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# **Training Regions**

*Research and innovation for safety, security and sustainability of cities and regions*

**Research Strategy 2011-2013**

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### Training Regions Research Centre

#### Mission

To promote safety, security and sustainability of cities and regions by providing the 'Training Regions' members and the wider world with new research based knowledge, processes, methods and tools, and by supporting initiatives that apply these outputs in practice.

#### Vision

To become a world-renowned transdisciplinary centre for research and innovation for safety, security and sustainability of cities and regions that bridge the gap between theory and practice.

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## Summary

Our world is changing and cities and regions are increasingly understood not only as places, but also as vital hubs in national and global networks, through which people, capital, goods and services flow to ensure the functioning of society, as we know it. People and capital are increasingly concentrated in these hubs, which aside of positive effects on efficiency also is associated with challenges for safety, security and sustainability.

Training Regions is a public-private partnership to promote resilient cities and regions. It is a triple helix formation in which governmental authorities, private companies and universities collaborate for reaching the objectives of their respective sphere. Its focus is on Training, in its widest sense, including all types of activities supporting the development of capacities of cities and regions to protect the well-being of their citizens and to maintain critical societal functions. This by ensuring effective and efficient flows of people, capital, goods and services, regardless of disturbance or disruption, now and in the future.

Training Regions is promoting safety, security and sustainability partly by contributing to meet the needs for new research based knowledge, processes, methods and tools to address these key challenges. It includes an independent transdisciplinary centre for research and innovation, hosted by Lund University. The research and open innovation activities at Training Regions is structured in four mutually supporting programmes, all of which with considerable overlaps between each other:

1. **Critical Flows:** *Mapping Interdependencies in Critical Flows for Cities and Regions*
2. **Risk Governance:** *Managing Risk and Adapting Cities and Regions in a Changing World*
3. **Response Management:** *Managing Emergencies, Disasters and Crises in Cities and Regions*
4. **Training:** *Developing Sustainable Capacities for Resilient Cities and Regions*

The first programme focuses on cities and regions as complex systems of critical flows necessary for the well-being of citizens and for maintaining and developing critical societal functions. The second programme focuses on how to manage risk in such complex and dynamic systems, with multiple values, threats and stakeholders, and how to adapt cities and regions to climate change and other ongoing processes of change. The third programme focuses on the management and coordination of a multitude of stakeholders necessary to alleviate the consequences of events in which critical flows are disrupted. Finally, the last programme focuses on how external stakeholders can support the development of sustainable capacities within cities and regions to be resilient, regardless of disturbance or disruption, now and in the future. Hence, Training Regions is not only focusing on developing knowledge, systems, processes, methods and tools to directly implement activities that promote safety, security and sustainability, but also for supporting cities and regions to develop their own resilience.

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# Introduction

## **Background**

The world is changing. The global population has almost tripled since 1950 [1] and the total economic purchasing power has increased more than tenfold during the same period [2]. The lion's share of the economic growth has been concentrated to urban areas [3], which together with other factors are driving people to move into cities and towns virtually everywhere in the world [4]. In fact, since 2008 the majority of the world's population is living in urban areas for the first time in human history and the entire population growth for the coming half century is forecasted to occur there [5].

Aside of the historical reason of military protection, cities and towns exist because of other advantages of concentrating human activity to smaller areas [6], resulting in increased efficiency as it facilitates finer division of labour and the flows of people, goods and ideas [7]. However, concentrating human activity is also associated with challenges for safety, security and sustainability. Challenges that are increasing as a result of other ongoing processes of change, such as globalisation [8] and climate change [9, 10].

First of all, the concentration of people and capital increase the vulnerability to and potential losses in disrupting events [11-13]. Such concentration has also the potential to cause calamity in itself, as the complexity of society increases [14] and intensifies both the likelihood and consequence of critical failures and events. The reasons for this is that the growing complexity increases the likelihood that two or more failures interact in ways that are difficult to anticipate, as well as increases their consequences as they cascade through society [15]. Finally, concentrating human activity also means concentrating the consumption of resources and increasing the ecological footprint [16], which results in cities and town appropriating the natural resources of vast and dispersed ecosystems [17]. This together with other rural-urban linkages, e.g. flows of people, capital, goods and services, make a distinct rural-urban divide unfeasible [18]. Although old central cities often lend their names to metropolitan areas, they contain a shrinking proportion of the wealth and population in their wider regions [19].

