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Discussions

The connection between long-term and short-term risk management strategies: examples from land-use planning and emergency management in four European case studies

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Abstract

The need for continuous adaptation to complex and unforeseen events requires enhancing the links between planning and preparedness phases to reduce future risks in the most efficient way. In this context, the legal-administrative and cultural context has to be taken into account. This is why four case study areas of the CHANGES[1] project (Nehoiu Valley in Romania, Ubaye Valley in France, Val Canale in Italy, and Wieprzówka catchment in Poland) serve as examples to highlight currently implemented risk management strategies for land-use planning and emergency preparedness. The strategies described in this paper were identified by means of exploratory and informal interviews in each study site. Results reveal that a dearth or, in very few cases, a weak link exists between spatial planners and emergency managers. Management strategies could benefit from formally intensifying coordination and cooperation between emergency services and spatial planning authorities. Moreover, limited financial funds urge for a more efficient use of resources and better coordination towards long-term activities. The research indicates potential benefits to establishing or, in some cases, strengthening this link and provides suggestions for further development in the form of information and decision support systems as a key connection point. Aside from the existent information systems for emergency management, it was found that a common platform, which integrates involvement of these and other relevant actors could enhance this connection and address expressed stakeholder needs.

1 Introduction

According to global and European reports (EEA, 2010; UNISDR, 2011), in past decades the number of disasters caused by natural hazards has demonstrated an increasing trend fuelled by changing contexts in socio-economic, environmental and cli-

[1] Marie Curie ITN CHANGES – Changing Hydro-meteorological Risks as Analyzed by a New Generation of European Scientists.

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matic patterns. Particularly in the target study areas of the CHANGES project (Fig. 1), it is evident that damages have occurred in recent years due to extreme events resulting from hydro-meteorological hazards. This is made apparent through examples such as the flash floods that struck in August 2005 in the catchment of the Targaniczanka stream (tributary of Wieprzówka River, Poland) that repeated in the spring of 2010. Evidence is further found in the French case study site through flood events caused by peak discharge of the Ubaye River in May 2008 (Barcelonnette Basin in Alpes-de-Haute-Provence) and in the Romanian case study with the flash flood event in 2005 that affected the Nehoiu Valley in Buzău County which resulted in substantial economic damages. Finally, within the Italian case study, evidence is given through the intense flash flood event in the Fella Basin (Val Canale in the Friuli Venezia Giulia Region) that occurred in August 2003 and caused hundreds of millions of Euros in damages and even human casualties.

Changing contexts in a long-term and short-term perspective should be managed within an integrated risk management framework that accounts for both temporary management strategies and permanent preventive measures to reduce the impact of natural hazard processes (Fuchs et al., 2012). Both long-term and short-term risk management strategies are equally important. An integrated or comprehensive risk management approach, however, asks for coordinating and weighing up different risk management options and then choosing the best combination of measures and practices available in order to achieve the most efficient strategy. For clarification, this paper considers a strategy to be a broader, more goal or vision-based agenda. A policy is considered to be less broad and serves more as guidelines for action used to work towards achieving the strategy. Measures and practices are considered to be the actions actually employed following the guidance of the policies which work towards the achievement of the main goal or strategy.

Furthermore, an integrated approach suggests not only a combination of long-term and short-term measures but also the interaction between the actors involved towards policy agreements for the successful implementation of risk strategies. This has also

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been stressed by the European Commission, which underlines the requirement of "linking the actors involved in developing and implementing measures that can have significant impacts on disaster prevention" (European Communities, 2009, p. 6). Within this paper, short-term risk mitigation refers to emergency management (preparedness and response) measures aimed to minimize the impact of a disaster, to be prepared for a crisis situation and to be able to immediately respond. In contrast, examples for long-term measures include permanent technical (structural/non-structural) measures as well as spatial planning, which is inherently a future-oriented activity that can implement long-term prevention measures. The coordination of short-term and long-term management strategies is not an easy task, mainly due to the often existing void between crisis management and risk prevention (Neuvel and Zlatanova, 2006) or the disconnection of actors involved (Sapountzaki et al., 2011). It also often implies a conflict of objectives since, for instance, regulations related to regional planning and development include several other aims besides prevention of natural hazards (Holub and Fuchs, 2009). Moreover, the legal framework as well as the political-administrative system significantly determine how risk responses are designed and by which institutions they are implemented (Greiving and Fleischhauer, 2012). In addition, cultural beliefs play an important role how risks are perceived, evaluated and managed (Angignard et al., 2013).

In this paper, we consider the need for connections between long-term and short-term management strategies with a specific focus on spatial planning and emergency preparedness, considering different risk cultures and legal settings in the four case study areas of the CHANGES[2] project that were identified via expert interviews and stakeholder meetings conducted with the following interview partners: decision-makers in municipal offices (including mayors and local crisis management teams), volunteer and professional fire brigades, civil protection, regional and district level crisis management offices, spatial planners, sectoral planners (e.g. representatives from water au-

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thorities, geological surveys, and environmental protection agencies). The highly valuable input from these interview partners in addition to supporting literature serves as the basis for the analysis of in-practice examples for spatial planning and emergency preparedness management and their existing and potential connections.

Section 2 gives a brief background of what is meant by risk management strategies within the research. Sub-sections are divided into a focus on spatial planning and emergency preparedness containing explanation and examples of these strategies within each of the case study sites. Section 3 provides the connection between spatial planning and emergency preparedness in the context of the case study sites, focusing explicitly on points for establishing and strengthening coordination for risk management strategies. Section 4 concludes the paper with final reflection on the key points for coordination and what remains to be investigated in further research.

