Building resilient communities through urban planning and the integration of Natural Sciences

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Meeting Report

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This report is based on the contributions of all workshop participants (Appendix)

Executive summary

Cities and human settlements face unprecedented challenges as urbanization rates continues to increase along with the exposure of vulnerable populations to hazards and risks, both in developed and emerging economies. It is therefore necessary to develop and implement urban planning tools and policies using knowledge available in natural science on hazards and risks. This requires bringing together the different stakeholders dealing with hazard and risk as well as with urban planning. That was the objective of the workshop organized by the Programme on Assessment and Management of Geological and Climate Related Risk - CERG-C of the University of Geneva and the Committee on Housing and Land Management from the United Nations Economic Commission for Europe (UNECE).

This workshop took place at the University of Geneva, on 13 January 2015 and gathered forty-five experts in hazard, vulnerability and risk assessment, urban planning and urban policies, including representatives of the governments of ECE countries, of the Joint Research Centre of the European Commission (JRC), of the Secretariat of the UNECE Environment Division, of UNHCR, of WHO, of WMO of GEO, of NGOs, of academia and of private sectors (see Appendix).

The workshop started with oral presentations on hazards to highlight the latest advancements and stimulate discussions on relevant topics, such as climate change and multi hazards in urban contexts, on impact assessments and spatial planning as well as on specific tools like the convention on transboundary effects of industrial accidents. It was followed by break-out sessions aiming at discussing three major issues, namely: 1) challenges in identifying main impacts of natural and human-induced hazards on cities and human settlements, 2) determination of type of hazard data and evaluation required by policy makers for a comprehensive and risk-sensitive urban planning, 3) identification of the main challenges associated with the integration of hazard maps within risk-sensitive urban planning. Participants agreed that:

1) Cities and human settlements face unprecedented challenges as urbanization rate continues to increase along with the exposure of vulnerable populations, both in developed and emerging economies. Indeed cities and human settlements are increasingly experiencing the impacts of natural hazards, such as flooding, rainfall, storm surges, coastal erosion, sea level rise, landslides, earthquakes, volcanic related hazards, cold and heat waves, and Climate Change related hazards; in addition also human-induced hazards can threat human security and well-being due to an inadequate location of critical facilities near human populations, e.g. power plants, chemical industries, mining facilities, and the trans-boundaries risks represented by the transportation of dangerous goods.
2) As addressing the reduction of risks is hampered by reduced interdisciplinary cooperation between natural scientists, policy-makers and urban planning disciplines joint efforts between different actors in the fields of hazards, risks and policy-making are critically needed for the reduction of human lives loss and economic losses before, during and after the occurrence of impacts on cities and human settlements.

Recommendations were also proposed at a) policy level, b) data sharing and c) integration of hazard data into policy making and urban planning.

INTRODUCTION

Natural and human-induced hazards strongly affect vulnerable populations, especially the urban poor. These hazards, along with the effects of climate change, are posing unprecedented challenges to cities and human settlements. The vulnerability of these hazard-prone regions is exacerbated by dense population in hazardous areas, environmental degradation, unsustainable use of water and natural resources, and poverty. Other factors include the increasing value of buildings, which deprives many social groups of adequate and affordable housing, lack of access to information, and deficiencies in urban planning and governance in emerging countries and cities. Many of these aspects can be prevented if governments develop and implement urban planning tools and policies using knowledge available in natural science on hazards and risks. However, in order to do so, data need to be available, readable and affordable. Moreover, scientists have a role to play in developing innovative tools for hazard assessment, where there are only few data available.

As a step towards bringing together the different stakeholders dealing with the issue of reducing the impact of hazards on housings, the Programme on Assessment and Management of Geological and Climate Related Risk - CERG-C of the University of Geneva and the Committee on Housing and Land Management from the United Nations Economic Commission for Europe jointly organized the Workshop *"Building resilient communities through urban planning and the integration of Natural Sciences",* held at the University of Geneva, on 13th of January 2015, counting on the active participation of policy makers, scientists and professionals from different disciplines of the fields of hazards, risks, natural sciences, social sciences, architecture, urban planning and land management from more than twelve nationalities (see Appendix).

