RISK AND RESILIENCE REPORT

Preventing and Managing Large-Scale Disasters in Swiss Cities

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Disclaimer: *The opinions presented in this study exclusively reflect the respective authors' views.*

Executive Summary

Switzerland's civil protection system is generally considered to be very effective by international standards. However, it has rarely been exposed to the kinds of extreme events that have influenced disaster management organizations in other countries over the last decade. Even so, the system has been adapted based on key experiences and learning from important international events.

Switzerland's continuing urbanization and high population density in potential hazard risk areas creates new vulnerabilities and poses new challenges for disaster management. Urban areas where population and infrastructure are concentrated, are considered to be especially vulnerable. If a disaster of large scale strikes, consequences will be particularly devastating not only in the cities themselves, but also in surrounding rural areas. Large-scale events can affect the entire environment, bringing economic, social, and technical systems to a halt. Long-term processes that can be observed today, such as climate change, will make extreme events, be they natural or technological in their origins, more likely in the future.

This report assessed and analyzed the current state of Switzerland's disaster management at the city level. More specifically, the study provides an overview of how major Swiss cities prepare and plan for large-scale disasters. The study examined cities' planning and organization concerning the major risks they identified. A key element of the analysis was an examination of the institutional set-up that cities have put in place in the area of disaster prevention and management

In order to assess civil protection processes and practices in urban areas in Switzerland, the study addressed several relevant questions:

- How are Switzerland's major cities equipped to respond to large-scale hazards?
- How much institutionalization is necessary and useful to prepare for and respond to disasters that cut across jurisdictional boundaries?
- What are the personnel, financial, and infrastructure resources that cities are capable and willing to invest into managing extreme events?
- Who are the city risk managers and what agencies are they affiliated to? Who do they cooperate with to fulfill their tasks?
- Which risks are given highest priority in urban disaster management in Switzerland – and which risks might be overlooked?

The present study was designed as a qualitative case description of Switzerland's largest urban areas. Seven major Swiss cities and their agglomerations were selected for the study: Zurich, Geneva, Basel, Bern, Lausanne, Lucerne, and Lugano.

The study was completed using expert interviews with officials involved in cities' risk management.

The results of the analysis provides a systematic and deeper understanding of the role Swiss cities are playing in modern civil protection. Key results are listed here with respect the main points of focus highlighted above.

1. Risk analysis and disaster response

Conducting systematic risk analyses is a relatively recent development in Swiss cities, and is as such characterized by a marked diversity in approaches. On the political-strategic level, legal mandates, plans and strategies are less established in this area than in the response phase. Also, on the operational level, little standardization exists across cities with regard to how risk identification and analyses are carried out.

2. Resources and context factors

To fulfill their tasks, civil protection organizations depend on a broad array of partners and resources. Results from this analysis demonstrate that three factors are particularly important in urban disaster management practice: adequate financial support, and other resources; political support (both at the city level, and at higher levels); and a strong partnership with the public.

3. Institutional challenges

The work illustrated that institutional ambiguities impacts on civil protection efficiency. While responsibilities are clear in legal terms, responsibility, competency, and task sharing are in reality rather complicated in Switzerland's subsidiary system. These challenges are further intensified by accelerated urbanization.

Intergovernmental policy-making is a key feature of the federalist political system in Switzerland, which has traditionally involved three levels of government: the Confederation, the cantons, and the municipalities. These traditional political structures are, to a certain extent, challenged by continued urbanization and the new spatial and demographic realities it creates. As a result, the division of labor between the different political levels must adapt in order to remain efficient and effective. Policy-making in the area of disaster management has characteristics that require adequate institutional arrangements. Even so, the balance between institutionalization and flexibility may at times be difficult to strike.

A clearer allocation of responsibilities across the different political levels, acknowledging the changing role of cities in civil protection would help cities establish more systematic and steady structures (institutional organization, budget, etc.) for disaster management. This means tailoring initiatives and concepts developed at higher political levels to the operational needs of the city. While in normal times, cooperation between the city and the federal level works well, the decentralized system underlines potential weaknesses in large-scale events.

1 Introduction

Today, more than half of the world's population (54%) lives in urban areas, which constitutes a major policy challenge. The urban population has grown rapidly and is expected to reach six billion by 2045 (up from 3.9 billion in 2014) (UN 2014). To meet the needs of the growing urban population, infrastructures and services, such as energy, transportation, housing, employment, education and health care, need to be adequately developed, maintained, and protected.

Cities are the centers of modern social and economic life. The concentration of people and infrastructures, marked by a high complexity, interdependency and interconnectedness, also extending outside cities, are both their strength and weakness. If cities are negatively affected by major hazards, regions connected to them, if not the whole country and beyond, will suffer from the negative consequences.

Against the background of urbanization and the changing demographic and spatial realities it involves, plans and strategies to protect the population and its livelihood need to be adapted: this requires a continuing reorientation and reorganization of countries' civil protection systems. Urban growth usually involves an increase of interdependencies between services and humans within the city, as well as between the city and its surroundings. What needs to be protected (f. ex. critical infrastructures), and how, are questions to which answers are subject to constant change. As previous research by the CSS has shown, urban disaster management is globally dynamic, in most cases leading to a stronger role of cities in civil protection practice (Prior & Roth 2013).

The current study's focus is on cities and their disaster preparedness and response in the *Swiss* context. Within only a couple of decades, Switzerland has experienced a fast transformation from a formerly rural country characterized by century-old village structures into a strongly urbanized society. As a consequence of the pronounced federalist and subsidiary character of the Swiss political system, diversity exists with regard to the organization of the civil protection system at the city and cantonal level. Experience has shown that the multi-level governance system in place, with lower political levels bearing a major share of the burden in Swiss civil protection, has functioned well in the past. Especially daily challenges are efficiently dealt with. But can the challenges also be met in case of a major extreme incident? The present study evaluates current practices in urban disaster management in Switzerland, analyses its main challenges, and discusses options for further development.

1.1 Aim of the study

The purpose of the study is to assess and analyze the current state of Switzerland's disaster management at the city level. More specifically, the study aims to provide an overview of how major Swiss cities prepare and plan for large-scale disasters, as they have been rare in recent history, but nonetheless could strike tomorrow. What is the range of risks city risk managers envisage? The study will examine the city's planning and organization concerning the risks identified. What are the resources in terms of personnel, budget, and infrastructure that cities are capable and willing to invest in view of an extreme event that might occur or not occur? A key element of the analysis is the examination of the institutional set-up that cities have put in place in the area of disaster prevention and management. Who are the city risk managers and what agencies are they affiliated to and who do they cooperate with to fulfill their tasks?

A teleological perspective is taken in evaluating the preparedness and organization of Swiss cities with regard to major disasters. The main question is that of how to provide the best protection to citizens. This question is asked in reference to the broader political context in Switzerland, where responsibilities are distributed among various actors at different political levels. Rather than in legal responsibility, the interest lies in how responsibilities are understood and implemented in the current system. More specifically, the focus is on the capacities and knowledge that is presently held by all the actors involved, and on whether, and how, they are employed in the most efficient way. The use of theoretical concepts capturing the characteristics of Swiss political institutions (formal and informal), such as intergovernmental policy-making and informal networks, helps to analyze and assess the adequacy of the current state of Swiss disaster management at the city level, as well as its future challenges.

The study's ultimate aim is to inform future adaptation measures in urban disaster risk management, contributing to an overall increased resilience of Swiss society towards various hazards. The perspective taken in the present study differs from previous research, which has examined urban security in Switzerland in the context of day-to-day challenges of public order and security (for example, *Schweizerischer Städteverband 2013*)[1]. In contrast, the present study focuses on disasters of a particularly large-scale nature, so-called 'extreme events'. How is Switzerland, and in particular its major cities, today equipped to respond to such large-scale disasters and what can be done to increase city resilience?

1.2 Outline of the study

The study is structured as follows: the second section provides a cursory background analysis, referring to the relevant literature and ongoing policy debates on urban disaster management at the national and international level. In the third section, Swiss cities'

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[1] See http://staedteverband.ch/cmsfiles/Schlussbericht_SSS2025_1.pdf

disaster management plans and practices are described and analyzed, focusing on issues of risk analysis and disaster response. The next section discusses current issues related to the resources available to urban disaster management as well as general political and social factors that influence disaster management practice on the level of Swiss cities. Section 5 addresses questions around coordination and cooperation between political levels as well as between different cities. Finally, in the concluding section, the question of what the implications are for the civil protection system at the national level are addressed in more detail.

