Understanding disasters from a local perspective: insights into improving assistance for social housing and settlement development

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Understanding Disasters from a Local Perspective

Insights into Improving Assistance for Social Housing and Settlement Development

Christine Wamsler

Die Schäden der weltweit ansteigenden Naturkatastrophen sind erschütternd. Marginale Armensiedlungen in Entwicklungsländern sind gegenüber diesen Naturkatastrophen am anfälligsten und somit am stärksten betroffen. Der vorliegende Artikel untersucht im Detail die dem Katastrophenrisiko und –vorkommen in Slums zugrundeliegenden Hauptvariablen und deren kausale Beziehungen, zu deren Analyse sogenannte „causal loop diagrams" herangezogen werden. Die Sicht und das Wissen von Slumsiedlern in El Salvador stehen im Fokus dieser Untersuchung. Ein besseres Verstehen dessen, wie betroffene Familien Katastrophenrisiko und -vorkommen wahrnehmen und erfahren, gibt wichtige Einblicke, welche für die Verbesserung von Entwicklungshilfe — einschließlich sozialen Wohnungsbaus und Stadtplanung — von entscheidender Bedeutung sind.

The damage caused by the worldwide increase in natural disasters is staggering, with the poor and marginalised slum communities being the most vulnerable. This paper analyses the key variables and their causal relations underlying the complex system of risk and disaster occurrence in slum areas in El Salvador. Slum dwellers' views and knowledge are the focus of this inquiry. A better understanding of what households perceive, experience, and hence need in order to deal with risk and disasters can yield important insights into how to improve reconstruction and development aid, including assistance for social housing and settlement development. Causal loop diagrams, one of the main tools of systems analysis, is presented as an instrument that can help aid organisations in this process.

Background

Over the past decades, the frequency of so-called natural disasters has increased worldwide, resulting in growing human and economic losses. In 2005 alone, over 360 disasters were reported, with around 92,000 people being killed, another 160 million suffering adverse impacts, and direct material losses of about US $ 160 billion (UNISDR, 2006). Developing countries bear the highest losses in terms of human lives and gross domestic product (GDP), and El Salvador is no exception to this. On the contrary, being located in one of the most disaster-prone regions in the world, the country is strongly affected by natural disasters (Lavell, 1994).

Slum dwellers are particularly vulnerable to natural disasters. Low-income human settlements are often located on marginal land near rivers or on steep slopes; housing and infrastructure are substandard and thus less disaster-resistant. Among other problems are leaking sewage pipes from better-off settlements passing through slum areas to discharge into nearby rivers, a lack of water and waste management services, limited access to information, and overcrowding. Currently, more than one billion people worldwide live in slums and are forced to accept inhuman and dangerous living conditions. It is estimated that their numbers will double over the next 24 years (UN-HABITAT, 2003).

During recent years, increasing attention has been given to the need to reduce disaster risk[1] within the context of development work. The stated aim of the Millennium Declaration, namely, to achieve a significant improvement in the lives of at least 100 million slum dwellers by 2020, alludes to this need;[2] and the Hyogo Framework for Action 2005–2015 urges governments to address the issue of disaster risk in their sector development planning and programmes (UNISDR, 2005). However, aid organisations working in human settlement development in the field still struggle to sustainably reduce existing disaster risk in their everyday work.

A better understanding of the underlying drivers of risk and disaster occurrence in slums is a first urgent step towards improving the situation described.

Objectives and Methodology

This paper is based on case studies carried out at the household level in El Salvador in 2005/2006.[3] Its objective is to investigate, from a local perspective, the existing disaster risk, the related causes and impacts, and the resulting local needs. The main focus is on analysing the key variables — and their

1
Risk is defined as: "The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. Conventionally, risk is expressed by Risk = Hazards x Vulnerability." See http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm. Risk reduction has become a popular term used to bring together those measures to minimise disaster risk throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards within the broad context of sustainable development. It is also a component of successful reconstruction.