These cities and regions are not only places where the state, market and civil society coexist, but hubs in networks of flows of people, capital, goods and services [20]. Regardless if it is the hubs that run the networks [21] or the networks that generate the hubs [20], cities and regions depend on effective and efficient flows between as well as within them, constantly, regardless of disturbance or disruption, now and in the future. If a city or region by any circumstance is disconnected, it initially causes problems for others in the network, but quite rapidly it is simply bypassed with staggering local consequences [20].

The safety, security and sustainability of cities and regions are thus increasingly becoming the centre of attention of policy-makers and practitioners from various administrative levels and countries around the world [e.g. 22, 23]. The common overall objective is to protect the well-being of citizens and to maintain critical societal functions, regardless of disturbance or disruption, in order to create an as attractive city and region as possible. Hence, it is not only vital to ensure that a city or region stays connected to national and global networks, but also to maintain effective and efficient flows of people, capital, goods and services within the city or region itself. These cities and regions comprise not only the public organisations often borrowing their names, but also all other stakeholders partaking

in the overall functioning of society, representing the public and private spheres, as well as civil society.

**City** – “a large urban area that has a name, defined boundaries, and local government”

**Region** – “an area or division, esp. part of a country or the world having definable characteristics but not always fixed boundaries”

**Safety** – “the condition of being protected from or unlikely to cause danger, risk, or injury”

**Security** – “the state of being free from danger or threat”

**Sustainability** – “the condition of being upheld or defended”

[based on 24]

Protecting the well-being of citizens and maintaining critical societal functions are not new issues for cities and regions, but visible in legislation and policy for decades. However, the challenges associated with them have been growing incrementally over time. There are four primary processes behind this, out of which two are related to the increasing complexity of society.

First of all, the flows of people, capital, goods and services necessary for the functioning of society are increasingly dependent on each other, causing consequences of a disruption in one flow to also affect other flows. This hampers the effectiveness of traditional management strategies that attempt to divide problems into parts and address these in isolation of each other [25]. Secondly, there is a process of diversification of stakeholders responsible for maintaining and developing most of these flows. This process is commonly referred to as institutional fragmentation and further impedes the effectiveness of traditional management strategies that attempt to address problems by allocating the responsibility for a flow to one stakeholder [26, 27]. Increasing the need for both horizontal and vertical integration [28], including integration of stakeholders representing the state, market as well as civil society.

The third process is connected to the drive to make systems increasingly effective and efficient for everyday circumstances. This process of optimisation has the positive effect of reducing the needed resources to support critical societal functions, which than can be used for other important things in society. However, with greater optimisation comes greater vulnerability [29], as steadily less buffers, make smaller and smaller disturbances to potentially lead to disruptions of entire systems.

Finally, the fourth and very human process is the change of the expectations of human beings in a society that is developing. For instance, citizens of a Scandinavian city or region 50 years ago probably viewed a week without electricity as a nuisance, but such event did not cause the same alarm as it would today, when it would constitute a crisis for society.

These primary processes, as well as other processes of change, impact cities and regions differently around the world. Diverging physical, environmental, social, cultural, political and economical factors form together contexts with unique challenges for safety, security and sustainability. Training Regions acknowledges that and contributes through its centre for research and innovation to the pursuit of solutions to the main challenges of cities and regions around the world, in the present as well as for the future.

## **About Training Regions**

Training Regions is a public-private partnership to promote safety, security and sustainability of cities and regions. It is a triple helix formation in which governmental authorities, private companies and universities collaborate for reaching the objectives of their respective sphere. Its focus is on Training, in its widest sense, including all types of activities (e.g. advice, education, training, exercise etc) supporting the development of capacities of cities and regions to protect the well-being of their citizens and to maintain critical societal functions. This by ensuring effective and efficient flows of people, capital, goods and services, regardless of disturbance or disruption, now and in the future.

Training Regions has two mutually supporting parts:

1. *A neutral arena for safety, security and sustainability of cities and regions*

A neutral arena for collaboration between governmental authorities on various administrative levels, private companies of different sizes and sectors, and universities and research institutions.