2 Background: the rise of cities in disaster management

The growing importance of cities in national and international politics, including in the area of disaster risk management, has already been recognized and reflected in an ever increasing body of research and policy initiatives in the area of urban security. Arguments exist in research, and in policy cycles, in favor of cities assuming a bigger role in politics in general, but also more particularly in disaster risk management. Reasons include practical necessity (political mandate and authority needed to fulfill their tasks) and normative arguments ("If mayors ruled the world" by Barber 2013). Much can be gained by putting cities at the forefront of preventing and managing disasters, including public risk communication. This was also a finding of the CSS work on "Disasters in Global Cities", which analyzed recent trends and practice in disaster management in the context of *global* cities, such as London, Los Angeles or Sydney (Prior & Roth 2013). The present study follows on from this work, asking how Swiss civil protection fares in light of the rise of cities.

2.1 International trends in urban security

Urbanization is a common key challenge shared by civil protection systems around the globe (Prior *et al.* 2016). More specifically, the ever increasing complexity and interdependency of threats and hazards, which are closely linked to the growth of cities, challenge today's civil protection systems in their current form. Socio-technical complexity is introduced by the needs of city populations for services, such as transport, electricity, telecommunications, and water. Such systems can be more sensitive to hazards or threats. To keep up with this challenge, civil protection needs to adapt and broaden its capabilities (against the challenge of financial efficiency), necessitating important organizational adjustments. This also includes efficient coordination of tasks across different levels of government and among the increasing number of actors in the public and private sectors.

Promising regional and global initiatives exist in the area of urban disaster management: the European Forum for Urban Security (Efus) was founded in 1987[2]. It promotes a "balanced vision of urban security, combining prevention, sanctions and social cohesion" and supports local governments "in the conception, implementation and evaluation of their local security policy"[3]. At the global level, the UNISDR launched the Making Cities Resilient Campaign in 2010 to "support

sustainable urban development by promoting resilience activities and increasing local level understanding of disaster risk"[4]. Further global work on urban security and resilience include contributions from the City Resilience Framework, developed by Arup with support from the Rockefeller Foundation[5], and the ICRC (Deely *et al.* 2010).

> **Box 1: Community-based risk reduction in Austria**
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> An interesting example of how cities can build up their resilience quite independently from national political structures is given by Austria (see Prior *et al.* 2016, p. 20). 280 municipalities signed up with the UNISDR initiative "Making Cities Resilient: My City Is Getting Ready". The unequalled popularity of the international initiative among Austria's municipalities can be explained by the need for significant re-organization of the emergency management system against the background of a complicated national federal system. The city of Lienz serves as a model case for how a city (with the help of an international initiative) can increase its level of preparedness without having to rely on national political support. It illustrates the power of community-based risk management. Based on a participatory risk assessment process, a hazard zone map, a detailed risk register, as well as spatial and building development plans were developed. This process was supported and strengthened by organizational adjustments in the city government. Risk reduction and management have become an integral part of the processes and policies of the newly created environmental department.

We also see efforts at the level of the nation-state to institutionally adapt to cities' growing in space and in political relevance See Box 1 for an example of cities' role in civil protection in Europe). Political organization along the traditional levels of government, where the units at the higher political levels encompass the territory of the lower level-units is increasingly being challenged. The literature on metropolitan governance analyzes if, why, and how governance structures are being adjusted to political realities (see f. ex. Heinelt & Kübler 2005, Kübler 2012): cities cross established politically defined sub-national, and sometimes national borders. Certain policy areas are adapting more quickly to the new spatial and demographic realities, whereas others preserve traditional political structures longer. In major global cities, disaster management authorities have been found to look beyond traditional jurisdictions and acknowledge the specific geographical, political, and social contexts of the cities in which they operate (Prior & Roth 2013).

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[2] It includes nearly 250 local and regional authorities from 16 countries.

[3] See EFUS website (https://efus.eu/en/about-us/about-efus/public/1450/).

[4] See UNISDR website (http://www.unisdr.org/campaign/resilientcities/home/faq).

[5] See the Rockefeller Foundation website (https://www.rockefellerfoundation.org/report/city-resilience-framework/).

2.2   Urbanization and urban security in Switzerland

In line with the worldwide trend, cities in Switzerland become ever more important in demographic and economic terms. Urbanization is in progress, even if definitions of urban space vary. Typically, densities of population, workforce, and overnight stays, and the number of inhabitants are used as criteria to define urban areas, and more specifically, central municipalities in agglomerations (for details on metropolitan statistics in Switzerland, see Appendix 1). Surrounding municipalities are identified based on commuter flows towards these central municipalities.[6] According to official statistics, roughly three-quarters of Switzerland's population (73%) lives in agglomerations, *i.e.* in the central or its surrounding municipalities, and an even higher number of the workforce (79%) is concentrated in these dense urban areas (BFS 2014). The concentration of people depends on, and fosters, a concentration of infrastructure, such as well-developed and –connected transportation and communication systems, centered close to the big cities (*e.g.* railway stations and airports in Zurich, Geneva, and Basel). Much of the country's economic activity is also concentrated in the citie**s**[7]**.**

In policy sectors other than civil protection and disaster management (*e.g.* the. transport sector), a restructuring of political governance has already been taking place to adjust to these new realities (see Koch 2013). Disaster management organized along the three political levels in Switzerland lags behind this process, for instance compared to the domain of public transport. Examples are the ZVV (*Züricher Verkehrsverbund*) including the canton of Zurich or Libero including the canton of Bern. In the field of economic promotion (see *e.g.* Christmann 2014) we have also seen governance structures emerge that have changed political organization in Switzerland. Examples are the *Nordwestschweizer Regierungskonferenz*, established in 1971, for the metropolitan area Basel, *Métropole lémanique*, established in 2011, for the metropolitan area Geneva, and *Metropolitanraum Zürich*, established in 2009, for the metropolitan area Zürich (see Ahrend *et al.* 2014).

While the significance of cities in security matters has been acknowledged by higher political levels in recent times, practical advances in risk prevention and management have, for the most part, been made at these higher levels. National strategy papers, such as the *Strategie Bevölkerungsschutz und Zivilschutz 2015+* (VBS 2012) discuss the need for a stronger integration of major Swiss cities into the country's national civil protection system. In practice, the focus has, however, been on the cantonal level. A guideline, developed by the Federal Office for Civil Protection (KATAPLAN), provides a common methodological basis for the cantons to conduct their risk analyses. Since its introduction in 2008, it has been widely used. As a trend, cantonal risk analyses are conducted in an ever more regular and institutionalized manner (Herzog & Roth 2015). At the city level, a similar development, driven by a commonly used, well-established risk analysis tool that is employed systematically and independently from the cantonal analysis, is lacking.

At the federal level, efforts in the field of disaster management have focused on conceptual work with the aim of providing comprehensive and consistent planning foundations for all actors involved in Swiss civil protection, including sub-national authorities. A national risk assessment has been conducted ("Disasters and Emergencies in Switzerland 2015"), in which 33 events have been identified that could strike Switzerland at any time. This also involved the creation of a risk diagram based on expected damage and frequency of each event. A corresponding number of scenarios have been developed ("hazard files"). The experts consulted in the scope of this process have come up with a more encompassing "hazard catalog", in which some 100 hazards are defined, which Switzerland potentially may face[8]. Further products by the Federal Office for Civil Protection (FOCP) include methodological and risk reports.

Adjusting government structures and processes to urbanization trends may already constitute a particular challenge in the security sector, of which disaster management is a part. Clear hierarchies seem to be particularly important in this field, where decision-making has to be quick and efficient. In the Swiss context, this adaptation process is further complicated by the strong federalist traits present in the country's political system. Cantons are responsible in most civil protection-relevant areas, with the Confederation playing a supporting role. Traditionally, the focus in regulating responsibilities between the different political levels has, thus, been on the cooperation between the federal and cantonal governments. Growing cities cross these established institutional hierarchies, in which they traditionally did not play an important role. Research on inter-governmental policy-making and on informal networks that parallel formal government structures is insightful in this context and will be picked up in this study.

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[6] In Switzerland, two different definitions of agglomerations and cities have been applied in recent times. Based on a population census conducted in 2000, a spatial classification was developed that distinguished three categories of urban space: 'core city of the agglomeration', 'other municipality in agglomeration', and 'isolated town'. In 2012, a new classification was introduced. While similar in approach, the definition of urban space now relies on other datasets (mainly based on registration data), criteria and thresholds. Datasets (population census, as well as structural and demographic business statistics) are now constructed mainly based on registration data as compared to written questionnaire surveys, which were typically used in the past. The 2012 classification also introduced two new categories of urban space: 'municipality oriented to multiple cores' and 'core municipalities outside agglomerations'. The advantage of the revised definition of urban space is that it allows international comparisons and a stronger differentiation of urban structures. Moreover, it is robust to municipal mergers. (See BFS 2014).

[7] 84% of the country's economic output is produced in urban areas. *Schweizerischer Städteverband* (http://www.staedteverband.ch/).

[8] Such a list of hazards has been compiled in 2009 for the first time.