2
www.unmillenniuproject.org

3
The case studies were carried out within the framework of a broader research study on managing urban disasters which was initiated by the author in 2003. The outcomes so far are summarised in several publications (Wamsler 2007; 2006a,b,c; 2004).

causal relations — that underlie the complex system of risk and disaster occurrence in slum areas. Slum dwellers' views and their extensive knowledge as to what makes them vulnerable or resilient to natural disasters are presented. The outcomes provide an understanding of what households perceive, experience, and hence need in order to deal with disaster risk and disaster impacts. This yields important insights into how social housing assistance could be improved.

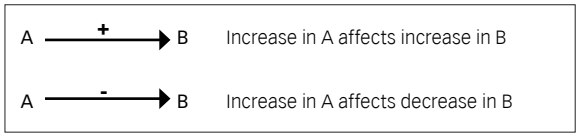
The research included observation, walk-through-analyses and interviews with 62 households, comprising a total of 331 persons, living in 15 disaster-prone slum communities.[4] For the data analysis, a combination of grounded theory (Glaser and Strauss, 1967) and systems analysis (Haraldsson, 2004) was applied.

In the following, analyses of the current situation in El Salvador will be presented, providing a "snapshot" from the household level of the selected slum communities. Discussed are, firstly, the significance of disaster occurrence, secondly, its underlying drivers, and thirdly, its impacts on slum dwellers. Finally, general conclusions are drawn regarding the needs and possible conditions that could assist in improving aid organisations' social housing assistance to effectively and sustainably manage risk and disasters.

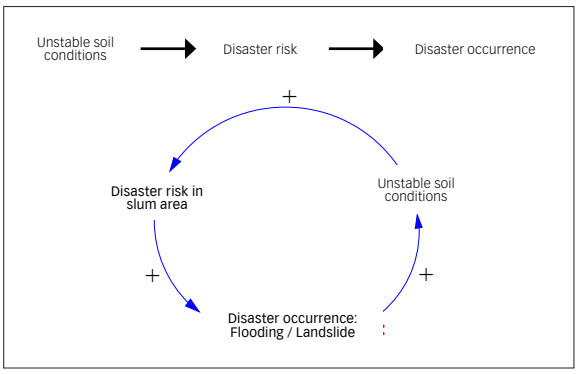
Understanding Risk and Disaster Occurrence in Slums

In the slums analysed, flooding and landslides affect many slum dwellers, not only sporadically but annually, usually during the winter period. These were generally seen as the main risk to lives and livelihoods. Earthquakes and windstorms were next in importance. The lack of job opportunities and water provision, and the insecurity due to violent juvenile gangs (*maras*) were also seen as substantial "risks".[5]

Causal loop diagrams, one of the main tools of systems analysis, were used to develop illustrative models of the key variables and their causal relations that influence risk and disaster occurrence in slums.[6] A causal relation between two variables is portrayed by an arrow with a plus (+) or minus (-). As shown in *Figure 1*, a plus (+) or minus (-) indicates the type of change that occurs if variable **A**, at the beginning of the arrow, increases: A positive symbol (+) shows that the increase in variable **A** affects the increase in **B**. However, a negative symbol (-) means that the increase in **A** results in a decrease in **B**.



▲ fig 1: Illustration of positive or negative causal relations between two variables