2. *Research and innovation for safety, security and sustainability of cities and regions*

An independent transdisciplinary centre for research and innovation supporting the arena and the wider world with new research based knowledge, processes, methods and tools, as well as with support to apply these outputs in practice.

Training Regions is a membership organisation accommodating members from different countries and spheres of society, operating under different laws and regulations. In order to accommodate such diversity, Training Regions is structured as a not-for-profit membership organisation, suitable for private companies and others that legally can be part of such organisation, and a research centre suitable for governmental authorities, universities and others that cannot. All members have however access to the arena and to the centre for research and innovation.

## **Introducing Training Regions Research Centre**

Training Regions Research Centre is the heart of research and innovation at Training Regions. The centre itself is hosted by Lund University, initially funded by the university and the Swedish Armed Forces and intended to involve other universities and authorities, as well as private companies. Its mission is to promote safety, security and sustainability of cities and regions by providing the Training Regions' members and the wider world with new research based knowledge, processes, methods and tools, and by supporting initiatives that apply these outputs in practice. A focus area commonly referred to as community resilience.

The centre builds upon the established infrastructure and activities at Lund University Centre for Risk Assessment and Management (LUCRAM) and draws upon the expertise of established researchers from around the world, as well as of professionals from the governmental and private sectors. It has thus an inclusive approach to research and focus on open innovation, with the vision to become a world-renowned transdisciplinary centre for research and innovation for safety, security and sustainability of cities and regions that bridge the gap between theory and practice.

## Programmes for research and innovation

Research and innovation at Training Regions is structured in research programmes containing areas of concern in relation to developing and implementing new research based knowledge, systems, processes, methods and tools to promote safety, security and sustainability of cities and regions. Developing resilient cities and regions requires three types of knowledge – thematic, contextual and processual – as well as systems, processes, methods and tools to promote resilience in practice. Thematic knowledge entails understanding of the requisite functions for promoting and maintaining safety, security and sustainability of cities and regions. In other words, the functions necessary to perform for protecting what human beings value, now and in the future, e.g. risk assessment, preparedness planning etc. Thematic knowledge is general and applicable in all cities and regions, regardless of context. Contextual knowledge, on the other hand, involves understanding of the context in which the functions are performed, e.g. how they are performed, what resources are utilised, who is involved, what threats are present, etc. Contextual knowledge is thus specific to each context. Finally, processual knowledge entails understanding of how resilience can be promoted and maintained in cities and regions, which can be done in first, second and third order processes. First order processes involve service providing in which a stakeholder is involved in performing a required function directly. Second order processes entail training, in its widest sense, in which a stakeholder facilitates the development of capacity of another stakeholder to perform that function. While third order processes involve training-of-trainers in which a stakeholder facilitates the development of capacity of another stakeholder to engage in capacity development for community resilience in the future.

Research and innovation at Training Regions is structured in four mutually supporting programmes, all of which with considerable overlaps between each other:

5. **Critical Flows:** *Mapping Interdependencies in Critical Flows for Cities and Regions*
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## **P1: Critical Flows**

### **- Mapping Interdependencies in Critical Flows for Cities and Regions**

Critical societal functions, such as health care, energy supply and provision of food, as well as the well-being of citizens, depend largely on effective and efficient flows of people, capital, goods and services, in and between cities and regions. These flows must be maintained and developed during “normal” circumstances and, as far as possible, also continue in the event of disturbances and crises.

The critical flows of people, capital, goods and services are enabled by critical infrastructures, which in this context can be seen as networks of assets or systems that are essential for the production and distribution of these flows, and for maintaining critical societal functions [30, 31]. Cities and regions are becoming increasingly dependent on such critical flows and infrastructures [32], which in turn are becoming increasingly interdependent on each other [33]. This means that disruptions in the flows enabled by an infrastructure may lead to widespread domino effects that are difficult to understand without systematic and comprehensive mapping and analysis.

Critical infrastructures and critical infrastructure protection have been the focus of much research over the last decade or so. The focus has primarily been on the physical aspects of the critical infrastructure systems rather than on the critical flows and functions they enable and support [34]. Efforts to identify critical infrastructures have been made, resulting in different lists of critical infrastructures to focus on in different parts of the world [35, 36]. These infrastructures have often been studied and analysed from strict structural perspectives [e.g. 37], often in isolation from each other [e.g. 38], while functional aspects mainly have been starting to be included rather recently. A main reason for this is the exponentially increasing complexity when including additional infrastructures, limiting the feasibility of existing simulation models.