2.3 Large-scale disasters in Swiss cities

A special focus of the study is on the analysis of cities' preparedness and countermeasures in the context of large-scale disasters, or more specifically unexpected 'extreme events'. Extremeness is a relative concept. To define 'extreme events' in generally valid terms is therefore difficult. A useful approach is to think of extreme events along three dimensions (Stephenson 2008): rarity, severity, and rapidity. Rarity refers to the probability of an event occurring, while severity refers to the size of its impact. Rapidity refers to the speed of onset of an event. Typically, an event is considered to be more extreme when it is rare, when it results in significant impacts, and when the onset is acute. For the present study, extremeness needs also to be defined in the context of Switzerland's event history and by the resources and organization available at the city levels. According to the Swiss risk assessment, the most significant risks include earthquakes, large scale blackouts, and longer-term (more than several days) pandemics or flooding.

Table 1 gives an overview of past large-scale disasters in Switzerland during its more recent history. In an international comparison, these disasters were small (with respect to the number of casualties and in terms of the damage caused). Out of the ten disasters listed here, only three directly affected urban areas and had a more than local impact. Only one was socially-induced.

The importance of learning lessons based on past disasters and establishing a knowledge management system within the civil protection system that supports the learning process has been highlighted in a recent CSS study (Prior & Roth 2016). However, risk preparedness and response measures need to go beyond that. A quick glance at the national risk assessment reveals that there are events, such as earthquakes, power blackouts, and pandemics that could strike Switzerland, and particularly its cities, at any time and that can potentially create great damage (up to 50 times bigger than the worst events reported in Table 1[9]), which have not occurred in the recent past. Hence, the importance of an efficient and adaptive disaster prevention and management system at all levels of government, including at the city level.

Table 1: Historical large-scale disasters in Switzerland (since 1960). From beobachter.ch: "Disasters in Switzerland" (last updated on 09.01.2013, retrieved on 20.12.2016).

Date	Disaster	Origin	Casualties	Geographical scale	Metropolitan area(s) directly affected
Aug. 1965	Mattmark ice avalanche (during dam construction)	Natural	88	Local	–
Jan. 1969	Nuclear reactor incident in Lucens	Technical	–	Local	–
Apr. 1969	Explosion in explosives plant in Dottikon	Technical	18	Local	–
Feb. 1970	Plane crash in Würenlingen (terrorist attack)	Social	47	Local	–
Nov. 1986	Fire and subsequent chemical spill in Schweizerhalle near Basel	Technical	–	International	Yes
Sep. 1993	Flooding in Brig and surrounding municipalities	Natural	2	Local	–
Dec. 1999	Hurricane Lothar	Natural	29	International	Yes
Oct. 2000	Landslide in Gondo	Natural	13	Local	–
Oct. 2001	Fire in the Gotthard road tunnel (triggered by a car accident)	Technical	11	Local	–
Aug. 2005	Historic flooding	Natural	6	International	Yes

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[9] Bevölkerungsschutz: Zeitschrift für Risikoanalyse und Prävention, Planung und Ausbildung, Führung und Einsatz (22 Juli/2015).

3   Methodology

The present study is designed as a set of observational case studies of Switzerland's largest urban areas. Seven major Swiss cities and their agglomerations were selected for the study (see Figure 1): Zurich, Geneva, Basel, Bern, Lausanne, Lucerne, and Lugano. Zurich is Switzerland's biggest city (8'237700 inhabitants) and constitutes with its surrounding municipalities Switzerland's biggest agglomeration (1.32 million). Geneva and Basel complete the list of the big three among Swiss cities. Bern and Lausanne rank fourth and fifth. In addition to these cities and their agglomerations, Ticino constitutes an additional Swiss "metropolitan area" (see statistical office's 2000 definition). Lugano, as Ticino's biggest city, was selected for the study (although it is technically not part of the metropolitan area that includes Chiasso, Mendrisio and parts of Italy). Lucerne is Switzerland's seventh biggest city – and agglomeration. It was selected for the study as it is representative of Switzerland's medium-sized cities and because it is recognized for its innovative approach to risk assessment. These cities, together with other central municipalities of the country, form 12% of Switzerland's surface area and 38% of the settlement area and encompass 59% of all population and 70% of all workforces.[10]

The study's empirical basis consists of expert interviews conducted with officials involved in cities' risk management. One to five interviews were carried out per city. The main focus lay in finding interview partners at the city level. However, when deemed useful, additional interviews were conducted with officials from the cantonal administration (for example, in Basel, where city and Canton are almost identical). This perspective from the next higher political level allowed the researchers to gain complementary insights, especially with regard to how cities and cantons cooperate in disaster management. Potential interview partners were identified based on information found on webpages of city administrations. Also, if considered suitable, people in the researchers' network were contacted. In addition, a snowball sampling procedure was used, according to which participants were asked to recommend further individuals as potential interviewees for the study. Interviews were carried out face to face, in German or French, and one to two researchers were present. In total, 16 expert interviews were conducted between April and June 2016.

Methods of data collection, preparation, and analysis were chosen to match the study's research design. The approach was based on qualitative, open-ended interviews. On average, interviews lasted 90 minutes. An interview schedule had been prepared around the main themes and issues of interest, namely: (1) the identification and assessment of risks; (2) measures and strategies of response; and, (3) the
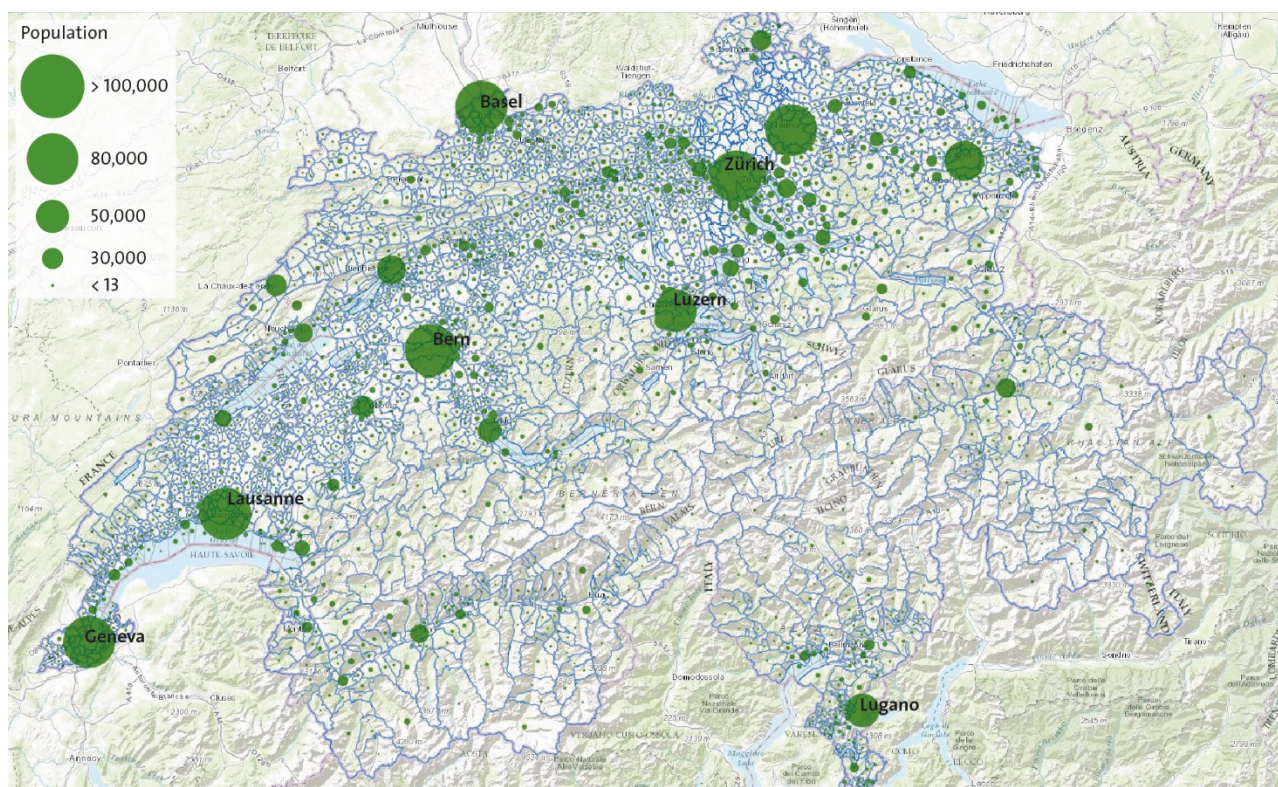
Figure 1: Focal cities studied in this project with population density of municipalities. Swiss Federal Statistical Office's (FSO).

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[10] In the surrounding municipalities the ratio between surface area (17%) and population (15%) is more balanced (BFS 2014).

institutional and informal structures and processes of cooperation among actors. These questions were used as an interview guide helping to cover the topics of interest. Neither the sequence of questions nor the exact content was set and could evolve during the course of the semi-structured interview. This format allowed the interviewer(s) to quickly react to responses given by the interviewee and to further probe statements made. This flexible method of eliciting information is considered to have a positive impact on the richness and the quality of the interview data (see Hamill 2014).