2 State of the art of risk management strategies

Risk management strategies utilize and apply resources towards the ultimate goal of reducing disaster risks and the overall threats imposed by extreme events; thus, achieving disaster risk reduction (DRR) (Paul, 2011). The efforts to achieve this goal are made throughout all phases of the disaster risk management cycle (Fig. 2), which includes the phases of prevention (often interchanged with mitigation in DRR research), preparedness, response, and recovery (Baas et al., 2008). Within and across all phases at all administrative levels, DRM activities and processes are conducted for the design and implementation of strategies to improve the understanding of disaster risks, to reduce losses, and to control, avoid and transfer risks (IRGC, 2009; UN, 2009; IPCC, 2012). In this research, focus is placed on the first two phases of the DRM cycle which are defined as follows based on Alexander (2002, p. 5):

- Prevention: actions taken and decisions made to reduce the threat (potential for tangible and intangible losses) of disaster consequences in the future, typically divided into structural and non-structural measures.

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– Preparation: given the preeminence of a threat, actions taken and decisions made to reduce the impact of the impending disaster.

A clear example of the distinction between the two terms is given by Alexander (2002) where, in the case of security measures for a potential levee failure, the planning of the emergency evacuation falls within prevention while the execution of the plan falls under preparation (Alexander, 2002).

The activities and processes conducted by emergency management and spatial planning practices constitute key components of DRM. Overlaps between these two components exist especially in terms of actions taken and decisions made within emergency preparedness (a part of overall emergency management) and regional and/or urban planning practices. Emergency preparedness is considered in closer association with actions and decisions which take place within a preparedness phase featuring a more short-term perspective, while spatial planning is best associated with that of prevention and a long-term perspective (Fig. 3). In practice, the emphasis on what actions are taken and decisions made varies depending on the consideration for and importance placed on short-term and/or long-term strategies.

Often, and from what has been revealed from the CHANGES case study research, greater action and policy attention is given within phases that require a limited window of available time for decision-making. These are, namely, the response and recovery phases as opposed to the prevention and preparation phases. This pattern applies also within the latter two phases where often the more immediately required actions for preparedness are given greater attention than actions for prevention. Reasons for this emphasis within the case study findings vary including limited financial resources, inability to target preventive actions due to uncertainty of the location in which the hazard will occur (e.g. especially for flash flooding), inter-institutional conflicts regarding responsibilities and abilities to construct structural mitigation measures, among other reasons. This focus can lead to a common pattern of risk management strategies, which tends to be highly disaster reactive. In consequence, this pattern reduces the realization of measures for prevention and preparedness which dramatically diminish potential

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losses as compared to measures taken later in response and recovery phases, especially for long-term planning strategies (Pelling and Schipper, 2009; UNISDR, 2009b; EEA, 2012). Nevertheless, some in-practice examples from case study analysis reveal that long-term focused strategies are pursued for example where long-term land-use planning strategies are well-enforced.

Risk management strategies for both emergency preparedness and spatial planning are dependent upon the "place" or national, regional and local context (e.g. including the institutional, social, geographic, and physical characteristics) in which they are developed (Cutter et al., 2003). This context is especially important to consider as one management practice in one case study is not necessarily suitable for application in another. Thus, taking a case study approach to understanding emergency preparedness and spatial planning at regional and local levels is crucial for consideration of the different case-specific contexts and the respective in-practice connections between these two components of DRM. For each case study presented in this paper, examples are provided which demonstrate the types of measures employed for both spatial planning and emergency preparedness with focus on the importance of encouraging their connections in risk management strategies. The benefit of strengthening this connection is pertinent especially for the nature of the threats caused by multiple and sudden onset hazards such as flash floods and landslides, as dealt with in the CHANGES project. Therefore, the need for continuous adaptation to complex and unforeseen environments requires enhancing the links between planning and emergency preparedness while acknowledging the roles, needs and values of the involved parties (Comfort and Kapucu, 2006; Garcia and Fearnley, 2012). This integrated approach can have strong implications both in long-term and short-term perspectives to strengthen the resilience of a community before, during and after a disaster strikes.

The sub-sections following this section provide a brief elaboration of the roles of spatial planning and emergency preparedness practices within DRM strategies in general. The sub-sections then delve explicitly into the details of these strategies within each case study site. More precisely, the sections offer specific examples and results from

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the analysis of field site visits and commentary from interview partners in each case study, contributing to the understanding of these practices at a more local level.

2.1 Role of spatial planning for risk management

Spatial planning is undeniably one of the major contributors to DRR. By regulating the long-term usage of space it can determine the distribution of people and development structures and decide on the location, the type and the intensity of a planned development. An appropriate allocation of the different land uses can thus influence exposures to natural hazards and minimize or prevent damages to life and property (Sutanta et al., 2010). Consequently, planners can either increase or decrease risk through decisions on how and where to build houses, infrastructure and facilities. They have certain instruments at hand, which clearly affect risk reduction activities, but their effectiveness depends to a certain extent from the national planning system they are embedded in. Although spatial planning in general has competences in all phases of the disaster risk cycle, its main competences lie in the prevention phase.

Within the prevention phase one can distinguish between structural and non-structural mitigation measures. Especially in regard to non-structural mitigation, spatial planning has notable competences, e.g. in terms of reducing the damage potential with zoning instruments that regulate future development. Its main characteristic or the main task of land-use planning instruments consists in guiding new development away from hazardous areas, i.e. leaving hazard-prone areas free of development, as well as determining and restricting future land uses. Non-structural measures also involve the relocation of existing developments into a safer area (Greiving, 2004). For an enforcement of restrictions of land-use, hazard maps are needed which serve to display hazardous areas and thus help to designate areas with settlement restrictions in local land-use plans (Schmidt-Thomé, 2005; Greiving and Fleischhauer, 2006).