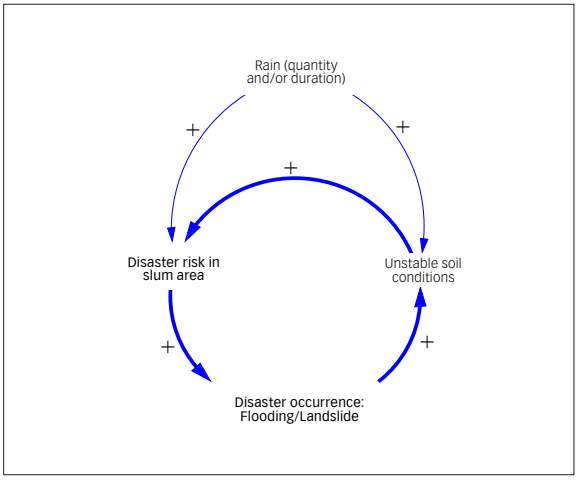


◀ fig 2: Flow diagram and corresponding causal loop diagram

The inclusion of non-linear relationships is one of the most important advantages of causal loop diagrams compared to conventional models, such as flow charts. Causal loop diagrams usually have at least one closed loop, representing feedback. *Reinforcing feedback loops* are circular relations between various variables, which are all connected with arrows going in the same direction (see *fig 2*). These loops could create a vicious circle and can be highlighted through the use of bold arrows.

When slum dwellers were asked about the underlying drivers of risk and disaster occurrence, the primary response of most referred to natural drivers (i.e., weather [rain] and soil conditions). *Figure 3* illustrates how the identified key variables "rain" and "unstable soil conditions" relate to risk and disaster occurrence. As can be seen, an increase in the amount of rain or in its duration could increase disaster risk and hence the occurrence of flooding and landslides.[7] In turn, flooding and landslides can make unstable soil conditions worse, resulting in a further exacerbation of disaster risk. In addition, more rainfall further destabilises unstable soil conditions, which again influences the occurrence of risk and disaster (see *fig 3*).

Upon probing, the majority of the interviewees knew of at least some other factors that increase their vulnerability. In fact, apart from natural drivers, it was possible to identify space-related, infrastructure-related, socioeconomic, organisational and institutional drivers.[8]



◀ fig 3: Natural key variables underlying risk and disaster occurrence

4
The communities analysed are: La Chacra; Llanos de la Charcra; Quiñones Privado; Quiñones Municipal; San Martín Privado; San Martín Municipal; Casitas del Coro, Coro Nuevo; San Luis Portales, Bolívar, Granjero II and Nueva Esperanza (making up the slum area called "Los Manantiales, situated in San Salvador), José Cecilio del Valle and Divina Providencia (also situated in San Salvador); and Refugio (situated in and made up of people from the slums of the Bálsamo region).

5
For more information on juvenile gangs in El Salvador see Kotowski (2005).

6
The computer programme Vensim© was used to support the creation of the diagrams/models. These models can be used as a basis for computer simulations. See www.vensim.com.

7
Note that the relation between disaster risk and disaster occurrence is definitional. However, it is important to illustrate the variables separately in order to show causal loops as affected by disaster occurrence (i.e., not by disaster risk).

8
Note that there is a range of variables that are inherent of different sub-diagrams and interconnect the different thematic loops. Those interconnecting variables are only partially included in the following figures.