All interviews were transcribed verbatim, and transcriptions were qualitatively analyzed using the MAXQDA qualitative analysis software package. Quotes from the expert interviews are included into the text (italicized with inverted commas) where relevant, and only to highlight important generic patterns discussed in the text. Direct quotes are anonymized in most cases to protect the identity of interviewees, and the city location.

4 Risk analysis and disaster response in Swiss Cities

The extent to which cities, compared to other political actors and levels, are involved in disaster management varies along the disaster cycle. A comparison across cities reveals that structures are more similar in the response phase, where involvement is extensive, as compared to structures in the pre-hazard phase, where involvement considerably varies. In some cities, risk identification and analysis processes are still very rudimentary. In others, a system has been put in place that allows for regular and systematic assessments. Recent hazard events are found to have a strong influence on the spectrum of risks considered by the cities.

Interestingly, in the area of risk identification and analysis, little exchange exists across political levels, *i.e.* between cities, cantons, and the Confederation, or across cities. Also, with regard to disaster response measures, the respondents describe the cooperation with other cities and higher political levels as little-institutionalized, working mostly on the basis of *ad hoc* arrangements.

4.1 Risk analysis processes

Conducting systematic risk analyses is a relatively recent development in Swiss cities and characterized by a marked diversity in approaches. On the political-strategic level, legal mandates, plans and strategies are less established in this area than in the response phase. Also, on the operational level, little standardization exists across cities with regard to how risk identification and analysis are carried out.

4.1.1 Varying degrees of institutionalization

In general, some sort of risk identification and assessment could be found in all cities. The analysis is usually clearly city-specific and has a strong operational focus. Oftentimes, location-specific scenarios exist. The concrete mechanisms, tools, and procedures used in the cities to establish a culture of risk awareness and assessment within their government structures are manifold, but all aim to introduce a process through which risks are analyzed at regular intervals, involving a broad range of people, whose feedback is then incorporated into the existing system. At the same time, the level of institutionalization often varies significantly. The level of institutionalization of risk analysis appears to depend less on the size of the cities than on their financial resources, political support, and personal initiative and engagement.

At one end of the spectrum, risk identification and assessment are conducted in a regular and systematic manner by entities specifically assigned for this task.

Typically, the relevance of a risk is evaluated in terms of its impact and likelihood (mostly using some type of risk matrix). Some cities use in-house experts and some collaborate with external consultants in their risk analyses. In Lucerne, a tri-annual security report since 2007 is published. The analysis contained in the report serves as a basis for the city's risk and security management system. Another example is given by the Chance and Risk Management of Zürich City. In 2012 the city established bi-annual risk and insurance concept that assesses the opportunities and risks, posed by relevant hazards, to the services of the city administration.

At the other end of the spectrum, cities place the responsibility for risk analysis in the hands of a single person, a role that is often conducted in addition to his/her regular work. The degree of institutionalization in these situations is limited. Less attention is given to the methods applied and outcomes are not necessarily presented in a written report. In such cases, the identified risks serve as a direct input for operational planning. Only in some of the cities are risk assessments foreseen and conducted in a regular manner. Other city risk managers reported that they need to apply for extra resources for every assessment round. Ideally, an assigned budget for regular assessments is available, but in Geneva, for example, finances to support an assessment must be allocated by the parliament, introducing some uncertainty in relation to the regularity of the assessments.

Diversity also exists with regard to where risk assessment is located in the system, *i.e.* what the service in charge is, and how many people work on the topic. The work in the preparatory phase may be conducted by the police (f. ex. in Zurich, where a city police exists), but more often rests with other agencies, including professional firemen or rescue services. The division of labor between the police and non-police forces may also vary. The organizational solution in Lucerne differs again: the city has its own security manager within the security department. In some cities, all the work related to civil protection and disaster management is entirely done by people in their militia capacity (f.ex. in Lausanne, Lugano, and Geneva). In other cities, the number varies from one (f. ex. in Bern) to up to a handful of people (f. ex. in Basel and Zürich). The challenges (redundancy problems, lengthy consultation procedures *etc.*) posed by a multi-organizational arrangement like this, and what it implies for coordination within and across different government levels is a point of current focus by the Swiss Federal Office for Civil Protection (see VBS 2016).[11]

4.1.2 The influence of historical scenarios

In general, recent events (in the respective cities themselves, and in other Swiss cities or abroad) strongly influence trends in the practices of risk analysis and assessment in the cities under examination. Most often

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[11] See the strategy paper *Umsetzung Bevölkerungsschutz und Zivilschutz 2015+* (2016). While the paper focuses on the cooperation between the Confederation and cantons, its conclusions are also valid for cities.

the starting point for a city's risk analysis, and the range of hazards considered there, are determined by the experience of past events in the city (see Table 2). Many cities, for example, have had to deal with floods – a hazard that figures prominently in the cities' risk analyses.

An influential event with repercussions at the city level, but also nationwide, is the fire at *Schweizerhalle* and the related chemical spill in Basel in 1986. Chemical accidents are not only a concern in Basel with the large presence of chemical industries, but also in Geneva, host to two big companies in the perfume industry, and in cities where transports of chemicals are daily carried out, such as in Lausanne and Lugano.

Trends in risk identification and analysis are also driven by more recent events that have occurred outside the focal cities examined here. This includes events in neighbor cities or cantons, but, also international events. Acts of terrorism, as occurred in Paris and Brussels in 2015 and 2016 (respectively), leave their prints on the evaluation of risks in Swiss cities. French-speaking cities and cantons, especially international Geneva, closely observed such events and sought an active exchange with their counterparts in both countries. Shootings at schools is another issue that has gained in importance in some cities' risk management (f.ex. Lausanne). Dangers emanating from the migration influx and viruses transmitted by mosquitoes, as experienced in Switzerland's neighboring countries, or other world regions, have also recently caught the attention of city risk managers (as explicitly mentioned in Geneva and Zürich).

More generally, past experience can be used to further improve the risk assessment systems in place. Efforts to collect information on specific disasters and events, such as the Paris attacks in November 2015, have been dispersed. In the case of the Paris attacks, cities and cantons made their own inquiries: in some cases city representatives from Switzerland were sent on site. The respondents considered it to be helpful and, importantly, more efficient to join forces and establish common (knowledge) standards on the basis of such lessons learnt. A possibility that was mentioned would be to have the federal government conduct such inquiries and to put in place a common (online) platform, accessible to all (city) risk managers.

4.1.3   Planned future events

The setting up of a system of risk analysis has not only occurred in reaction to past events, but also in view of upcoming major events (see Table 2). In Zürich, city risk management gained new institutional leverage ahead of the soccer Euro Cup 2008. The Euro Cup was a city-wide event requiring far-reaching security measures and coordination, for which no legal basis had previously been in place. Based on this planned event, ideas on how to prevent and deal with disasters were developed in a systematic manner. Another planned event that lead to further progress in the field of risk analysis at the city level was the nationwide security network exercise (SVU

14). Two years ahead of the event, the city of Zürich invested additional human resources for this purpose.

4.1.4   Cooperation between administrative levels

Risk analysis processes can also be influenced by developments on other political levels (see Table 2). According to the interviewees, assessments and concepts used at the federal (see hazard catalog) and cantonal levels are generally well known and referred to in the analysis of risks at the city level. However, implementation is sometimes found to be difficult, because risk analysis concepts developed and promoted by federal agencies often take a scenario-specific approach (see hazard catalog). By contrast, the authors found a strong tendency towards an all-hazards approach at the city level. Here, disaster management is seen as an extension of city officials' daily work (especially when finances are limited). According to the respondents, the operational forces on the ground need to be prepared for any type of disaster (natural hazard or terrorist attack). Moreover, hazards are often interconnected and occur at the same time. According to the respondents, for operational forces at the city levels, concepts developed by the Confederation are usually too broad and too

Table 2: Stated events and processes influencing city-level risk analysis.

Different influences of risk analysis in Swiss cities

Past events

Schweizerhalle fire 1986
Terrorist attacks Paris 2015
Terrorist attacks Brussels 2016
School shootings USA in recent years

Planned future events

EURO Football Cup 2008
Security network exercise conducted in 2014 (SVU 14)

Cooperation between administrative levels

National hazard analysis
Common exercises
Trainings by federal agencies

abstract.

While risk managers at the city level have generally been found to favor a stronger involvement by, and engagement with, the federal government in the pre-disaster phase, the clash of 'cultures' between the operationally-oriented city risk managers and the more strategically-oriented federal agencies needs to be acknowledged and addressed. The federal concepts are *"…useful, but very general. […] What we needed is a much more operational basis for planning, much more focused on the ground. […] It is important that the*

Confederation understands this..."[12] A possible reason for this clash, mentioned by the interviewees, is that cities are only rarely actively involved in the risk identification and analysis process of higher political levels. Following the interviewees' perspective, by developing concepts and scenarios for risks that are directly relevant in the specific city context, the federal government could make sure that the most important, and newly emerging risks, are acknowledged by all lower political levels and risk managers.