Concerning structural mitigation measures, at the local planning level authorities can influence building permissions through their legally-binding land-use plans. Building standards can be used that aim at specific regulations to protect settlements and in-

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frastructure (Schmidt-Thomé, 2005). Spatial planning instruments ensure building code compliance and an efficient quality of construction (Sapountzaki et al., 2011). Such building standards can be traditional building codes, flood-proofing requirements, requirements regarding the retrofitting of existing buildings etc. (Burby et al., 2000). Examples include the prohibition of a basement or the strengthening of the outside wall (Schmidt-Thomé, 2005).

In regard to reactive, short-term activities, the role of spatial planning is rather small (Schmidt-Thomé, 2005). However, it can still have a supporting role. For instance, it has to consider the needs and interests of emergency response units. The development of evacuation plans and the location of emergency shelters are always related to current and future urban development (Sapountzaki et al., 2011), which is why spatial planning has to ensure that any inhabited area or industrial facility is reachable in an appropriate time in case a disaster strikes. It also has to anticipate potential adverse impacts on roads and response stations and thus plan for an appropriate accessibility with different means of transport (Schmidt-Thomé, 2005; Greiving and Fleischhauer, 2006).

In the four case study sites of the CHANGES project, spatial planning as a risk prevention instrument is regarded with different degrees of importance. Whereas in three sites (the French, Italian and Romanian study areas) authorities rather rely on structural mitigation measures, in the Polish case study site authorities underline the essential role of non-structural mitigation in form of restrictive land-use planning.

In Poland, flood and landslide prevention is directly linked with local land-use planning. In the Polish study area, the Wieprzówka catchment in the Małopolska voivodship, interviewed mayors highlighted the importance of non-structural mitigation measures, whereas the number of structural mitigation measures in the municipalities concerned is negligible. Therefore, the main activities addressing risk reduction consist of regulatory zoning in terms of determining, restricting or prohibiting future uses and developments. The reason for a rather reserved implementation of structural mitigation measures can be the limited financial means which are not sufficient to stabilize all landslides and to protect all areas at risk, as stated by local authorities in Stryszawa

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municipality. It was also argued by public authorities in the municipality of Andrychów that implementing structural measures required a better identification and understanding of the areas at risk. However, the uncertainty about (a) which and how many areas are at risk and (b) what is the probability of future events, result in a limited amount of structural mitigation measures. For instance, floods in this area occur suddenly and there is neither much time for preparation, nor it is easy to predict which zones or places might be hit. Due to the difficulty of assigning the best places for structural measures, local authorities rely on land-use planning competences to reduce the risk. Another obstacle to implementing structural measures is the distribution of legal competencies. River banks are commonly known places where structural measures are needed. However, they are under the administration of separate authorities and the local authorities are unable to do anything without an agreement with the responsible water board. As regards landslides, an online information system called SOPO ("System Osłony Przeciwosuwiskowej") is currently under construction in the Polish Carpathians. First available results give hope for a better identification of areas at risk for urban planning purposes and simultaneously impose a task of formulating adequate land-use regulations.

The situation in the Italian Fella River catchment is different. After heavy rainfalls in 2003, which caused severe flooding and landslides, several mitigation works have been completed in the towns of Malborghetto and Ugovizza by the civil protection agency of the Friuli Venezia Giulia region as an immediate reaction to the disaster. Officials of Malborghetto-Valbruna explained, that due to the existing problem of continuous outmigration from the valley, structural measures were considered as effective and necessary option to prevent both having to relocate people and having people leave. Furthermore, according to a representative of the river basin authority, in the Fella River catchment 90 % of the events occur at more predictable or even at the same places. This is why the civil protection can more easily identify the most affected areas and better anticipate disasters. The authors conclude that the importance of spatial planning related risk management activities is rather low. Nonetheless, spatial planning can currently contribute in terms of prohibiting new construction in hazard-prone areas

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thanks to the so-called “Piano stralcio di assetto idrogeologico” (PAI), a legally-binding plan providing one map each for hydrological, geomorphological and avalanche hazards. The PAI promotes a risk reduction oriented spatial planning by displaying areas exposed to hazards in four different levels (moderate, medium, elevate, highly elevate) (Fig. 4). In addition, the map for geomorphological hazards also shows the elements at risk, i.e. a parameter for vulnerability, and existing structural defence works. Contents and prescriptions of a PAI need to be considered in all planning documents, i.e. their provisions are legally binding for local authorities as well as for the private sector (Galderisi and Menoni, 2006). In the Fella catchment, the PAI has been adopted but not yet approved. Nonetheless, the current available version already has to be used in local spatial planning.

In the town of Nehoiu in Buzău County, Romania, the lack of funds clearly is the biggest problem. The insufficient budget immensely limits actions at the local level. Nonetheless the focus lies on structural mitigation measures, as dams and other built structures are considered to be most effective in the short-term. In fact, several interview partners in the Nehoiu town offices indicated that there is no possibility to consider a long-term perspective because of the need to first try to manage short-term problems. Within this case study, the role of spatial planning in risk management is rather low and its use as a risk prevention tool is not fully taken into account. Planning decisions at the local level are often based on local knowledge and experiences, as commented by an urban planner in Nehoiu town. For instance, current planning practices merely prohibit construction in areas where the landslide risk is known or a landslide already exists. According to a representative of the local planning department, in areas where a potential risk of landslides exists building permits are usually granted. Illegal building also constitutes a problem and adds to an increasing risk. The role and purpose of regulatory zoning as a risk mitigation measure is known and its benefits are acknowledged, still the commune is both limited in its actions in this regard and considers structural measures as even more effective. Reasons for this approach may be the lack of hazard- and risk-related information that could be used in land-use planning (esp. hazard and

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risk maps) as well as a missing acceptance of the population for a more preventive planning approach, which influences current planning decisions and activities.