Although increased attention is devoted to identifying and analysing interdependencies between critical infrastructures, often only one or a few of the closest related infrastructures are included in the analyses. However, if critical infrastructures are seen as networks of interdependent systems and processes that together produce and distribute essential flows of people, capital, goods and services [31], it is clear that also external systems and processes that each infrastructure depends on must be included in the analysis. If not, it is difficult or impossible to maintain or develop the critical societal functions that the flows are intended to continuously support. Although structural aspects are important as a basis for further research, a focus on critical flows, on the functional aspects of critical infrastructures, emphasise the vital importance of focusing on interdependencies and of attempting to grasp as holistic view as possible of the complexity of cities and regions.

The focus of this programme for research and innovation at Training Regions is on identifying and analysing flows that are critical for the functioning of cities and regions, while accounting for the interdependencies between them. The aim is to describe cities and regions as complex systems of critical flows where these flows constitute the building blocks of the national and global systems in which the cities and regions compete and coexist. To be able to do this, the programme for research and innovation will focus on developing new methods and tools for describing and analysing cities and regions, seen as complex systems of interdependent flows, as well as on supporting initiatives oriented towards applying them in practice.

## **P2: Risk Governance**

### **- Managing Risk and Adapting Cities and Regions in a Changing World**

To protect the well-being of citizens and maintain critical societal functions, cities and regions depend on effective and efficient flows of people, capital, goods and services. Ensuring these critical flows over time, in everyday circumstances as well as during various disturbances or disruptions, is a main challenge often referred to as business- or service continuity. This challenge requires cities and regions to have systems and processes in place for managing risk in, and adapting to, a complex and changing world.

Controlling and regulating risk in society has received substantial interest from both academics and professionals [39]. Many approaches to this involve detailed descriptions of how to manage risk by designing and operating various systems, e.g. the design of buildings with regards to fire safety, the operation of electric power grids with regards to unexpected loss of transmission capacity, etc. However, risks to and in society seem to be changing in nature and context, as well as with respect to society's capacity to manage them [22]. This trend is at least partly caused by the increasing complexity of modern society, which in itself creates new vulnerabilities [22, 40]. The increased complexity and interconnectivity in society has led to disasters and crises becoming increasingly transboundary in nature. This entails that "...they affect multiple jurisdictions, undermine the functioning of various policy sectors and critical infrastructures, escalate rapidly and morph along the way" [41]. Hence, what used to be localised events managed within one administrative level and one sector are now increasingly transcending various geographical, administrative and functional boundaries, causing widespread consequences that are difficult to grasp. This implies new challenges for controlling or regulating risk, requiring a more holistic perspective on risk management in cities and regions [22]. The concept of risk governance has been suggested to encompass such holistic framework for managing risk in this context [42-47].

Risk governance is not only including aspects of risk management per se, but also considerations of the legal, institutional, social and economic contexts of risk, as well as of the inclusion of the stakeholders representing them [45]. Risk governance involves in other words the complex network of stakeholders, rules, processes and mechanisms through which risk management decisions are made [45]. This incorporates both decisions and actions of the state, market and civil society, which is of particular importance in situations where no single authority can make a compulsory risk management decision, but where collaboration of various stakeholders instead is necessary [45]. Managing risk in cities and regions, including adaptation to climate change, thus requires ability to accommodate different and sometimes competing values, include multiple threats, involve stakeholders across geographical, administrative and functional borders, and integrate several analyses by different stakeholders [48].

The focus of this programme for research and innovation at Training Regions is on operationalising the concept of risk governance in the context of cities and regions, and on designing systems, processes, methods and tools for cities and regions to anticipate, recognise, adapt to and learning from disturbances, disruptions and disasters that threaten or affect the well-being of citizens and critical societal functions.