Another (or rather a complementary) channel that we found to be used to introduce topics discussed at higher political levels into city risk managers' agendas is through common exercises. Preparedness for power blackouts and pandemics have been tested in major, nationwide exercises, which (further) sensitized city risk managers to the challenges associated with managing these hazards. The security network exercise conducted in 2014 (SVU 14) was referred to as a positive example[13]. Training opportunities offered by the federal administration to people responsible for local disaster management is another tool through which knowledge and a common understanding of hazards is distributed and shared in Switzerland's federalist civil protection system.

4.2   The risk landscape

What are the hazards and risks Swiss cities focus on in their current practices? What do city risk managers regard as the most concerning scenarios? According to the respondents, daily business is mostly preoccupied dealing with regular events on small-to-medium scales. They include seasonal floods, fires, and regular crime. The challenge of risk managers at the city level is that they need to be familiar with, and cover the whole range of hazards, *i.e.* from minor to major events. Some respondents saw a trend in risk analysis leading away from risks that are primarily dealt with by the police or fire service to "*…everything that moves people and scares them...*"

4.2.1   Major risks

Cities usually consider a fraction of the hazards included in federal and cantonal analyses, focusing on those that are perceived to be most relevant to them. Cities were found to be aware of the documentation and information that exists at the federal and cantonal levels regarding hazards and their assessments. (f.ex. earthquakes in Basel or terrorist attacks in Geneva). Even so, depending on the financial and human resources available, not much attention can be dedicated to extreme and unexpected events.

Answers were rather homogeneous to the question of what kind of event would outstrip the capabilities of the civil protection forces: namely a long-

lasting event that keeps many forces busy and takes place at multiple sites. This would quickly overburden the current system in the cities. Among the most cited types of major disasters, which enter risk managers' analyses, were earthquakes, floods, and power blackouts (see Table 3). Another major concern is potential terrorist attacks, a risk for which all cities are found to be prepared for in only a rather limited way. Generally, all cities do not feel sufficiently prepared for a terrorist attack – a particular concern in international Geneva. "*If somebody attacked an international organization or an embassy […] this would hurt Geneva, this would hurt Switzerland.*"

4.2.2   Potential "blind spots" in current city risk assessments

A major challenge mentioned by the city

Table 3: Potential large-scale disasters envisaged by Swiss city risk managers.

Scenarios most concerning to city managers

Earthquake
Flood
Power blackout
Terrorist attack

managers is that political and media attention usually go to currently imminent disasters, rather than to those with the biggest impact. "*People are strongly influenced by current events, today [these are] terrorism and migration.*" While the monitoring of, and the openness to, newly emerging issues is a key element of efficient risk management, a too-strong influence by political and media trends might be harmful. From the perspective of city risk managers, a balance needs to be found between adjusting to new trends while not neglecting hazards, such as natural hazards, that are still relevant in a city's context, in terms of their likelihood and impact. An earthquake is the typical example of an often-neglected risk with a potentially devastating impact. "*This is the difficult part with planning security: receiving money for topics that you do not see or feel on a daily basis. This is the eventual challenge.*"

4.3   Disaster response

With regard to response measures to frequent emergencies, plans and procedures at the Swiss city level are generally well developed. In cases of disasters or emergencies, established procedures apply that allow the different elements of the city administration to collaborate effectively. In comparison, coordination and cooperation in disaster response among cities as well as between cities and higher political level is found to be generally less clearly defined.

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[12] Direct quotes from the expert interviewees are included in the text in this manner.
[13] The nationwide exercise of the Swiss Security Network (SVU 14) was organized from 3 to 21 November 2014. Scenarios of a pandemic and a power shortage were used to examine cooperation between

partners within the Swiss Security Networks. The exercise aimed at testing crisis management procedures and decision-making in the event of large-scale disasters. Partners included the 26 cantons, federal agencies from all departments, the Armed Forces, crisis organizations and the private sector.

4.3.1 Command and cooperation within cities

On the city level, command and coordination structures for disaster response overall resemble the ones at the cantonal level. The police is usually in a leading position, with the police chief heading the task force convened in cases of extraordinary situations. For response measures, special funds usually exist.

Exercises to train for emergencies were highlighted as important tools to evaluate and improve current procedures in place, which should be made use of more intensively. They allow the identification of potential lacunae in the existing system. This concerns city-internal procedures, as well as the cooperation with higher political levels. After the major exercise SVU 14, disaster management systems at the city level were revised in cities, such as in Zürich. The respondents emphasized that a lot of time and effort are needed to organize exercises and training, but that supporting resources are sometimes not available at lower political levels. Therefore, they would highly appreciate a more active input from the Cantonal and federal partners in this regard.

4.3.2 Cooperation with other political levels

In current practice, cooperation and coordination with the cantons and the Confederation for the response phase are generally still limited. In some of the cities, city task forces include members of the cantonal administration and vice-versa. This helps establish an efficient flow of information between the political levels. However, sometimes, mutual expectations are not very explicit.. In general, the bigger the catastrophe, the more city risk managers expect higher political levels to step in, an expectation that aligns with the subsidiary nature of the Swiss federal system. In emergencies, inter-cantonal help is considered to be important and assessed to be readily available. However, this *ad hoc* support is not necessarily institutionalized. Expectations vis-à-vis the Confederation seem even less concrete and less defined. In certain scenarios, funding would be expected. For an efficient deployment of additional resources, organization and coordination structures would need to be clear, though (see *Umsetzung Strategie Bevölkerungsschutz und Zivilschutz 2015+*).[14] The army, as a federal instrument, is known as an available resource. However, the Confederation's contribution does not seem to be concretely factored into planning in the city representatives' perceptions.

Interestingly, the federal government is seen to play a potential role in overcoming coordination problems between cantons, resulting, for instance, from rivalries (f.ex. if one canton claims superiority over others) or other reasons. For this reason, interviewees stated that it would be important to have common operational plans for large-scale disasters affecting a number of cantons, or the whole country. For issues that need coordination beyond the city and cantonal level,

such as a pandemic, a central point of contact would be considered helpful during crisis. A more centralized organization and communication structure in times of crises would allow the federal government to speak with one voice, which would help make the system as a whole more efficient and effective. The UK and French systems were referred to as model cases. While these resources and contact points might exist in Switzerland, the formal exclusion of cities from the civil protection system means the representatives interviewed are less likely to be aware of them.

While in normal times, cooperation between the city and the federal level has been assessed to work well, the decentralized system reveals certain weaknesses during times of crisis. When the bird flu reached Geneva, and the scenario of a pandemic was imminent, people involved in Geneva's risk management faced a multiplicity of questions, such as whether to lock the borders, to keep up the right to assemble *etc.*, to which they would not receive any answers from federal agencies. If critical, all of Switzerland would have been affected by the way in which Geneva responded and managed the crisis. In case of a big event, cascading effects are common and should be expected. From a city risk managers' perspective, the federal government will currently not be capable of providing the needed quick decisions and answers in the current system, especially to city disaster risk managers.

4.3.3 Cooperation between cities

Interestingly, there appears to be only very limited systematic exchange between cities. This concerns sharing of information, common training and exercises. Little explanation has been provided by the experts as to why this is the case. However, a factor that has de-facto contributed to preventing close cooperation between cities in the past is the language barrier. Exchange among German- and among French- speaking cities respectively has been assessed to be more extensive than the exchange across cities of different linguistic regions. The cantons of Vaud and Geneva, for example, had focused their exercises more on cooperation with France than with each other. The same goes for risk managers in Ticino who are in regular contact with their Italian counterparts, but less systematically connected to Swiss partners.

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[14] This statement from a national strategy paper focuses on the cooperation between the Confederation and the cantons, but is also applicable to cities.

5 Tangible and intangible resources for disaster management

To fulfill their tasks, civil protection organizations depend on a broad range of partners and resources. The analysis showed that three factors were particularly important in urban disaster management practice: financial and human resources; political support; and a strong partnership with the public.

5.1 Financial and human resources

Considerable variation exists across cities in relation to the amount of resources city risk managers have at hand. Cities differ in their overall financial power (tax income), but also in terms of the extent of resources directed towards disaster management. While financial resources were not mentioned as a restraining factor by risk managers in some places, they have been found to be the single most important factor in limiting cities' preparedness levels in other places. "*We are very limited by our resources. If we had [the resources], if you gave us 10 people to develop [scenarios] [...] we would do it.*" In terms of human resources, professionals who work full-time on disaster risk management issues are typically very few. Some cities can rely on a number of full-time professionals, but in other cities, professionals from the 'blue-light' organizations fulfill their disaster management-related tasks in their militia capacity. Their back office support to the forces on the ground are important to keep the system sustainable.