In regard to the importance of structural vs. non-structural measures, the situation in Barcelonnette, a commune in the Ubaye valley, is in a way similar to the one in the Fella River catchment. In general, structural measures are considered as very effective and practical. Since the commune is already quite densely populated and developed, the zoning option and the designation of retention areas do not seem to be feasible, at least not in regard to protecting already existing developments. Thus, structural measures like the elevation of a dyke have proved to work and are also accepted by the population. However, it has to be stressed that in the year 1995 the French government has implemented a very strong and influential risk prevention instrument which has essential effects for non-developed areas: the "Plan de Prévention des Risques Majeurs", PPR (Risk Prevention Plan)[3]. The PPR (Fig. 5) is an instrument designed for the prevention of any type of hazard, including, among others, floods, landslides, rock falls, earthquakes and avalanches (European Communities, 2000; Mancebo, 2009) and determines where building is allowed (white zone), not allowed (red zone), or allowed under certain conditions following specific regulations (blue zone). The PPR is therefore particularly important in terms of prohibiting new development in risky areas (red zone) or adapting building structures to present risks (blue zone). However, in order to protect existing structures such as the departmental road and houses along the Ubaye river, structural measures are necessary, however.

While in France and Italy comparably strong and separate risk prevention instruments provide for compulsory consideration of hazards or risks respectively in spatial planning, in Poland and Romania the obligation of taking hazards into account exists, but the realization differs. In the former two cases maps, with comparably clear delineations of the hazard or risk levels exist. In the latter two cases only information

[3]France has a well-elaborated framework of natural hazard management due to the long tradition of hazard mapping and risk management instruments and the prevention of risks has always received great attention.

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about the extent and the intensity of hazards is used. In the case of the Romanian site decisions are often based entirely on local knowledge and experiences. Despite the compulsory use of spatial planning as a tool for risk prevention, it is not equally considered as effective as structural mitigation measures. However, there are opportunities for planning to be the more efficient strategy in the long run.

2.2 Role of prevention and preparedness for emergency management

Typically, activities for emergency management aim at safeguarding people and assets exposed to particular threats while incorporating the "organization and management of resources and responsibilities for addressing all aspects of emergencies, in particular preparedness, response and initial recovery steps" (UNISDR, 2009, p. 13). Overall, emergency management requires a fast or near real-time provision and absorption of information for hazard and vulnerability identification. Communication is based upon the coordination of different organizations such as government agencies, local administrations, non-governmental and volunteer forces (Comfort and Kapucu, 2006; De Leoni et al., 2007), in which local volunteers and crisis management teams are often the first responders (Fischer, 2008). Despite the short-term focus, emergency activities comprise all four major types of strategies for risk management: hazard mitigation, disaster preparedness, emergency response and disaster recovery (Lindell, 2013). Consequently, effective emergency management includes preventive actions that protect passively against casualties and damage at the time of hazard impact. Such extended management perspective represents a proactive resilience approach to strengthen the communities' capacity before, during and after a disaster strikes (EC, 2012). This is opposed to a reactive resilience approach that focuses on emergency response to reduce casualties and damage when an event takes place (Adger et al., 2005).

By taking into account the imminent probability of the event and the limited time for decision-making, activities for emergency management mainly rely on the implementation of emergency plans and early warning systems (Mens et al., 2008). The former define a chain of actions, actors and resources that are required in order to

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be better prepared and to better respond in case of specific risk scenarios (Piatyszek and Karagiannis, 2012; Sterlacchini et al., 2014). The latter encompass the monitoring and identification of triggering factors for hazard events, which may be citizen and technically-based. The overall aim is the activation of warning messages for the implementation of either active or passive temporary measures that reduce vulnerability and risk consequences (Rogers and Tsirkunov, 2010; Verkade and Werner, 2011). Examples of active temporary measures are the operation of protection works like dams or the allocation of sandbags to increase the height of levees. Instead, examples of passive ones correspond to the reallocation of building furniture and appliances to higher floors or the evacuation to safe areas (Holub and Hubl, 2008).

However, in case of sudden-onset hazards such as flash floods and debris flows, time is a crucial restriction to activate warning messages and to support the implementation of emergency plans at the time of hazard impact. In this case early warning can only benefit people and movable objects and not stationary objects such as infrastructure (Hübl, 2000). In addition, long-term and short-term changes contribute considerably to the risk levels regarding the temporal and spatial distribution of buildings and people exposed (Aubrecht et al., 2013). Consequently, there is an imperative need to enhance communication and coordination activities beyond emergency response while accounting for the interaction between different actors involved in risk prevention and preparedness. This holds especially true for spatial planners and emergency managers if one considers their essential need to share common critical data, particularly for mountainous environments where hazards often occur unexpectedly and rapidly.