The overall aim of the workshop was to discuss the integration of Natural Science data and research into the development of comprehensive natural disaster-risk mitigation strategies for cities and human settlements, and it specifically addressed the following objectives:

1. identification of the main impacts of natural and human-induced hazards on cities and human settlements
2. determination of the types of hazard data and assessments required by policymakers to draft comprehensive and risk-sensitive urban planning strategies
3. identification of the main challenges in integrating Natural Science information with urban planning

This consensual document combines the outcomes of the breakout sessions and plenary discussions focused around the main objectives of the Workshop described above and aims at providing the basis for the integration of hazards, risks analysis and Natural Sciences into policy making for cities and human settlements of the most vulnerable countries and cities. It also provides recommendations for a better integration of disciplines and a better understanding of roles of actors involved in the reduction of risks of urban populations towards hazards and disasters.

Key points raised during the break-out sessions and plenary discussion include:

1. CHALLENGES IN THE IDENTIFICATION OF MAIN IMPACTS ON CITIES AND HUMAN SETTLEMENTS

- There is a need of identifying impacts from natural phenomena and human-induced activities on population health, covering both psychological and physical effects.
- It is important to address feeling of security and how the lack of it affects well-being and health.
- There is a predominance of physical damage assessment over systemic assessment.
- The identification of windows of opportunities is critical for changing regulations.
- There is an insufficient understanding of secondary impacts and their time frame. Indeed infrastructure damage could over days, weeks or months have a larger health and economic impact than the event itself. This requests to find a way to facilitate understanding for decision makers on how direct impacts are a proxy of other associated impacts

2. TYPE OF HAZARD AND VULNERABILITY DATA AND EVALUATION REQUIRED BY POLICY MAKERS FOR A COMPREHENSIVE AND RISK-SENSITIVE URBAN PLANNING

- Decision makers need aggregated and comprehensive risk data to allocate measures, but disaggregated hazard assessments are useful for urban planners.
- Simplified data is needed for rapid response of decision makers.
- Risk maps need to include the development of future settlements while disaggregated hazard and vulnerability data are needed for existing settlements
- There is uncertainty about the time frame of the projection of hazards for long-return scenarios. The longer the period of the projection, the larger the error
- Data formats vary, between paper or digital, and static or dynamic and the question remains on what is more appropriate and useful, for which categories of users, for which time frame and at which conditions
- GIS and modelling are tools that can support planning decisions
- Hazard assessments should consider chain effects on human settlements
- There is a need to agree on units of analysis
- Identify relevant actors that can provide hazard and vulnerability data according to their disciplines
- It is important that secure data and open access of hazard and vulnerability data is available to the public, government in different scales and other stakeholders.
- Interagency collaboration is needed for the delivery of hazard data to the responsible body and agency
- Challenges to overcome in data sharing for decision making concerns the type of approach (deterministic vs probabilistic), the type of data (aggregated vs disaggregated), the type of analysis (qualitative vs quantitative) and the type of expected outcome (remediation vs new development)

3. MAIN CHALLENGES ASSOCIATED WITH THE INTEGRATION OF HAZARD AND VULNERABILITY DATA WITHIN RISK-SENSITIVE URBAN PLANNING

Main challenges identified, associated with the integration of hazard and vulnerability data within risk-sensitive urban planning, are:

a) Understanding acceptable risk

- There is a need of long term cooperation addressing aleatory and epistemic uncertainties at local level. Aleatory uncertainty cannot be reduced while epistemic uncertainty can be reduced to certain levels. Policy makers need to decide the level of accepted risk in cooperation with other stakeholders in order to improve the understanding of risk and overcome differences of acceptable levels from country to country.
- Acceptable risks are difficult to define because they depend on societal and political decisions.
- Risk is a process characterized by warning signals in some hazards which makes them predictable in some instances while it is impossible in others, making it difficult for policy makers to make decisions at the right moment.
- Risks are treated differently based on their reoccurrence period. For probabilistic scenario of hazards, it is difficult to calculate different risks without having a lot of uncertainties
- Hazard maps do not take into consideration all aspects of the processes taking place in a specific areas: e.g. the different vegetation types in different locations; additionally, built environment in the city is different, thus scale should be considered on the projections of scenarios for different portions of the city and the suburbs

b) Defining the role of different actors

- Land use planning integrating natural hazard and risk is a major challenge because the degree of implementation and understanding differ from country to country
- Social aspects are complex to integrate within natural sciences approaches, representing a challenge for the implementation of risk reduction measures and understanding between scientists and policy makers
- There is a need to define the role of different actors to improve mutual understanding between science community and policy makers in the implementation of decisions
- Local populations or its elected representatives, should be the ones to define priorities and decide on the terms needed for implementation
- Different hazards have different time scales, representing a major challenge; on many occasions the local administration is not interested in the natural phenomena occurring in their area as the time occurrence is larger than their mandate.
- It is difficult to identify roles of different actors, especially in cases where hazards are less frequent with no monitoring system put in place. Would it be preferable that scientists are in charge of informing about hazards because local administrators have limited time ?The role of scientists is to continuously inform the government on the state of natural hazards
- Scientists should not wait on the society to feel concerned about hazards, because hazards occur spontaneously. There is a need for interdisciplinary action to reduce the breach existing between scientists and government