The question of sufficient resources, *i.e.* financial and human resources, proves to be essential against a background where many civil protection services at the city level are provided by people acting in a militia capacity. Professional forces, such as policemen and professional firemen fulfill their civil protection tasks in addition to their daily business. This means that their deployment in cases of extraordinary situations, such as disasters and emergencies, is an extension of their daily activities. In Geneva, for example, where the number of conferences held by international (non-) governmental organizations is very high, these forces have very little extra capacity. Thus, daily work makes it difficult for them to make time for their civil protection-related duties, including planning, training and participating in exercises in view of major disasters. This can lead to sub-optimal preparation.

5.2 Political support

A clear political mandate from the competent political level has been found to be a key factor in building a sustained system of risk analysis at the city level. The political mandate can, for example, take the form of a city council ordinance or a law. In Zürich, the city council ordinance of 2008 provides the "*…legal basis to think [of risks that are to be assessed and managed] and defines the responsibilities, the process and the products.*" Once a political mandate is issued, questions concerning allocation of resources and institutional organization can be settled. Where such a mandate is lacking, as f.ex. in Geneva (canton), solutions are more *ad hoc* and less sustainable.

Political support, or the lack thereof, can be more subtle. A major challenge for risk managers to do their work is that their views often clash with views of politicians, on one hand, and the views and expectations of the general public on the other. Political attention is often drawn to very recent events, which attracts broad media coverage and moves public attention. Longer-term developments or rare events tend to get neglected and often are attributed less political relevance as compared to more pressing and visible issues. This is true for politicians as well as for the broader population. Moreover, politicians have a strong interest in avoiding problems, including disasters, for which they could be held accountable. Very rare events, especially if of natural origins, such as earthquakes, are often not considered to fall into this category. While rare, the impact of such a large-scale disaster would be particularly devastating and thus constitutes a major concern to risk managers, but less to politicians.

5.3 Public support

Policy-making in the area of disaster risk management, and the stance this policy area has in the overall political context, also depends on the general understanding citizens have of the role of the state. These attitudes are subject to social change. Today, the relationship between Swiss citizens and their (city) government is such that a part of the population is highly critical of state intervention in many areas of life. According to the interviewees, political initiatives in the area of disaster management, such as obligating citizens to store food and beverages at home, would go against this *Zeitgeist* and are therefore hard to implement. "*How to approach people who do not know anymore why to store food?*" Still, in case of an emergency, citizens' reliance on the state and their expectations towards it are expected to be high. "*…now, the government is in charge. [...] Everybody expects the government to be responsible that you get fed.*"

This seeming contradiction in requirements poses a challenge to city risk managers: how to protect citizens that are not aware of risks, reluctant of compulsory risk reduction measures, but still expect the state to step in when a major disaster occurs? Social norms in the area of security politics have changed since the end of the Cold War. A general trend from accepting and preferring authoritative and top-down styles of policy-making, towards more participative forms, has been observed. This new way of engaging with citizens involves new approaches to informing citizens and communicating with them, not only during crises but particularly beforehand. So far, disaster management in Switzerland, including at the city level, has not kept up with these social changes. In general, we find only few activities on the city level to increase public preparedness to disasters

through active and direct engagement with the citizens. Although city representatives recognize the importance of active risk communication, these efforts are mostly just in their early stages.

6   Institutional challenges

How adequate and efficient is disaster management in Swiss cities with regard to the protection of the population? We have identified a number of key factors, related to the broader institutional context of the country, that can either facilitate, or limit, the functioning of the system. For an efficient system, literature suggests avoiding institutional ambiguities and ensuring clear competencies. This is particularly important in the Swiss context with its highly subsidiary civil protection system. While responsibilities may be clear in legal terms, the reality of city representatives' shows that cooperation in a federalist system, *i.e.* the actual sharing of responsibilities and the corresponding competencies and tasks, is rather complicated. These challenges are further intensified by accelerated urbanization, and the formal exclusion of city administrations from the subsidiary civil protection system.

Intergovernmental policy-making is a key feature of the federalist political system in Switzerland, which has traditionally involved three levels of government: the Confederation, *i.e.* the federal government, the cantons, and the municipalities (see section 6.1). These traditional political structures are, to a certain extent, challenged by continued urbanization and the new spatial and demographic realities it creates: cities sometimes reach into neighboring municipalities or cross cantonal or even national borders. The division of labor between the different political levels, which has developed over time, has to adapt to current challenges to remain efficient and effective. Policy-making in the area of disaster management displays characteristics that require adequate institutional arrangements, but the balance between institutionalization and flexibility may at times be difficult to strike (see section 6.2).

6.1   Intergovernmental performance

Management and organization studies suggest that, for a good functioning and efficiency of a system, it is essential that assigned tasks are congruent with competencies of actors, such as their operational means,

and their responsibilities, including the authority to decide on actions. However, discussions over responsibilities and coordination problems are inevitable when multiple government levels are engaged in dealing with the same issues concurrently (on federalism and disaster management, see Birkland & Watermann 2008, Scavo *et al.* 2007, Schneider 1990). Tensions are common in a system where disasters are managed according to a subsidiarity principle.

The results of the study suggest that intergovernmental performance in the context of Switzerland's multi-level disaster management system is, indeed, a challenge. Swiss civil protection is an integrated management, protection, rescue and relief system: in addition to ensuring an effective cooperation among the five partner organizations (police, fire services, health care and technical services, and the protection and support service (civil defense)), efforts across the three levels of government (federal government, cantons, and municipalities) need to be coordinated. This is a complex system. The distribution of civil protection tasks across the political levels are often such that they do not match the distribution of competencies and responsibilities in this policy area. *"Tasks, competencies, responsibilities* [must be aligned] […] – *interface problems must be avoided."*

In the current system, cantons are attributed a leading role in civil protection, *i.e.* civil protection issues fall, for the most part, into the legal competence of cantons, not the Confederation (see grey-colored cells in Table 4). The cantons have the general responsibility and delegate certain tasks to municipalities. Policy sectors, such as the police and the health sectors, are regulated by the cantons. Fire services are also under cantonal jurisdiction. As to the protection and support service with its focus on disasters and emergencies, the Confederation has set up a general legislative framework. But within this framework, regulatory power belongs to the cantons. It is thus, primarily an instrument for cantons and municipalities. Technical services (often private or semi-private sector organizations), function more independently from political authorities. They are responsible for the provision of services related to service

Table 4: Levels of main operational (✓) vs. main formal (in grey) responsibilities in Swiss urban security provision. From http://www.babs.admin.ch/de/verbund.html (retrieved on 20.12.2016); VBS (2012).

Political level Agency	Municipalities/cities	Canton	Confederation
Police	(✓, if city police)	✓	
Fire services	✓		
Health care services (first aid and medical rescue services)	✓	✓	
Technical services	✓	✓	✓
Protection and support service (Zivilschutz)	✓		

Note:
✓ = political level of agency providing the major share of operational means (in terms of personnel etc.)
in grey color: political level formally in charge of civil protection service

provision of electricity, water and gas supply, waste disposal, transport and IT.

In the context of cantonal leadership in the Swiss civil protection system, cantons nevertheless expect cities to provide the following services (see *Strategie Bevölkerungsschutz und Zivilschutz 2015+*, p. 19):

- Organization, equipment, and training of partner organizations of the civil protection system at the city level, according to legal requirements;
- Coordination and command for regional and municipal disasters and emergencies;
- Sufficient financial means to support the fulfillment of specified missions;
- Risk analysis and assessment at the municipal and regional levels;

While cantons have broad responsibilities in the area of civil protection, it is, however, cities that to a large extent determine the operational means necessary to actually protect the population (fire and rescue services). Table 4 contrasts the distribution of powers and responsibilities in the civil protection sector (grey-colored cells) with the distribution of operational means at the hands of the actors at the different government levels (checkmarks). Such institutional arrangements have developed over time; the rescue missions by *Schutz und Rettung Zürich*, which extend to territories outside the city and even the canton, is an illustrative example. As a general observation, disaster risk managers of cities in bigger cantons, *i.e.* where cities are only one among many municipalities, tended to express more concerns regarding intergovernmental cooperation and coordination than their counterparts working in cities within smaller cantons.