When comparing the emergency management structures within the four case study areas of the CHANGES project, the mayor has the legal responsibility for disaster management at the municipality level. Regional and national levels provide support for lower tiers of emergency management. This support depends on the spatial extent and intensity of the event as well as the exhaustion of local resources for event management (Gaetani et al., 2008; Dworzecki, 2012). Moreover, competences of emergency management at the regional level integrate activities to promote risk prevention, monitoring

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and forecasting activities that respect the national principles. In the French site, such competences are based upon the “Seven pillars of French prevention policy”. These pillars include, among others, the understanding of phenomena, unexpected events and the risks they pose, monitoring and reducing vulnerability (MEEDDM, 2011). In Friuli Venezia Giulia, a functional centre at the regional level supports local administrative levels for forecasting, warning, coordination of emergency plans and response. This centre is structured according to the national legislations (Law No 225/1992, Legislative Decree No 112/1998, Law No 401/2001 and Law No 100/2012) and further adapted according to regional legislations. In the Romanian site, emergency committees operate according to the Government Emergency Ordinance 21/2004 for the implementation of national strategies at lower administrative levels into emergency plans and by planning exercises to maintain awareness and to inform citizens. For the Polish site, these competences for crisis response plans and programs are stipulated within the Act of 26 April 2007 on crisis management.

In addition to the above legal framework and with reference to preparedness activities, all case studies receive warning information from meteorological services. Overall, monitoring and warning systems are more specialized and automatic in the French and Italian sites as compared to the Polish and Romanian sites. Despite the differences, there is a common interest to develop early warning systems based on modelling approaches and triggering thresholds while incorporating local knowledge and citizen-based approaches. Additionally, in all study sites emergency plans are recognized as key instruments to support preparedness and response activities. Particularly in the French and Italian cases, there are available platforms to manage and update emergency plans whereas in the Polish site information systems are devoted to support crisis management. Moreover, the implemented systems support comprehensive databases to collect and share data on the occurrence and damages of flood and landslides. In contrast, in the Romanian site regional (county level) emergency authorities acknowledged the need for developing a platform and tools to support their activities.

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Such integrated platforms could also support the scientific identification of dangerous areas by sharing and combining it with local knowledge on past hazard events.

In practice, the competences of emergency management for each study site are generally driven by the level of involvement of regional and local authorities in prevention and preparedness activities as opposed to response and recovery phases. In this regard, the interaction with private and volunteer organizations is considered as a relevant aspect to support proactive resilience approaches. The Italian site is an example of strong community involvement in volunteer activities. The Friuli Venezia Giulia model of volunteer activities follows an historical tradition of fire brigades that was enhanced after a devastating earthquake in 1976 (Bianchizza et al., 2011). For the Romanian site, different categories of stakeholders in Buzău County (e.g. Regional Environmental Protection Agency as well as local and regional bodies of emergency management) identified the need to promote and adjust voluntary activities to the local context. In the Polish and French sites, the local level involvement in emergency activities is limited to fire brigades that are the first responders in case of emergency.

The overall risk management focus also varies according to the distribution and coordination of funding as well as other types of financial means to support not only preparedness and response but also to promote instruments to prevent losses. In the Italian site, after the 2003 event, a large sum of approximately 40 million Euros was spent on remediation works in the form of restoration works and recovery from damages to affected infrastructures (both private and business structures) among others. Additionally, a large sum of money was spent on structural mitigation measures such as check dams and channels (Fig. 6). Consequently, large investments were made in prevention measures. However, in general, two thirds of the annual costs of the Italian civil protection system (around 1.7 billion Euro) is used to refund payments accrued during previous disasters (Gaetani et al., 2008), i.e. for recovery. In the French site, it became apparent that attention is paid to both prevention and preparedness. One of the reasons may be that the French system for natural disaster indemnification combines the solidarity idea behind mutualisation – related to an existing risk and through payment

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of premiums – with the national solidarity principle by guaranteeing indemnification granted by the State (Consorcio de Compensación de Seguros, 2008). Therefore, the State has also a financial interest to provide for the best prevention and preparedness possible in order to reduce and minimize potential damages before a disaster strikes. In contrast, in the Romanian site, the limited operative resources and lack of funds focus most efforts on the preparedness and response phase regardless of the importance of prevention activities, as recognized by interview partners. In the Polish site, the limited funds are distributed among the preparedness and response instruments that are in place (i.e. early warning and information systems for crisis management). In general and in looking beyond the scope of the case study findings, other preventive measures in addition to zoning regulations are rarely implemented at local level due to difficulties in ownership rights and distribution of responsibilities. As a result, municipal authorities must deal with the future risks arising in emergency situations rather than taking preventive actions in advance[4].

While Sect. 2 focused on the role of both spatial planning and emergency management for risk management in general and by providing examples from the case study sites as well as on explaining the respective focus of risk management strategies, the next section will highlight currently existing connections between the two. It will also provide reflections on how these links could even be further developed and strengthened.

3 Coordination of emergency preparedness and long-term spatial planning activities

As stated above, disaster risk management includes activities before, during and after a disaster occurs. At the same time a question that is often raised is whether the fo-

[4]These results corroborate statements found in the literature and experiences made in other case study related researches (e.g. Fleischhauer et al., 2006; Sapountzaki et al., 2011).

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cus should be on pre-disaster measures in terms of risk prevention or on post-disaster measures, i.e. emergency response. Sapountzaki et al. (2011) argue that emergency planning often plays a bigger role than prevention planning. This can be regarded as a concern as generally both should be considered equally important: the former because it primarily ensures the prevention or at least the reduction of adverse consequences from a disaster. Preventing a disaster in the first place should be the primary goal. However, the latter is just as essential because, due to the residual risk, a well-functioning emergency system is vital for any society (Neuvel and Zlatanova, 2006). Moreover, risk levels vary remarkably on different temporal and spatial scales: on the one hand due to long-term socio-economic development that can be regarded as the basic disposition. Therefore, permanent constructive mitigation measures and land-use regulations should be implemented. On the other hand short-term fluctuations in the frequency and magnitude of events ask for emergency plans and temporal measures such as immediate support and evacuation (Fuchs et al., 2012). Neuvel and Zlatanova (2006) further mention the need for investments that address both risk prevention and crisis response to make a society more resilient to disasters. However, this requires effective coordination not only among different disciplines and policy areas but also across all phases of the disaster risk cycle (European Communities, 2009) of all risk management approaches involved.