### **P3: Response Management**

#### **- Managing Emergencies, Disasters and Crises in Cities and Regions**

Responses to crises and emergencies bring together multiple stakeholders that often differ in terms of abilities, values, norms and goals [49]. These stakeholders may be forced into new and unplanned roles by the unfamiliar, complex and dynamic character of these situations [50-52]. Not only do the established stakeholders have to be innovative and improvise in their efforts to meet various needs, they must also take into account a variety of emergent resources, such as relief organisations, private sector initiatives and volunteers. Managing<sup>1</sup> this conglomerate of response resources is likely to be challenging [53]. Here such management is termed response management, defined as an event-specific non-hierarchical function with the aim to influence how the event unfolds. Since each stakeholder usually contributes with a share of the concerted effort, management quality may be described as the degree to which the influences (a) convergence in terms of direction and timeliness and (b) function as mutual enablers.

However, it remains unclear how such quality should be achieved. The last decade has seen calls for a shift of focus from the stakeholder organisation (internal focus) to the shared response arena (external focus), the latter sometimes described as an effects based approach. Disaster researchers, such as Drabek [1985], Comfort [1999] and Kapucu [2006] have further contributed with empirical analyses of major responses and shown that normative management ideas need to be developed based on a further contextual understanding. A lot of work has already been done or is in progress in related areas, such as stakeholder interface design [57], sensemaking [58, 59], labour division [60] and networking [49, 61, 62]. Despite this progress, many academic efforts still cling to hierarchical models with levels of authority in terms of decision-making, information dissemination and contact patterns. This risks leaving large parts of the response domain understudied.

The Training Region research program for response management addresses this knowledge gap by focusing on the stakeholder interface, with the aim to understand how response management should be designed when no commonly recognised hierarchy exists in this interface. Particular focus is placed on the interface between stakeholders from different institutional spheres, such as between civilians and military, state and market, etc. The objective is to improve the understanding of collective response management and stimulate the development of such management functions. Examples of research areas within the program are stakeholder understanding (converging and diverging factors and their importance) and management function design (what socio-technical principles should guide the shaping of stakeholder interfaces to improve the quality of interaction?).

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<sup>1</sup> Here the concept of management refers to processes *between* stakeholders rather than within. It includes but is not limited to the the concept of *co-ordination* (traditionally civilian), *command and control* (traditionally military) and *focus and convergence* (developing politico-military).

## **P4: Training**

### **- Developing Sustainable Capacities for Resilient Cities and Regions**

The concept of training at Training Regions involves all types of activities that an external stakeholder can do to support the development of sustainable capacities to promote safety, security and sustainability. Capacity is here referred to as the combination of all strengths, attributes and resources available within a city or region to contribute to its resilience [developed from 63].

It has been suggested that capacity must be grown and nurtured at different levels, which are linked to each other in such a way that the strengths at one level depend on, and determine, the strengths at the others [64, 65]. Some guidelines for capacity development specify these levels as the enabling environment, the organisation and the individual [65, 66], while others divide the same under other headings [64, 67, 68]. Regardless if capacity is looked upon as stemming from three or more levels, any capacity development initiative must start with assessing the capacity needs and addressing them by engaging in a mix of activities at all necessary levels [65-67]. However, to be able to systematically analyse the current capacities of a city or region, it is vital to concretise what strengths, attributes and resources that contribute to its resilience, as well as how to do it.

Training, at Training Regions, entails not only activities to develop human and material resources, but also effective and efficient organisations, a system of organisations facilitating effective collaboration and coordination, and a legal and institutional framework guiding it all. Training activities span in other words from advocacy campaigns to alter legislation and policy to the implementation of a new tool, and from developing new educational curricula and pedagogical approaches to exercising how the interfaces for coordination between organisations function under pressure.

Academics and professionals have suggested a number of vital factors for effective capacity development, e.g. understanding the context [69] and which stakeholders to involve [64, 70], facilitating local ownership [64, 65, 67, 71], strong local leadership [64, 72], clear division of roles and responsibilities [64, 71, 72], etc. Aside of these general contributions to the theory and practice of capacity development, there is a need for dedicated guidelines for supporting the development of the resilience of cities and regions. Especially as past experiences include too many examples of inappropriate approaches with short-lived impacts [66]. Although there are good examples, the available knowledge and tools for capacity development “in practice” are still not widely shared and systematised [66]. In addition to researching and designing training activities per se, it is also important to study how to, as well as designing tools to, measure the effects of training activities in relation to the future performance of the participants contributing to the safety, security and sustainability of a city or region. There is in other words today a lack of scientifically grounded ways of knowing if a training activity has increased the resilience of the city and region

The focus of this programme for research and innovation at Training Regions is on developing new knowledge, systems, processes, methods and tools for how external stakeholders can facilitate the development of the capacities of cities and regions to protect the well-being of their citizens and maintain critical societal functions.