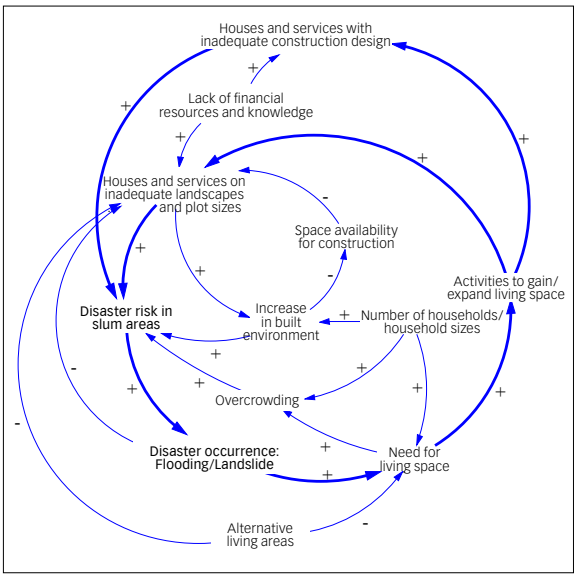
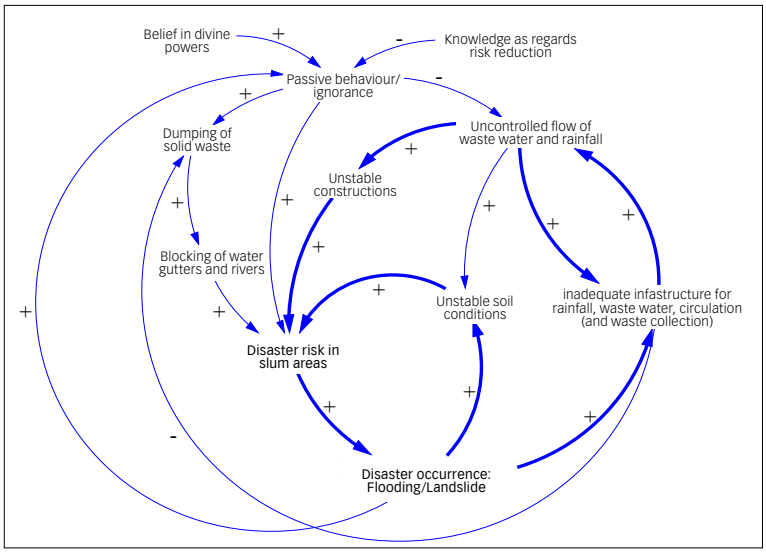


fig 4. Space-related key variables underlying risk and disaster occurrence

Space-related drivers. Interviewees reported on residents' different strategies to gain and expand their living space to cope not only with the growing number and size of slum households but also with the lack of alternative living areas. Strategies included neighbours downhill felling trees or excavating the slopes below their houses; neighbours uphill building latrines close to the declivity; and other residents claiming land from nearby rivers. As illustrated in *Figure 4*, a vicious circle could develop, with the increasing need for living space encouraging people to expand their living areas. Under slum conditions, this could result in unsuitable buildings and services being constructed in inadequate locations and on too-small plots. This is related to a lack of financial resources, knowledge, and available space for mitigation works. The outcome can be increased disaster risk and hence floods and landslides, which in turn affects the need for living space (due to loss of housing and land). Moreover, an increasing built environment (in terms of space and density) and overcrowding foster disaster risk. *Figure 4* portrays the related key variables.

Infrastructure-related drivers.[9] Lack of adequate infrastructure (for waste collection, pedestrian and vehicle circulation, rain and waste water) was another key variable identified. Slum dwellers reported on neighbours uphill allowing waste and storm water to flow on to their land, and people from inside and outside the settlement tipping solid waste down their hills or into the nearby rivers. Insufficient knowledge about how to reduce existing risk and the conventional belief that disasters are purely "divinely driven" may — together with a range of other needs — foster such behaviour. Blockage of water gutters and river flows, as well as unstable constructions, such as pathways and housing, are the outcome. *Figure 5* illustrates related key variables and causal relations.

fig 5: Infrastructure-related key variables underlying risk and disaster occurrence



Socioeconomic (and organisational) drivers. The lack of financial resources due, among other things, to unemployment and low income levels, was mentioned frequently as one of the underlying causes of risk and disaster occurrence. The research indicated that a lack of financial resources, apart from its more obvious influence on the quality of housing and infrastructure and on people's ability to absorb disaster impacts, further influences individuals' community engagement (see *fig 6)*. In fact, as people need to work at several jobs and take care of family members (e.g., children and the elderly), they have little time available for community efforts to reduce risk. Furthermore, better-off household members opt out of community involvement, which can have a negative effect not only on social cohesion but on the disaster resilience of the entire community. A general mistrust of community cohesion and the local community organisation was also identified. This was related, among other things, to corruption, co-optation, and political factionalism.

Figure 6 highlights a vicious circle that could develop: Disaster affects people's already poor financial situation through, for instance, reduced income and additional expenses for reconstruction. Hence, increased disaster occurrence can result in an increased lack of financial resources.[10] This, in turn, increases people's disaster risk, and hence flooding and landslides are more likely to occur.