In this regard, attention has to be paid to the inter-linkages between spatial planning and emergency management, especially within the prevention and preparedness phases. Neuvel and Zlatanova (2006) note that, although emergency management units and spatial planners work in different environments and time frames, they are concerned with similar safety issues. As mentioned above, spatial planning is involved in emergency management and vice versa. In spatial planning, integrated risk and hazard maps are essential to enable the inclusion of a DRR strategy into land-use plans (Sutanta et al., 2010). Disaster hot spot locations can be identified with the practical knowledge inputs of emergency managers, such as safety recommendations provided by fire departments, for instance (Neuvel and Van den Brink, 2009). The information

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obtained from emergency response units can provide more insight into useful risk reduction measures as well as to what interests need to be considered if emergency management concerns are addressed (e.g. areas required for emergency response and spaces for shelter, evacuation routes, accessibility of residential and industrial areas by emergency response units in case of a disaster, allocation of response stations, etc.) (Greiving and Fleischhauer, 2006). At the same time, spatial planning authorities have information on planned development in hazard exposed areas as well as on vulnerable zones and elements, which should be communicated to emergency services for inclusion in the emergency management plan. In general, spatial information in form of maps and models is appreciated by both entities, spatial planning and emergency management authorities. Accordingly, there are essential links between spatial planners and emergency managers to achieve better preparedness and response activities in risk management. Linking all actors within an integrated response strategy towards disasters throughout the whole disaster management cycle (Greiving et al., 2012) can be regarded as a key prerequisite for successful disaster reduction. Consequently, it is not only important to coordinate risk management activities at the same temporal scale but also to support cooperation between the different actors involved.

However, Sapountzaki et al. (2011) recognized that actors involved in risk management are hardly connected to each other. Young (2002) refers to this problem as the "problem of interplay". The problem of interplay constitutes a particularly crucial factor for the mitigation of spatial risks (Greiving and Fleischhauer, 2006). Institutions should not be regarded as individual arrangements but rather be seen as part of a wider network, since they interact with other arrangements both vertically and horizontally (Young, 2002). The existence of disconnected actors can partly stem from a historically fragmented administrative system. Often there are no linkages among the actors involved, which means that activities and information transfer run parallel and there is no real exchange (Greiving et al., 2012). In addition, funding is also often fragmented. As a result, the – mostly limited – resources are used in a rather ineffective and inefficient manner (Greiving et al., 2012), thus reducing key success factors. Neuvel and

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Zlatanova (2006) found that models and systems developed by emergency units are hardly used by spatial planning authorities. Moreover, spatial planning authorities use systems with information on the location of vulnerable assets, which can be of importance for emergency services. Whereas regional and local planners strongly focus on the location of urban development or safety measures for construction projects, emergency managers mainly focus on organizational aspects, such as surveillance, coordination, communication or logistics (Caragliano and Manca, 2007). Nevertheless, the physical characteristics of an area greatly influence the possibilities for emergency management. Therefore, alignment of information and actions among risk actors can increase the coherence of safety measures (Neuvel and Van den Brink, 2009). This potential alignment of emergency services and spatial planning has been examined in the CHANGES case study sites.

In France risks are rather managed in a whole system. Procedures addressing risk assessment and management have become more integrated and tend to cover the whole disaster risk cycle. Interviews conducted in the Ubaye Valley provide the impression that risk prevention and emergency preparedness and response are considered equally important. What must be additionally considered is that the emergency system in France "has moved toward an integrated risk management policy partly to become a key element of local planning and local policies" (Renda-Tanali and Mancebo, 2010, p. 10). There are two examples of this which demonstrate clearly the positive approaches which should be further investigated in future research.

During the preparation or the revision of a "Plan Local d'Urbanisme" (PLU), the commune can consult the "Service Départemental d'Incendie et de Secours", SDIS (Departmental Fire and Rescue Service) that provides a technical advice which addresses specific requirements attached to the project in question. These requirements concern prescriptions regarding minimum constraints for the accessibility of emergency services, the protection against fire risks and the consideration of major risks, including floods and forest fires. The prescriptions must be respected during the realization of future local planning projects within these zones. According to the first paragraph of

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Article L.126.1, National Law no. 53/508 (Urban Planning Code), the prescriptions of the SDIS rate as “servitudes” (easements) and shall be annexed to the regulations of the PLU.

In general, the mayor has responsibilities in all phases of risk management: prevention, preparedness and early warning as well as emergency response. There are several informative and regulatory instruments dedicated to natural risks. Besides the PPR as a regulatory instrument for risk prevention, mayors make use of a local document for emergency preparedness and response called “Plan Communal de Sauvegarde” (Communal Safeguard Plan, or PCS). The plan governs actions and measures to be taken during and after a disaster (Renda-Tanali and Mancebo, 2010). It intends to combine all local documents contributing to preventive information and the protection of people. According to Article L731-3 of the Inner Security Code (Code de la sécurité intérieure) the PCS is only obligatory for communes that are endued with a PPR. No direct link with local planning documents are found in the legislation, which means that the PCS does not – necessarily – take into account information included in a SCot (“Schéma de cohérence territoriale”) or a PLU, nor does a PLU have to consider the contents of a PCS. In the French case study site of the CHANGES project it was expressed by urban planners, that the consideration of the PCS during the elaboration of a PLU is regarded as useful. Since the document integrates different kinds of information, it could be a valuable source of information for local planning practices. Vice versa, knowledge about elements at risk (sensitive buildings and infrastructures exposed to hazards) is vital for the elaboration of a PCS (DDSC, 2009). However, according to the “Guide pratique d’élaboration” (Practical Guide for Elaboration) of the PCS, spatial planning documents do not constitute any of the sources mentioned to be consulted for information (DDSC, 2009), although spatial planning usually disposes of this vulnerability related information, “since such facts as the current distribution of population, the location of settlement areas, or technical infrastructure is basic information which is already needed for any kind of spatial planning activity” (Greiving, 2006, p. 186). In this

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context, linking the PCS and planning documents can be seen as an asset in aligning prevention, preparedness and response activities.