## References

1. United Nations. *World Population Prospects: The 2008 Revision*. [URL document], 8 February 2011, <http://esa.un.org/unpp>. (Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2008).
2. The World Bank. *Economic Policy and External Debt*. [URL document], 8 February 2011, <http://data.worldbank.org/>. (The World Bank, Washington D.C., 2010).
3. Bairoch, P. *Cities and economic development: from the dawn of history to the present* (University of Chicago Press, Chicago, 1991).
4. Satterthwaite, D., Huq, S., Reid, H., Pelling, M. & Romero Lankao, P. 'Adapting to Climate Change in Urban Areas: The Possibilities and Constraints in Low- and Middle-Income Nations'. in *Adapting Cities to Climate Change: Understanding and Addressing the Development Challenges* (eds Bicknell, J., Dodman, D. & Satterthwaite, D.) 3-47 (Earthscan, London and Sterling, 2009).
5. United Nations. *World Urbanization Prospects: The 2009 Revision*. [URL document], 1 April 2011, <http://esa.un.org/unpd/wup>. (Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2009).
6. O'Flaherty, B. *City economics* (Harvard University Press, Cambridge, 2005).
7. Glaeser, E. L. 'Are cities dying?'. *The Journal of Economic Perspectives* **12**(2) 139-160 (1998).
8. Beck, U. *World risk society* (Polity, Cambridge, 1999).
9. Elsner, J. B., Kossin, J. P. & Jagger, T. H. 'The increasing intensity of the strongest tropical cyclones'. *Nature* **455**(7209) 92-95 (2008).
10. Kasei, R., Diekkrüger, B. & Leemhuis, C. 'Drought frequency in the Volta Basin of West Africa'. *Sustainability Science* **5**(5) 89-97 (2010).
11. Freeman, P. K. 'Natural Hazard Risk and Privatization'. in *Building safer cities: the future of disaster risk* (eds Kreimer, A., Arnold, M. & Carlin, A.) 33-44 (The World Bank, Washington D.C., 2003).
12. Quarantelli, E. L. 'Urban Vulnerability to Disasters in Developing Countries: Managing Risks'. in *Building safer cities: the future of disaster risk* (eds Kreimer, A., Arnold, M. & Carlin, A.) 33-44 (The World Bank, Washington D.C., 2003).
13. IFRC *World Disaster Report 2010: Focus on urban risk* (International Federation of Red Cross and Red Crescent Societies, Geneva, 2010).
14. Luhmann, N. *Observations on modernity* (Stanford University Press, 1998).
15. Perrow, C. B. 'Complexity, Catastrophe, and Modularity'. *Sociological Inquiry* **78**(1) 162-173 (2008).
16. Rees, W. & Wackernagel, M. 'Urban Ecological Footprints: Why Cities Cannot be Sustainable—and Why They are a Key to Sustainability'. in *Urban Ecology* (eds Marzluff, J. M., Shulenberg, E., Endlicher, W., Alberti, M., Bradley, G., Ryan, C., Simon, U. & ZumBrunnen, C.) 537-555 (Springer, New York, 2008).
17. Folke, C., Jansson, Å., Larsson, J. & Costanza, R. 'Ecosystem appropriation by cities'. *Ambio* **26**(3) 167-172 (1997).
18. *The Earthscan reader in rural-urban linkages* (eds Tacoli, C.) (Earthscan, London, 2006).

