing the MDGs, but overall success is still far from assured. It is argued that rapid and large-scale progress is still feasible, but this will depend largely on whether developed countries fulfill their aid commitments. In the Millennium Declaration (UN, 2000), governments agreed that globalization should become a positive force for all. However, there is also a need to consider the diverse negative health effects of the globalization process. Hence, anticipating both the risks and opportunities provided by the globalization process should be a vital part of the international effort to achieve the MDG. Other examples of global initiatives that need to account for the health effect of globalization are Health for All (global strategy for health development advocated by the WHO) and Agenda 21 (the United Nations programme of action on sustainable development). The recent 'Global Health and Foreign Policy Initiative' explicitly addresses the health impacts of globalization. Under this initiative, Brazil, France, Indonesia, Norway, Senegal, South Africa, and Thailand issued the Oslo Ministerial Declaration in March 2007. In this statement they acknowledge that health as a foreign policy issue needs a stronger strategic focus on the international agenda (Anonymous, 2007).

Another approach that can be used to stress the importance of 'globalization and health' might be through the international human rights framework (Huynen and Martens, 2007). Under international human rights law, states have the legal obligation to respect, protect and fulfill human rights for all citizens. They have to ensure that their own policies do not impact negatively on the enjoyment of human rights in other countries, and that the activities of the international organizations of which they are a member are human rights-consistent (Smaller, 2005). The presented conceptual framework illustrates that achieving global health concerns not only the right to health, but also requires the

fulfillment of other important human rights upon which human health and well-being depend. Several important human rights issues mediate the pathways from globalization to health, such as the right to health care, food, water, and a healthy environment. In addition, the international community must stress the human rights obligations and responsibilities of both state and non-state actors (e.g. the WTO and trans-national corporations). Hence, the current debate about the pros and cons of globalization must recognize that the forces of globalization should be subject to moral and ethical considerations and should respect international legal standards and principles. A rights-based approach integrates the international human rights norms and principles into the plans, policies and processes of globalization. As such, we can use human rights to provide a framework for discussion and international cooperation concerning the right to 'a healthy globalization' for everyone.

To conclude, the call for a global approach to health becomes stronger and stronger. What this exactly means, however, remains unclear (Lee, 2003). Especially in the phase of issue- or problem-framing, the development of a conceptual model improves the integrated understanding of all key components and processes involved. As such, the developed framework could provide a useful contribution to the ongoing discussions on the health effects of globalization, and can help to stimulate scientists, governments and other stakeholders to take a more integrated approach towards global health in order to find ways to ensure good global health governance and good health for the (future) world population.

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## Abbreviations

| | |
|---|---|
| BHC | Benzene Hexachloride |
| BP | British Petroleum |
| BRIC | Brazil, Russia, India, China |
| CDC | Center for Disease Control and Prevention |
| CHS | Commission on Human Security |
| CNC-IHDP | Chinese National Committee for the International Human Dimensions |
| CNG | Compressed Natural Gas |
| COMAR | Comisión Mexicana de Atención a Refugiados (Mexican Comission on Refugee Attention) |
| CRIM | Centro Regional de Investigaciones Multidisciplinarias (Regional Center for Multidisciplinary Research) |
| CSE | Centre for Science and Environment |
| DDT | Dichloridiphenyl Trichloroethane |
| DRC | Development Research Center of the State Council |
| ECDC | European Centre for Disease Prevention and Control |
| ESSP | Earth System Science Partnership |
| FAO | Food and Agriculture Organization |
| FAOSTAT | Statistics from FAO |
| GDP | Gross Domestic Product |
| GEC | Global Environmental Change |
| GECHS | Global Environmental Change and Human Security |
| GEC&HH | Global Environmental Change and Human Health |
| GECAFS | Global Environmental Change and Food Systems |
| HUGE | Human, Gender and Environmental Security |
| IFAD | International Fund for Agricultural Development |
| IHDP | International Human Dimensions Programme on Global Environmental Change |
| IMR | Infant Mortality Rate |
| INEGI | Instituto Nacional de Estadística, Geografía e Informática (Mexican National Institute for Statistic, Geography and Information) |
| UNIFRAN | University of Franca, Brazil |
| IPCC | Intergovernmental Panel on Climate Change |
| IUFRO | International Union of Forest Research Organizations |
| MOA | Ministry of Agriculture |
| MOF | Ministry of Finance |
| MOH | Ministry of Health |
| NAO | National Audit Office |
| NBS | National Bureau of Statistics of China |
| NGOs | Non-governmental Organizations |
| NKGCF | German National Committee on Global Change Research |
| OASCA | Observatory on Health and Environmental Change |
| OECD | Organization of Economic Communities for Development |
| PAID | Project of Support for the Definitive Integration in the States of Campeche, Quintana Roo and Chiapas |
| PEPFAR | The President´s Emergency Plan for AIDS Relief |
| PM | Particulate Matter |