Consequently, potential linkages and possibilities for coordination between emergency management and spatial planning are apparent, but it seems that so far coordination only takes place in the form of a technical advice provided from an emergency management authority towards local planning. It appears that no information is exchanged in the other direction, which means that a two way communication process does not take place. There are, however, opportunities to establish such links, especially in the preparedness phase.

In many Italian regions the main actor in regard to emergency preparedness and response is the "Protezione Civile" (civil protection). In their review of the Italian national civil protection system, the OECD (2010, p. 11) concluded, that "Italy has implemented a coherent, multi-risk approach to civil protection that fully integrates scientific research and technological expertise into a structured system for forecasting and early warning of natural disasters". The National Department of Civil Protection is a system coordinated by the Prime Minister and benefits from its position under direct authority of the Italian government (OECD, 2010). This shows the great importance that is attached to emergency response operations and recovery. Similarly, the observations and interviews from the CHANGES research allow one to reach the conclusion that risk management approaches seem to be very disaster reactive, especially in regard to funding. A great part of the governmental budget is dedicated towards emergency response activities (see Sect. 2.2).

Spatial planning as a tool for risk prevention has a less prominent role and planning requirements for construction and buildings are often set aside (OECD, 2010). However, with the PAI (see Sect. 2.1) Italy has quite a powerful risk prevention instrument in regard to planning activities. The problem is not the existing planning instruments themselves but a need for better implementation of prevention policies. Another prerequisite is the reinforcement of urban planning codes, e.g. through robust enforcement measures that may include thorough inspections, higher incentives for retrofitting and

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stronger penalties and efficient sanctions in case of legal violations (OECD, 2010). In particular, illegal building is still a widespread problem throughout Italy – with the exception of the Valle d'Aosta region. In the year 2003 alone, 40 000 illegal buildings were constructed (Fiorillo et al., 2007). It is evident within the Italian case study that there is a stronger focus on emergency management as opposed to spatial planning. However, in considering how to move towards equilibrium, attention must be paid to the links between these two approaches.

It is noted by Galderisi and Menoni (2006, p. 103), that only "very few regional planning acts specify the links between general planning tools and civil protection tools". As a further problem these authors state that even though risk management instruments exist for all phases of the disaster cycle, they do not create an effective sequence of actions and a coordination of activities[5]. Furthermore, the OECD (2010) highlighted that the NCPS (National Civil Protection Service) has no responsibilities in prevention policies and that it would be beneficial if the NCPS had more competencies related to these policies. After all, it is virtually assigned relevant capabilities and experiences in prevention strategies. Bignami's (2010) reflections lead into the same direction. He recognizes the need for a broader role for the modern civil protection by contributing to the determination of long-term choices. The author asserts this also for territorial structures, provided there is collaboration with authorities dedicated to land-use, construction standards and the realization of public buildings. He continues to explain that a closer collaboration between spatial planners and civil protection services is needed in order to benefit planning practices.

[5]A common pitfall, according to the UNHCR (2003, p. 12), is the fact that "everyone wants coordination, but no one wants to be coordinated". There are a couple of reasons why coordination efforts fail or why they are difficult to implement. Among others this regards the problem that actors involved, their information and their processes are not necessarily always transparent or accessible for everyone (UNHCR, 2003). This problem also hints at the imperative to share information, make it generally accessible and provide for transparency in order to ensure a better understanding of the overall system everyone is part of.

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In Friuli Venezia Giulia, there are some initiatives to support exchange information between civil protection and the regional technical services. The system SIDS is currently used to share information regarding the implemented infrastructure and protection works. It also allows the geological survey to validate hydro-meteorological events that are reported to the civil protection. However, despite efforts to exchange information between regional services, there is very limited coordination between authorities involved in civil protection and spatial planning. Expert interviews further revealed the fact that the civil protection of Friuli Venezia Giulia gives some specific opinions and guidelines to the municipalities regarding spatial planning but that the municipalities usually prepare the plan themselves, without consulting the civil protection. Municipalities are not obliged to ask the civil protection for advice but study the situation themselves. That means this link is neither formally nor legally stipulated. Furthermore, the municipalities generally have other studies at hand which they can make use of when elaborating land-use plans, which means that they have other sources than the civil protection. A representative of a fire department in Moggio Udinese (Province of Udine) criticized the missing coordination in the concrete case of a construction of a new bridge, which turned out to be too narrow for fire trucks. In short it was expressed that emergency planning is handled rather separate from spatial planning and that there is no real coordination.

In the Polish case study site, the main activities in regard to risk management seem to equally focus on regulatory zoning and emergency preparedness and response. In regard to the coordination of activities between spatial planning and emergency management no according legal regulation exists. At the Sucha Beskidzka district office and professional fire brigade it was expressed that there is only a limited flow of information with planning authorities. Information is at most exchanged with sectoral planning authorities, e.g. about places where protective work is needed. This was also confirmed in interviews with urban planners who state that generally there are very little connections with crisis management units.