19. Fainstein, S. S. & Campbell, S. 'Theories of Urban Development and their Implications for Policy and Planning'. in *Readings in urban theory* (eds Fainstein, S. S. & Campbell, S.) 1-15 (Blackwell, Oxford and Malden, 2002).
20. Castells, M. *The rise of the network society* (Wiley-Blackwell, Chichester and Malden, 2010).
21. Sassen, S. 'On concentration and centrality in the global city'. in *World Cities in a World-system* (eds Knox, P. L. & Taylor, P. J.) 63-78 (Cambridge University Press, Cambridge, 1995).
22. OECD *Emerging systemic risks in the 21st century: an agenda for action* (OECD, Paris, 2003).
23. Raco, M. 'Securing Sustainable Communities'. *European Urban and Regional Studies* **14**(4) 305 (2007).
24. New Oxford American Dictionary *The New Oxford American Dictionary* (Oxford University Press, New York, 2011).
25. Hale, A. & Heijer, T. 'Is Resilience Really Necessary? The Case of Railways'. in *Resilience Engineering: Concepts And Precepts* (eds Hollnagel, E., Woods, D. D. & Leveson, N.) (Ashgate, Aldershot and Burlington, 2006).
26. De Bruijne, M. & Van Eeten, M. 'Systems that should have failed: Critical infrastructure protection in an institutionally fragmented environment'. *Journal of Contingencies and Crisis Management* **15**(1) 18-29 (2007).
27. Pérez, P. 'Buenos Aires: fragmentation and privatization of the metropolitan city'. *Environment and Urbanization* **14**(1) 145 (2002).
28. National Research Council *Building Community Disaster Resilience through Private-Public Collaboration* (The National Academies Press, Washington D.C., 2010).
29. Carlson, J. M. & Doyle, J. 'Highly optimized tolerance: Robustness and design in complex systems'. *Physical Review Letters* **84**(11) 2529-2532 (2000).
30. European Commission *Council Directive 2008/114 on the identification and designation of European Critical Infrastructures and the assessment of the need to improve their protection* (European Commission, Brussels, 2008).
31. Rinaldi, S. M., Peerenboom, J. P. & Kelly, T. K. 'Identifying, understanding, and analyzing critical infrastructure interdependencies'. *IEEE Control Systems Magazine* **21**(6) 11-25 (2001).
32. Boin, A. & McConnell, A. 'Preparing for critical infrastructure breakdowns: the limits of crisis management and the need for resilience'. *Journal of Contingencies and Crisis Management* **15**(1) 50-59 (2007).
33. Little, R. G. 'A socio-technical systems approach to understanding and enhancing the reliability of interdependent infrastructure systems'. *International Journal of Emergency Management* **2**(1) 98-110 (2004).
34. Little, R. G. 'Controlling cascading failure: understanding the vulnerabilities of interconnected infrastructures'. *Journal of Urban Technology* **9**(1) 109-123 (2002).
35. Di Mauro, C., Bouchon, S., Logtmeijer, C., Pride, R. D., *et al.* 'A structured approach to identifying European critical infrastructures'. *International Journal of Critical Infrastructures* **6**(3) 277-292 (2010).
36. PCCIP *Critical Foundations: Protecting America's Infrastructures* (President's Commission on Critical Infrastructure Protection, Washington D.C., 1997).