Institutional drivers. Lack of or inadequate outside help was further mentioned by slum dwellers. In fact, national and municipal governments were often seen as unhelpful, and even a hindrance, to slum dwellers' efforts to improve their situation. The actions taken by planning authorities and the information obtained by them with respect to the development and legalisation of planned settlements were often viewed as contradictory and unreliable. Further outside help was seen as crucial for, among other things, easing people away from passive behaviour.

The incremental improvement of housing and infrastructure in slums, which reduces disaster risk, is generally supported by governmental and non-governmental organisations, religious institutions

9
Note that in all thematic causal loop diagrams presented, some influencing variables from other thematic groups are also included. For instance, in *Figure 4*, "number of households/ household sizes" is a socioeconomic factor. However, as it has an important influence on space-related aspects, it was included in this diagram.

10
In addition, disasters could increase the differences in the levels of residents' financial resources.

and political parties. Unequal distribution of such support was identified as being related to the level of community organisation, levels of corruption, and slum dwellers' individual relationships with the organisations mentioned. *Figure 7*, which summarises the institutional key variables, further shows that insecure tenure as well as promises of outside help being unfulfilled, can result in passive behaviour on the part of slum dwellers; that is, a general unwillingness to invest in reducing risk.

In the slum communities analysed, there was not only little sense of the mutual rights and obligations related to the settlements' maintenance and development (e.g., forbidding excavation of the slopes below houses or the construction of latrines close to declivities), but also a lack of information on risk reduction. Thus, the asymmetric disaster risk that the inhabitants incur is strong and rising, increasing tension among neighbours.

Understanding Disaster Impacts

Within the slums analysed, the key variables and causal loops identified result in the regular and presumably increasing occurrence of natural disasters. As shown in *Figures 3–7*, disasters subsequently have a negative impact on some of the key variables. Disaster impacts often have long-lasting negative effects on slum dwellers' livelihoods as well as on the development of their settlements. The information obtained by slum dwellers suggests that disaster impacts can be classified as immediate and delayed, as well as short- and long-lived:

a. *Immediate and short-lived:* Examples are electricity failures; temporary evacuations or resettlements; blocked accesses to houses or settlements; community distress; and psychological shocks.
b. *Immediate and long-lasting:* Examples are destruction of or damage to housing, infrastructure, household and vegetation; loss of land and personal belongings; modification of the landscape; deaths; and traumas.
c. *Delayed and short-lived*: Examples are secondary hazards, such as landslides during "normal" rain or through waste water flows due to soil instability and erosion caused by disasters; burglaries due to damaged houses; and reduced incomes.
d. *Delayed and long-lasting:* Examples are illnesses caused, for instance, by waste water entering houses; accidents due to insecure pathways; family disruptions due to a permanent move of children to other family members; contamination of the environment as a result of the plastic sheets used for protecting slopes from rain being blown away; and reduced support (e.g., legalisation of land) by planning authorities due to increased and unacceptable risk levels.

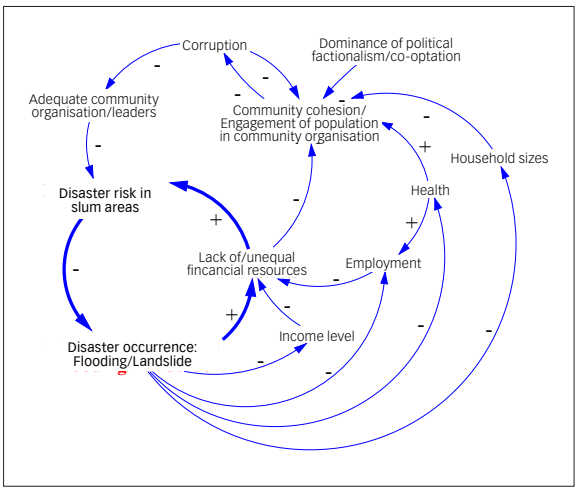


fig 6: Socioeconomic (and organisational) key variables underlying risk and disaster occurrence