| | |
|---|---|
| SARS | Severe Acute Respiratory Syndrome |
| SD | Standard Deviation |
| SEPA | State Environmental Protection Administration of China |
| SES | Social-Ecological System |
| TVET | Technical and Vocational Education and Training |
| U5MR | Under Five Mortality Rate |
| UHI | Urban Heat Island |
| UMA | Unidad de Manejo Ambiental (Unity of Management for Wild Life Conservation) |
| UN | United Nations |
| UNAM | Universidad Nacional Autónoma de México (Nacional University of Mexico) |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environmental Programme |
| UNESCO | UN Education, Science, Cultural Organization |
| UNESCO-IHE | Institute for Water Education |
| UNFP | United Nations Population Fund |
| UNHCR | UN High Commission on Refugees |
| UNU | United Nations University |
| UNU-EHS | UNU – Institute for Environment and Human Security |
| USA | United States of America |
| USD | US Dollar |
| WDR | World Disaster Report (International Federation of the Red Cross and Red Crescent Society) |
| WFP | World Food Programme |
| WHO | World Health Organization |
| WTO | World Trade Organization |

## Notes

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whereby the major drivers like land degradation, desertification; natural hazard events; gradual man-made and natural environmental and climatic change and variability including water depletion and quality deterioration are considered. Preparedness, adaptation and response are the main dimensions along which human security can be strengthened.

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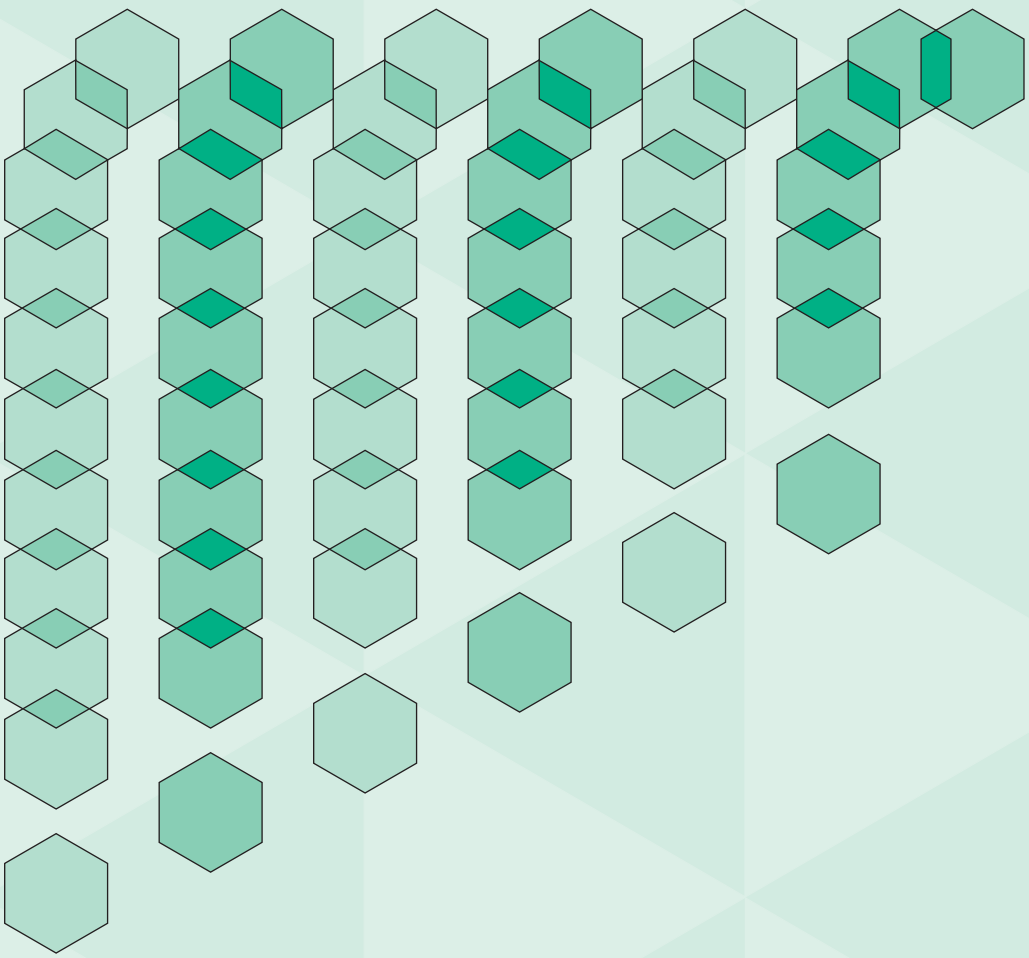

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