37. Zhang, W. J., Liu, X., Chai, C. L., Deters, R., *et al.* 'Social network analysis of the vulnerabilities of interdependent critical infrastructures'. *International Journal of Critical Infrastructures* **4**(3) 256-273 (2008).
38. Albert, R., Albert, I. & Nakarado, G. L. 'Structural vulnerability of the North American power grid'. *Physical Review E* **69**(2) 025103 1-025103 4 (2004).
39. Kirwan, B., Hale, A. R. & Hopkins, A. *Changing regulation: controlling risks in society* (Elsevier, Oxford, 2002).
40. Aven, T. 'A unified framework for risk and vulnerability analysis covering both safety and security'. *Reliability Engineering & System Safety* **92**(6) 745-754 (2007).
41. Ansell, C., Boin, A. & Keller, A. 'Managing Transboundary Crises: Identifying the Building Blocks of an Effective Response System'. *Journal of Contingencies and Crisis Management* **18**(4) 195-207 (2010).
42. IRGC *Risk Governance Deficits: An analysis and illustration of the most common deficits in risk governance* (International Risk Governance Council, Geneva, 2009).
43. IRGC *The Emergence of Risks: Contributing Factors* (International Risk Governance Council, Geneva, 2010).
44. Renn, O. 'White Paper on Risk Governance: Toward an Integrative Framework'. in *Global Risk Governance* (eds Renn, O. & Walker, K. D.) 3-73 (Springer, Dordrecht, 2008).
45. Renn, O. *Risk Governance* (Earthscan, London and Sterling, 2008).
46. Renn, O. 'Risk Governance: Combining Facts and Values in Risk Management'. in *Risks in Modern Society* (eds Bischoff, H. J.) 61-125 (Springer, Dordrecht, 2008).
47. Renn, O. & Schweizer, P. -J. 'Inclusive risk governance: concepts and application to environmental policy making'. *Environmental Policy and Governance* **19**(3) 174-185 (2009).
48. Becker, P. *Grasping complexity: analysing risk for sustainable development* (PhD thesis). (Lund University, 2010).
49. Alberts, D. S., Huber, R. K. & Moffat, J. *NATO NEC C2 maturity model* (CCRP Publications, Washington D.C., 2010).
50. Drabek, T. E. & McEntire, D. A. 'Emergent phenomena and the sociology of disaster: lessons, trends and opportunities from the research literature'. *Disaster Prevention and Management* **12**(2) 97-112 (2003).
51. Neal, D. M. & Phillips, B. D. 'Effective emergency management: reconsidering the bureaucratic approach'. *Disasters* **19**(4) 327-337 (1995).
52. Scanlon, J. 'Emergent Groups in Established Frameworks: Ottawa Carleton's Response to the 1998 Ice Disaster'. *Journal of Contingencies and Crisis Management* **7**(1) 30-37 (1999).
53. Quarantelli, E. L. 'Major criteria for judging disaster planning and managing and their applicability in developing societies'. *DRC Preliminary Paper* **268** (1998).
54. Drabek, T. E. 'Managing the emergency response'. *Public Administration Review* **45**85-92 (1985).
55. Comfort, L. K. *Shared risk: complex systems in seismic response* (Pergamon, Amsterdam and New York, 1999).
56. Kapucu, N. 'Interagency communication networks during emergencies'. *The American Review of Public Administration* **36**(2) 207-225 (2006).

57. Brehmer, B. *Från funktioner till konkret ledningssystem för komplexa operationer* (Lund University, Lund, 2008).
58. Weick, K. E. & Sutcliffe, K. M. *Managing the unexpected: assuring high performance in an age of complexity* (Jossey-Bass, San Francisco, 2001).
59. Weick, K. E. & Sutcliffe, K. M. 'Organizing and the Process of Sensemaking'. *Organization Science* **16**(4) 409-421 (2005).
60. Stephenson, M. C. 'Public Regulation of Private Enforcement: The Case for Expanding the Role of Administrative Agencies'. *Virginia Law Review* **91**(1) 93-173 (2005).
61. Alberts, D. S. & Hayes, R. E. *Power to the Edge* (CCRP Publications, Washington D.C., 2003).
62. Alberts, D. S. & Hayes, R. E. *Understanding command and control* (CCRP Publications, Washington D.C., 2006).
63. UNISDR *UNISDR Terminology on Disaster Risk Reduction* (United Nations, Geneva, 2009).
64. Lopes, C. & Theisohn, T. *Ownership, leadership, and transformation: can we do better for capacity development?* (Earthscan, London, 2003).
65. UNDP *Capacity Development: A UNDP primer* (eds Wignaraja, K.) (UNDP, New York, 2009).
66. CADRI *Basics of Capacity Development for Disaster Risk Reduction* (Capacity for Disaster Reduction Initiative, Geneva, 2011).
67. Schulz, K., Gustafsson, I. & Illes, E. *Manual for Capacity Development* (Sida, Stockholm, 2005).
68. Taylor, P. & Clarke, P. *Capacity for a Change* (IDS, Brighton, 2008).
69. OECD *The Challenge of Capacity Development: Working Towards Good Practice* (OECD, Paris, 2006).
70. Örtengren, K. *Logical Framework Approach - a summary of the theory behind the LFA method* (Sida, Stockholm, 2003).
71. OECD *The Paris Declaration on Aid Effectiveness (2005) and the Accra Agenda for Action (2008)* (OECD, Paris, 2009).
72. Stone Motes, P. S. M. & McCartt Hess, P. M. H. *Collaborating with community-based organizations through consultation and technical assistance* (Columbia University Press, New York, 2007).