- There is a lack of global methodology in the production of hazard maps. It requires to harmonise the procedure for hazard assessment at regional level as it exists for example in earthquake assessments
- Requirement for harmonization in building codes used. Problem in implementation in various countries.
- Lack of funding to implement codes and regulations
- Existing building codes are not a guarantee of "zero" risk, since they advocate building strategy to avoid buildings collapse, except for special buildings (hospitals, schools, dams, etc.), which must be able to resist entirely; thus protecting people requests a combination of measures (e.g. good construction, getting ready for the occurrence of an hazard) to live with risks.
- Need for awareness and education on most hazards e.g. floods, volcanic eruption, heat waves, sea level rise in order to be able to deal with these hazards; in Europe, for instance, there is a legislative framework on the assessment and management of flood risks requiring member states to map the flood extend and the assets at risk, and to give access to the information and to the planning process to the population.
- Mainstream the identification of hazardous areas in urban planning
- Identifying hazards today is a challenge in different countries
- Few scientist involved in hazard studies, thus limiting existing information
- Migrating and moving populations most often misunderstand the risks presence which highlights the need for education
- Tourists should also be taken into consideration in the education process; use of billboards; however, perception of risk is more difficult to achieve especially with tourists; risk perception is important to be emphasized all over the globe after every major disaster to increase perception

c) Time scale between planning (long term) and geophysical monitoring

- Short time lapse for action of civil authorities after the provision of satellite image before, during and after crisis. However planning requires long term initiatives and a longer time frame than emergencies
- Very little efforts on planning for risks on urban areas in the long term. In earthquakes prone areas, for instance, some planning is taken into account prior the occurrence of events by using building codes, however in many places they are not put into force even though they are existent.
- In some countries, industrial zones are subjected to geological suitability criteria, like considering previous occurrence of hazards such as earthquakes in the region; however, planners are the ones to take the final decision; in urban planning different groups put different pressures, thus in reality it is not often enforced
- Comprehensive risk management is difficult to handle.

d) Planning and development:

- Integrating hazard in planning through sustainable development and the improvement of quality of life (e.g. turning risk mitigation strategies into positive aspects of economic systems)

e) Economic responsibility

- Distribution of responsibility between different actors e.g. governments, the private sector and the civil society

f) Transparency of data

- Some information on existing scientific data is hold back; however this is a sensitive area because of data uncertainty
- Questionable level of transparency, access and quality of satellite data
- Some risk data should be transparent, open and accessible to the public even at corporative level (e.g. insurance companies)

g) Decision making process

- Money allocation to the elaboration of hazard analysis and risk reduction strategies
- Quantification of environmental, human, psychological, emotional and other qualitative aspects
- Communicating uncertainty in decision making and the definition of levels of acceptable risk
- Financial cost and time frame require to reduce uncertainties in hazard assessment
- Limited use of planning tools such as structural, land use planning and zoning
- Inclusion of hazards in environmental impact assessments to improve risk sensitive urban planning
- Hazard mapping needs to project possible dynamic changes on vulnerability and other factors
- A structural lack of information
- Foreseeing events with incomplete data
- Changing dynamics, time scale of certain impacts and return periods
- Excessive trend for standardization
- Addressing processes behind safe land use planning
- Limited interagency and stakeholder collaboration
- Corruption in some local authorities
- Education of architects and planners towards risk sensitive urban planning
- Development of risk reduction guidelines for urban planning and other disciplines
- Involvement of population in land use planning processes making them aware of existing risks

RECOMMENDATIONS

Recommendations were provided for three main issues:

A. Policy level strategy

1. promote projects at both national and regional levels to reduce epistemic uncertainty in hazard assessment
2. Integration of hazard and vulnerability data within risk sensitive urban planning should move from the scientific community to the local administrators because they have more knowledge on the functioning of their respective localities and regions

3. While local communities may lack of expertise, governments should be the responsible parties and create a specific institution to take care of the problems
4. Scientists should be in charge of monitoring systems because local administrators have limited time in power; scientists can be invited by the community to present results but not to give advice
5. UN should encourage governments to mainstream hazards analysis in urban planning
6. Existing efforts to harmonise existing codes should be supported with legal instruments
7. Mitigation measures should be associated with some level of education and not just the use of building codes and regulations that people may not understand