As the institutional arrangements in the Swiss disaster management system exists today, several areas of potential tension between the different government levels emerge. Involvement of city-level actors usually has a strong territorial component. Municipal forces, however, know that they will be called upon in the case of an emergency or a disaster, even if it takes place outside their territorial remit and is not directly in the area of their responsibility. For instance, in the case of fire services, we often find political arrangements that foresee that fire service forces, organized at the municipal level, cover a larger territory than their own city's territory. This is the case, for instance, around Bern, where the city fire services also extend to several of the neighboring communities. Another example is the provision of resources and means by cities in the areas of first aid and rescue, which are formally a responsibility of cantonal health services. Finally, technical services are an important resource in urban disaster management. Yet the position of technical service partners often crosses jurisdictions of different political levels – for example in the context of nuclear plants. *"How can the city take influence on power plant operations?"*

Potential challenges related to competing responsibilities can be further complicated by the fact that critical infrastructure services that used to be public,

have become, or could become privatized, at least in part. This could affect important issues such as food security, communication and transport services. For disaster managers, cooperation across government levels in these domains is essential, but confusing; *"...the state is not, neither the Confederation nor the cantons, in a position to prescribe to private actors how to prepare for extreme events"*. The question, thus, is who (what level of government) is ultimately responsible for protecting critical services and to engaging and cooperating with service providers in view of preventing and responding to disasters?

According to the respondents, in daily practice the effectiveness of the system can be hampered by complicated institutional arrangements, but also a lack of information exchange. An example provided in one of the interviews is the issue of pandemic control in Lucerne. As a popular tourism city, Lucerne's risk manager considers this to be an important issue. Many tourists from Asian countries, from where previous pandemics had originated, visit Lucerne every year. However, the city's authority and access to information from the health services is limited. Nevertheless, in case of a pandemic, the city's resources would still be employed. More complicated, though, is the fact that the Confederation is responsible for pandemic preparedness and response, and other important decision-makers are situated at the cantonal level (in the form of cantonal physicians and cantonal hospitals). This complicated situation means that information is not openly circulated on this topic, creating difficulties for cities in organizing adequate preparation and training. Another example where city activity in civil protection has been discouraged has occurred in Lausanne, where the city rescue forces sought to exercise a shooting at a school, a scenario that is perceived to be real by city risk managers. Efforts in this regards were prevented by the canton, which was possible because the education sector and, more specifically, the cantonal schools are under their jurisdiction.

6.2   Informal networks

Personal networks were unanimously highlighted as one of the main factors that facilitate the functioning and cooperation in the context of disaster management in Switzerland. This is true for cooperation in the preparatory and preventive phases, and for the response phase, where knowing the competent people and their competencies was seen as the single most important factor that determined the success of operations. How sustainable is a system with such a strong emphasis on personal relations? This research demonstrated that many of the interviewed city risk managers previously worked for the federal administration before assuming positions in city or cantonal administrations. In addition, a military background is not unusual indeed, a military background is a typical qualification for professional advancement in the Swiss security sector (see Hagmann *et al.* 2016).

We currently observe relatively few, and weak, formal structures for coordination that city risk managers could draw on in their daily work: instead, informal

networks shape horizontal and vertical cooperation patterns in the Swiss civil protection system. Horizontal cooperation refers to cooperation across cities, as well as between different agencies (police, fire services, *etc.*), and vertical cooperation refers to interaction across different political levels. Organizational theory highlights that in fields where tasks are non-routine, organizations are difficult to bureaucratize (Perrow 2014 [1973]); this applies well to the field of disaster management in the Swiss federal system. The theoretical argument posits that, in such a context, clear lines of authority, clear rules and procedures, and a high division of labor are difficult to achieve. "[D]iscretion must [consequently] be given to lower-level personnel; more interaction is required among personnel at the same level; there must be more emphasis on experience, "feel," or professionalization" (ibid).

Theoretical arguments highlighting the positive aspects of a system built on informal networks exist. Such networks have shown to facilitate the sharing and creation of knowledge (Abrams, Cross *et al.* 2003) and thereby can support the coordination of actions. They also serve as instruments that integrate diffused expert knowledge (Hislop *et al.* 1997). Through the circulation of information, people who are part of these networks are directly informed and, in addition, form a common understanding of things (Suk-Young Chwe 2000); attitudes and behaviors converge (Christakis and Fowler 2009). While being more fragile than formal networks, informal networks are also more flexible (Krackhardt & Hanson 1993), and highly adaptive. This capacity helps systems to solve unexpected problems and deal with complex, contextual and multi-faceted issues (ibid.; Larson *et al.* 2013). These are all qualities that are highly useful in the context of disaster management in Switzerland and internationally.

At the same time, these networks may constitute a hindering factor for a well-functioning and deeper cooperation. Several examples were given in the interviews, where cooperative efforts were limited across cantonal or city boundaries, amongst others, due to personal animosities. Examples given concerned rivalries between cities or cantons, where one entity was perceived to claim leadership over the other. Rivalries have also been reported to exist between different agencies within a city or a canton. Examples include agencies acting single-handedly without previous consultation of other involved agencies.

Also on the negative side, relationships may be more instantaneous and momentary. A person who leaves a position takes all connections with him/her. A new in-coming person has then to first identify the counterparts in other cities or agencies and build up all contacts from scratch. This is especially true for the least institutionalized collaboration forms, such as with the private sector (f. ex. with banks in Zürich or the perfume industry in Geneva), which strongly depend on personal initiative and connections.

The informal, personalized, and network-based style of policy-making in the area of disaster management is an institutional characteristic of the Swiss system that has its advantages and disadvantages. The overall effects of informal networks will vary depending on the strength of ties and the degree of inner closure. A trade-off exists between networks with a strong inner cohesion characterized by strong ties and a certain closure towards the outside and more open networks with weak ties extending to other networks (Granovetter, 1973; Burt 2005, 2009). In the first, information is more reliable and specific, in the latter access to new, non-redundant information and ideas exists. Sometimes, the strong role of individuals and their informal networks goes hand in hand with a lack of institutionalization or at least with institutional ambiguities (such as who is in charge of what). Systematic approaches are missing. The challenge consists of organizing flexibility, which may constitute a contradiction in itself.

While acknowledging the value of well-connected city risk managers that are well-trained for their positions, a diversification of the personnel with people from different backgrounds could be desirable. Results have shown that people elected into the positions of risk managers bring connections from previous positions (professional or military). Many of them have had a career in areas outside the field of disaster management first. This brings some needed diversity and openness. At the same time, an argument can be made that – in the present system with people who, overall, have a rather similar curricula, many of them with a military background - a too strong closure of the system needs to be avoided, f. ex. by hiring people into the positions of risk managers or also as supporting staff, so that the system as a whole remains innovative and adaptive.

7 Conclusion

Since the end of the Cold War, a diversification process has taken place in the Swiss security sector (Hagmann *et al.* 2016): actors, and issues, have become more diverse. In reaction to the shift in focus from military to non-military hazards, such as migration-related problems, terrorism, and natural hazards, cooperation from different sectors and across political levels has increased, with sub-national actors assuming an ever more important role. This strong shared involvement of actors in Swiss security politics is not reflected in the formal political structure. Consequently, a discrepancy now exists between the formally recognized and the actual roles that Swiss cities assume in civil protection in the Swiss federal system. Indeed, the federal government's main cooperation partners are the cantons. Cities, as lower-level political units, *i.e.* municipalities, were not even mentioned in the federal constitution before its revision in 1999.

7.1 Responsibility, formality, and informality: integrating the city

As of today, cities' roles in disaster management, and (security) politics more generally, is not adequately reflected in Switzerland's institutional and legal framework. If cities' roles were better acknowledged formally, disaster management could become more efficient at the sub-national level. When assigning tasks to cities, the higher political levels, *i.e.* the cantons and the Confederation, need to be aware of what it takes to fulfill these tasks and introduce measures that can support cities in the fulfillment of their tasks. This would also imply that initiatives and concepts developed at higher political levels should be more tailored to the operational needs that cities often have, rendering them more relevant to the system as a whole. Providing cities with the necessary information is a prerequisite for them to be prepared and to have their processes and actions fit for purpose to adequately respond to disasters. Without this attention, cities will not be able to train their forces in an appropriate way, nor to continuously adjust their organization and their equipment.

A pro-active stance by the cities in disaster preparedness and management should be supported. Including cities in exercises is essential to understand how cooperation in the multi-level government system works, and if/how it can be improved. While these organizational measures to better include cities in the overall framework of civil protection seem the obvious and easy way to adequately include cities in the overall system (f.ex. in the form of inviting them to planning and coordination events), giving them access to decision-making procedures may be a sensitive step in certain situations.

Cities are in possession of key operational means for disaster management, but they often lack the formal responsibilities that would allow them to engage their operational means. The identified existing practices and policies have developed over time. Importantly though, mutual expectations of responsibility between cities and their partners vary from city to city, complicating a systematic role for the city in the Swiss composite system. They may even vary according to the hazards under consideration considered. For some hazards, such as an incident at a nuclear power plant, which are not under the primary responsibility of cities, administrative obscurity exists. This is especially true when tasks assigned to cities are not congruent with the authority given to them and their competencies, *i.e.* the operational means at hand. Strengthening and clarifying the cooperation between the various political levels will help the multi-level governance system in place meet future challenges. This need not mean that cities become a formal fourth level in the Swiss system, but certainly engaged more closely in operational processes, planning and activities.