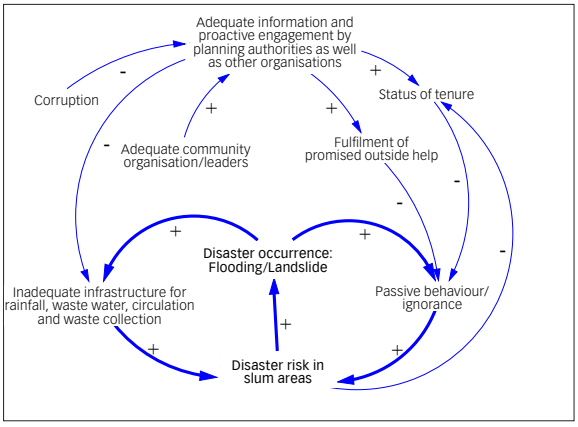


fig 7: Institutional key variables underlying risk and disaster occurrence

As with the key variables underlying risk and disaster occurrence, the impacts can also be classified as:

- Natural (environmental),
- Space- and infrastructure-related (physical),
- Socioeconomic and organisational,
- Institutional.

fig 8: Location of a slum community on marginal land and steep slopes

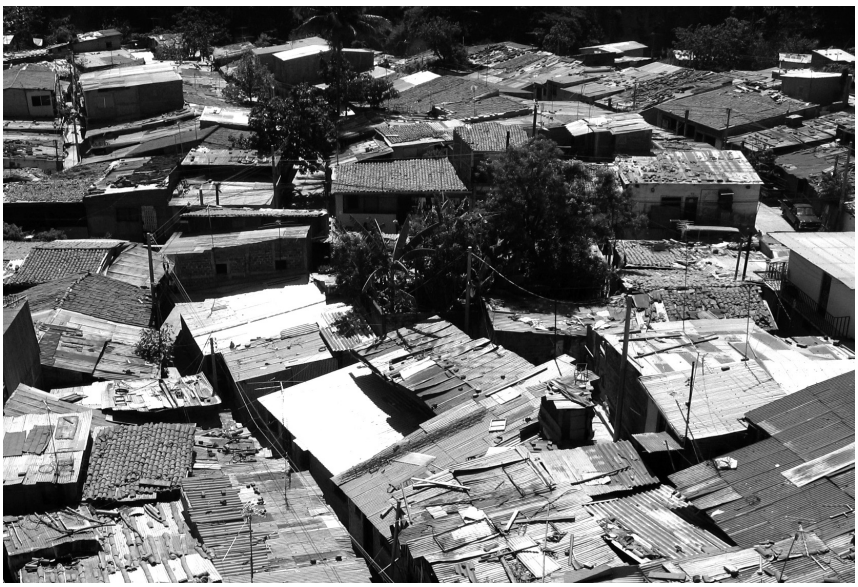


fig 9: Slum community in San Salvador

Conclusions

The paper discusses — from a local perspective — key variables and causal loops underlying the complex system of risk and disaster occurrence in selected communities in El Salvador. It provides a comprehensive "snapshot" of what drives risk and disaster occurrence in slums. This new "vision" may provide fresh input into ongoing discussions which currently deal with the issue only in terms of location and construction quality — aspects that are seemingly "solved" simply through post-disaster resettlement. The paper shows that disasters are the outcome of a non-linear development process, with the key variables and disaster occurrence reinforcing each other. Disasters make the already precarious conditions of slum dwellers worse, creating vicious circles of increasing risk. "Poverty traps" can be the outcome. Assistance provided for social housing and settlement development could counteract such developments.