B. Data sharing on hazard, vulnerability and risk

8. Promote a secure data sharing process and open access of hazard and vulnerability data to the public, government in different scales and other stakeholders
9. Consider monetary value in data analysis
10. Better integrate health and economic consequences of urban risks and potential disasters in urban planning, resilience and response strategies
11. Address the issues of data accuracy, cost, scales, unit differences and format
12. Promote an integrated hazard and risk assessment modelling
13. Encourage the application of new tools to help communities to rank valuable aspects
14. Project estimation of potential impacts in larger scales to facilitate decision making.
15. Build up local capacities to take care of persons potentially displaced by urban disaster events.

C. Integration of hazard data in policy making and urban planning

16. Avoid over-protective measure that could lead to inverse effects, like illegal buildings.
17. Combination of early warning and adaptation strategies should be prioritized in certain circumstances
18. Focus more at the process and performance for safe land-use planning, instead of standardizing everything

Appendix: list of participants

Name	Country	Institution	Title/Division
Government representation			
Mr. Matthew ZAMMIT	Malta	Government of Malta	Secretariat Officer, Parliamentary Secretariat for Planning and Simplification of Administrative Processes
Ms. Caroline BROUN	USA	U.S. Mission to the United Nations in Geneva	Environment/Climate, Science and Technology Officer Economic and Science Affairs
Ms. Ali JAFAROV	Azerbaijan	The state commitee of land and cartography	Head of the cadastre department
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Ms. Amie FIGUEIREDO	Switzerland	UNECE	Associate Economic Officer, Housing and Land Management Unit
Mr. Marco KEINER	Switzerland	UNECE	Director, Environment Division
Mr. Noel SAMPSON	Switzerland	UNECE	Housing and Land Management
Mr. Michele MELCHIORRI	Italy	UNECE	Consultant, Housing and Land Management
Mr. Andrew CUSACK	Switzerland	Global CCCM Cluster, UNHCR	Global CCCM Rapid Response Team Officer
Ms. Ana Maria CASTILLO	Switzerland	UNISDR	Programme Officer
Mr. Giacomo TERUGGI	Switzerland	World Meteorological Organization (WMO)	Project Officer, Associated Program on Flood Management (APFM) and Integrated Drought Management Programme (IDMP). Climate and Water Department
Mr Andre OBREGON	Switzerland	GEO - Group on Earth observation	Scientific and Technical Officer for Disasters

Ms. Yvette RAMOS	Switzerland	INWES- International Network of Women Engineers & Scientists	managing director
Mr. Nidal SALIM	Switzerland	Global Institute for Water, Environment and Health (GIWEH)	Director General
Ms. Kimberly MCLEOD	Switzerland	Global Institute for Water, Environment and Health (GIWEH)	Programme Manager
Dr. Tom CORSELLIS (HoD)	Switzerland	Shelter Centre	Director
Mr. Matthias BRAUBACH	Germany	World Health Organization (WHO)	Technical Officer, Housing and Urban Planning
Dr Robert BISHOP	Switzerland	ICES foundation	President and founder
Mr. Ferruccio FAVARON	Italy	Council of Architects, Planners, Landscapers and Curators (CNAPPC)	Chair, Department of Urban and Territorial Policies
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Dr. Irene MANZELLA	Switzerland	University of Geneva	Senior Researcher
Mr. Jan RIES	Switzerland	University of Geneva	Research Assistant, Institute for Environmental Sciences
Dr. Franco ROMERIO	Switzerland	University of Geneva	Professor
Mr. DUSAN ZUPKA	Switzerland	University of Geneva. Centre for Education and Research in Humanitarian Action (CERAH)	Coordinator, Disaster Risk Management
Mr. Blaise DUVERNAY	Switzerland	Federal Office for the Environment	Head of earthquake risk mitigation
Mme Elena SHLYAPINA	Switzerland	Institute of environmental science, University of Geneva	Research and teaching assistant

Dr Haris KONTOES	Greece	National observatory of Athens	Research director of NOA
Mr. Venkata Narayanan AEKBOTE	France	UPMF-Grenoble , UFR Institut d'Urbanisme	Researcher
Ms. Adha Montpelierina VIALA	Germany	Technische Universität Darmstadt	Student - Mundus Urbano
Mr Nebojša ČAMPRAG (Dr)	Germany	Technische Universität Darmstadt	Dr.-Ing TUD / urban planning and resilience
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Private sector and independent experts			
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Speakers			
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