A clearer allocation of responsibilities across the different political levels, acknowledging the role cities play in modern disaster management in Switzerland would also help cities establish more systematic and stable structures (institutional organization, budget, *etc.*) for disaster management. For example, the study has demonstrated that routines for the disaster response phase are well-established and institutionally anchored, but that responsibilities are less clear and less established in the preparatory and preventive phases.

In addition, informal networks have been found to be a key characteristic of the Swiss disaster management system and to have a favorable effect on the functioning of the system as a whole. However, a further diversification of personnel would allow the system to become more sustainable and integrative, serving the overall resilience of Swiss society.

A necessity exists to better include Disaster Risk Management in larger policy processes, such as urban planning, financial risk planning, neighborhood programs, *etc.*). If the significance of city risk management was better reflected in the city's institutional set-up (not variously positioned within blue light organizations, or elsewhere, as is the case today), this would also strengthen its position vis-à-vis politicians and the broader public. More generally, fostering public disaster preparedness should be prioritized on all administrative levels

Many positive developments could be observed in recent years in the area of city-level risk management: in addition to response measures, structures and processes in the area of risk assessment have been introduced and improved. Some developments have, however, not been in line with international trends. Two points will be highlighted here: firstly, city risk managers' communication with the public is rather limited, especially for the disaster preparedness phase. Secondly, city risk managers have been found to pay little or no attention to the reconstruction phase, which is not yet part of the general risk management framework at the city level.

An international comparison of disaster management in global cities has shown the growing importance of social media as a mean for cities' disaster managers to communicate and engage with the public (Prior & Roth 2016). Swiss cities are lagging behind this process. While plans exist on how to inform citizens in case of a disaster, new technologies have so far not been an integral part of such efforts. Social media provide new ways for authorities to interact with their citizens. Instead of the traditional top-down approach, Swiss city risk managers could benefit from a more participative approach: citizens' could provide valuable inputs during a crisis ('crisis mapping') and engage in an ongoing dialogue with the authorities during the pre-disaster phase. In this way, public risk awareness could also be raised. This is important to increase (the often lacking) political support for the investment of public funds in risk prevention activities and the implementation of risk reduction measures (OECD 2010).

A trend has been observed in urban disaster management around the globe involving a shift away from the traditional focus on disaster response towards disaster preparedness and recovery, both of which aim to bring (social, economic, *etc.*) functioning 'back to normal'. In Switzerland, such a shift in focus could not be observed. The response phase is still the most important phase in terms of the dedication of public resources (technical, financial, personnel). For the recovery phase, city officials rely on special agencies and experts in other departments, such as the construction department. These are expected to take over once the crisis is over. Recovery activities were generally seen as not being in the responsibility of risk managers or operational forces. City risk managers were not aware of additional funding in this context. More surprisingly, no regular or institutionalized exchange exists between risk managers and these specialized agencies.

7.2   Resources supporting cities

The study has shown that the more political and financial support a city's risk management receives, the more systematically risk identification and assessment are undertaken. A clear political mandate and enough money to conduct the risk management processes are, thus, considered to be important facilitating factors. If political support is weak or unclear and if financial resources are lacking this will have a negative impact on the extent and quality of risk management.

For urban disaster management in Switzerland, relying to an important extent on the militia principle, enough resources in the form of human power must be available, yet this is currently not always the case. It is, thus, important to provide for sufficient human and financial resources for the risk management to be undertaken in a timely, regular and systematic manner – a process that can undoubtedly support cantonal risk management processes. Unless there is sufficient funding for systematic approaches, then investment in disaster management will always be dealt with as a political question, especially in the context of low probability events.

7.3   The city and disaster resilience

Interviews with city disaster risk managers highlighted the importance of the city as a focal point in building broader disaster resilience. This role has been explored previously by the CSS in the context of international cities (Prior & Roth 2013), and in the context of urban systems, more generally (Giroux & Herzog 2014). This work highlights the way the complexity of urban and city systems can bring both vulnerability (largely because of the interdependence of services and systems), but also confer resilience (through redundancy, flexibility and the capacity to re-organize, and through shared learning).

Results from the current study directly support the reality that resilience is built through flexibility, re-organization, and shared learning. In particular, city managers' informal connections reflect a flexible and adaptive work-around to the formal exclusion of the city from the Swiss civil protection system. While these *ad-hoc* networks may not be sustainable over the long-term, they nevertheless appear to be a significant resource. The lack of sustainability in these networks is a point of vulnerability in the city's risk management.

The results of the project also demonstrate the benefits and disadvantages of the federal system from a resilience perspective. Beneficially, federalism and the subsidiary nature of the Swiss civil protection system offers significant capacity to adapt process and activities as the context (of the government level) necessitates (in risk identification and analysis, for example). From a resilience perspective, factors that prevent adaptability and specificity, like the centralization of processes, may even be counter-productive. However, such diversified approaches can also be disadvantageous. Interviewees in this study pointed out the difficulties of finding coherence in planning, decision-making and actions. This duality in terms of resilience outlines the need for strong leadership from the Confederation – offering guidelines for key activities that are coherent nationally, but also meaningful at lower geographical scales is fundamental, but difficult. The rollout, and wide (but incomplete) uptake, of the Swiss KATAPLAN risk analysis process is a case in point (BABS 2013). A key to addressing large-scale disasters is gaining complete policy and action coherence in disaster management, but with current arrangements, this is difficult.

7.4   What do city risk managers expect from the federal government?

Boxes 2 and 3 summarize city risk managers' expectations from the Swiss federal government in terms of processes and activities at different points of the disaster risk management cycle. In general, city risk managers welcome activities by the federal government that help them build up capacities, and that allow for a better and more efficient integration of cities into the overall civil protection framework. In the perspective of city risk managers, a more centralized and active leadership by the federal government is considered useful in view of an improved coordination among the various

actors of the Swiss civil protection system in- and outside the multi-level government structure in Switzerland. Many positive steps have been taken in the field of disaster risk management by Swiss cities in recent years. An active role by the federal government can help keep up the momentum.

Box 3: Regarding the response phase

Providing a central point of contact during crisis
City-risk managers called for a (more) centralized point of contact that can be contacted during emergencies, allowing better responsiveness and quick and efficient decision-making.

Box 2: Prevention and preparedness

Setting issues
An active agenda-setting role delegated from the federal government is generally appreciated (f.ex. through the development of concepts and scenarios).

Organizing exercises and training
Through the organization of exercises and trainings, the federal government can support cities that sometimes lack the time and resources needed to conduct these activities on their own.

Creating and sharing of knowledge (based on past events)
A centralized effort to collect and share information on past disasters is widely seen as desirable.

Providing leadership in nationwide and regional planning and coordination
Since disasters do not respect municipal and cantonal borders, a federal government-led process to establish plans and improve coordination between sub-national actors would be welcomed.

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Appendix 1: Swiss metropolitan statistics. Swiss Federal Statistical Office's (FSO), 2015.

Cities (Agglomerations)	Surface area, total (in km²) Status: 2014 (31.12.2013)	Permanent resident population, total Status: 2014 (31.12.2013)	Population density per km² Status: 2014 (31.12.2013)	Workforce per inhabitants Status: 2014 (31.12.2013)	% of workforce employed in the ICT-sector (incl. media) Status: 2014 (31.12.2013)	Overnight stays in hotels by non-residents per year and per inhabitants 2014	Commuters per inhabitants Status: 2014 (31.12.2013)	Building and traffic areas (% of total surface area) 2004–2009
Zurich	87.9 (1086.1)	384'786 (1'232'634)	4378.5 (1135.2)	1.2 (0.7)	8.4 (7.0)	7.6 (3.8)	1.1 (0.6)	50.9
Geneva	15.9 (478.1)	191'557 (546'122)	12024.9 (1142.8)	0.9 (0.7)	3.7 (4.3)	10.7 (5.6)	0.7 (0.4)	75.6
Basel	24.0 (481.2)	167'386 (508'640)	7000.7 (1057.2)	1.1 (0.7)	3.1 (2.7)	6.9 (3.0)	0.9 (0.4)	74.7
Bern	51.6 (479.0)	128'848 (361'700)	2496.1 (1057.2)	1.4 (0.7)	5.2 (6.4)	5.6 (2.3)	1.4 (0.8)	38.0
Lausanne	41.3 (314.3)	132'788 (351'469)	3209.0 (1118.4)	0.9 (0.7)	5.4 (5.1)	5.7 (3.3)	0.9 (0.6)	35.7
Luzern	29.1 (197.6)	80'501 (216'126)	2770.2 (1093.9)	1.0 (0.7)	3.7 (3.9)	15.1 (7.0)	1.0 (0.7)	39.4
Lugano	75.9 (243.2)	62'792 (140'709)	826.4 (578.5)	0.9 (0.7)	4.7 (5.4)	8.2 (6.8)	0.7 (0.5)	16.5

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