Causal loop diagrams, a tool of systems analysis, can help to provide an understanding of local contexts, perspectives and needs, and also assist in analysing the effectiveness of people's interrelated efforts to cope with risk and disaster occurrence.[11] This knowledge, which contributes to a better understanding of the conditions and conditionality for effective and sustainable project implementation, is crucial for development aid organisations that service slum communities, as they often do not have such information at their disposal and seldom carry out related analyses.

The research outcomes, illustrated in causal loop diagrams, confirm the respondents' views that improved housing and infrastructure in situ are crucial if physical/structural vulnerabilities are to be reduced. However, because of the complex system of risk and disaster occurrence, such improvements are not enough to achieve the sustainable security of slum dwellers' habitat, lives and livelihoods. The analysis supports the accepted view that an integrated perspective regarding disaster risk management is necessary to achieve sustainable risk reduction. Hence, integrating disaster risk management into social housing assistance has to combine purely physical/structural improvements with environmental, socioeconomic , organisational and institutional risk reduction. The use of causal loop diagrams can help to develop and validate concrete and slum-specific project measures. For instance, only local efforts to cope with risk and disaster occurrence that, in effect, tackle the key variables and causal loops identified in a sustainable way should be supported by aid organisations. In addition, the study indicates that, to be sustainable, projects need to consider the improvement of social relations within slum communities, as well as the trust of these communities in national, municipal and local authorities. This could be achieved, for example, through improved communication structures, the creation of community rights and obligations, the offer of *communitarian and individual* project measures for risk reduction, professional education in disaster-resistant construction, and training both in risk awareness and in the repair and maintenance of community infrastructure.

11
The slum dwellers' coping strategies were analysed in detail and are presented in Wamsler (2007).

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References

Glaser, Barney G. and Anselm L. Strauss (1967), *The Discovery of Grounded Theory – Strategies for Qualitative Research*, Aldine Publishing Company, Chicago.

Haraldsson, Hördur V. (2004), *Introduction to System Thinking and Causal Loop Diagrams, Reports in Ecology and Environmental Engineering 2004:1*, Institute of Chemical Engineering, Lund University.

Kotowski, Joanna (2005), "Das Phänomen der Jugendgewalt in El Salvador: Jugendbanden in El Salvador, Integrationsansätze im Rahmen von Stadtteilsanierung", *TRIALOG 4/2005*, pp. 4-11.

Lavell, Allan (1994), "Prevention and Mitigation of Disasters in Central America: Vulnerability to Disasters at the Local Level", in Varley, Ann (editor), *Disasters, Development and Environment*, Wiley, Chichester, pp. 49-64.

UNDP (2004), *Reducing Disaster Risk: A Challenge for Development*, UNDP, New York.

UN-HABITAT (2003), *The Challenge of Slums, Global report on human settlements*, Earthscan, London.

UNISDR (2006), *Disaster Statistics 1991-2005.* www.unisdr.org/disaster-statistics/introduction.htm (accessed 07.06.2006).

UNISDR (2005), *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters.* www.unisdr.org/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf (accessed 05.06.2006).

Wamsler, Christine (2007), "Bridging the Gaps: Stakeholder-based Strategies for Risk Reduction and Financing for the Urban Poor", *Environment and Urbanization*, April 2007 special issue on "Reducing risks from disasters in cities".

Wamsler, Christine (2006a), "Mainstreaming Risk Reduction in Urban Planning and Housing: A Challenge for International Aid Organisations", *Disasters 30(2) 2006*, pp. 151-177.

Wamsler, Christine (2006b), *Operational Framework for Integrating Risk Reduction for Aid Organisations Working in Human Settlement Development*, BHRC-HDM Working Paper No. 14, February 2006.

Wamsler, Christine (2006c), "Integrating Risk Reduction, Urban Planning and Housing: Lessons from El Salvador", *OHI 31(1) 2006*, pp. 71-83.

Wamsler, Christine (2004), "Managing Urban Risk: Perceptions of Housing and Planning as a Tool for Reducing Disaster Risk", *GBER 4(2) 2004*, pp. 11-28.