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In order to distribute the sparse financial means most efficiently, different risk reduction options should be weighed against each other, which currently appears to be difficult, as there does not seem to be a strong level of coordination between different authorities involved in risk management. Furthermore the assignment of tasks, allocation of responsibilities and property rights are sometimes difficult and questionable. The system ARCUS 2005 (Fig. 7) which is currently used to exchange information between local and regional administrative bodies involved in emergency management is a good example of vertical coordination, since it displays the availability of measures and resources in case of a disaster. There is also a degree of horizontal exchange with different local authorities. However, this system is not being used by spatial planning authorities and consequently neither is the information it contains. Yet it was observed that such a system may be quite beneficial as a potential tool to exchange information. Moreover, in 2010 a web-based platform to report incidents was introduced in the crisis management center of the Małopolska voivodship, which constitutes the first web-based application for crisis management in Poland (Bombała, 2013). Future developments of the system include adding services, guards and inspections to the system and localizing crisis situations based on google maps (Bombała, 2013), i.e. a spatial component. This might hint at a potential future link with bodies on a more horizontal level, including spatial planning authorities. Recorded incidents and crisis situations related to natural hazards could hereby help identify hot spot locations. Providing spatial planners access to such systems could be a good opportunity to enhance their information about the nature of hazardous establishments and particularly endangered areas in their municipality or the region. This information could then also be used by planning experts for the development of spatial plans. Vice versa, spatial planning could provide information about vulnerable objects which could then be fed into the system. In the Polish case study site, similar to the Italian site, there is hardly any coordination or cooperation between crisis management units and spatial planning bodies. Additionally, there is also no formal obligation to establish such links and develop according processes.

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In Buzău County in Romania the interview partners explicitly acknowledged the importance of prevention. The problem again is the missing realization. It was stated in expert interviews at the Emergency Situation Inspectorate (ISU) that – based on statistical evidence – apparently prevention is eight times less expensive in the long-term than emergency response and that prevention is even more important than recovery. Still, more investments are made in emergency response than in long-term risk prevention. However, concerning cooperation between planning and emergency entities, Buzău County provides some positive approaches. For instance, the ISU in Buzău is directly involved in urban planning, since it is a member of the council that approves the local spatial plans. ISU officers give their opinion on these plans and also check the plans. Additionally, ISU elaborates a prevention plan based on the urban plan and integrates all different plans into the County Spatial Plan, among others the evacuation plan and the flood prevention plan. As confirmed in the interviews, there is a two-way information exchange between spatial planning and emergency services. The legal basis of this type of coordination can be found in the Law 350 of 6 July 2001 on spatial planning and urbanism, which states that urban planning documents must be approved by a so-called "Comisia tehnica de amenajare a teritoriului si de urbanism" (technical committee for spatial planning and urbanism), that, in order to improve the quality of decisions regarding local sustainable development, provides advice, technical expertise and consultancy (Law 350 of 6 July 2001, article 37 (1)). ISU has a member within this technical committee who is responsible for checking the document and looking for specific issues related to mandatory protection against fire as well as signaling whether issues that are related to natural hazards (landslides, floods, earthquakes) are either missing from the documentation or are only partly and not sufficiently addressed. It was confirmed in interviews that although a system for the management of emergency situations already exists, a platform is needed which involves several services, such as the spatial distribution of events, the modeling of probabilities, better visualizations and maps, etc. This would not only be helpful in terms of emergency management but also in terms of a better long-term planning at the county level.

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Viewing these case study examples within a wider scope, a main problem that evolves from a lack of coordination between long-term and short-term risk management strategies is the fact that actors do not coordinate their activities and compare different options. Adverse consequences resulting from an inefficient choice can be minimized by implementing cost-benefit analyses or by underlining the need for comparing different alternatives. Thus, duplication of measures and a misuse of funds can be reduced or even avoided. This might ensure investment in the implementation of what are the most effective measures and therefore, a more efficient use of funds. Since the lack of funds seems to be an overall problem in all of the case study sites examined, there is an urgent need to identify the best option available. An example from this can be shown when looking at the Italian case study site where structural mitigation measures were considered as most effective (Sect. 2.2). However, at the same time, all these constructions were also very expensive. Bearing in mind that the study area is characterized by outmigration, such a costly investment might indeed be the most effective one at the time of decision making, but it might not be the most efficient one in the long run. One has to weigh immediate benefits with future development and long-lasting purposefulness. Otherwise, funds could be spent in vain. Accordingly, a better cooperation between actors involved can enable a more efficient use of resources and better coordination of activities. In this respect, the implementation of a decision support platform, as being developed by the CHANGES project for instance, can help integrate all the available risk information and support the decision making process in the selection and implementation of different alternatives with the most relevant actors involved in risk management.

This solution has also alreaqdy been highlighted by Neuvel and Zlatanova (2006), who believe in the clear benefits of the use of effective open standard GIS systems. Those systems constitute an important instrument to support decision-makers in both risk prevention and emergency response (Greene, 2002). After all, the first step for a successful risk management strategy involving all actors consists of the capability to share and access all available information (Neuvel et al., 2010). How these actors use

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each other's data can be made more efficient through the implementation of a common spatial information system. Such a system can link different actors involved and may ensure an improved information exchange and a better coordination of risk prevention and emergency response activities (Neuvel and Zlatanova, 2006). The proposed SDSS (spatial decision support system) of the CHANGES project follows an even broader scope. Due to its explicit geographic component it does not only allow for an exchange of (geographic) information and facilitate the use of information. It additionally supports decision-making processes. Accordingly, the SDSS is targeted to be able to "... analyse the effect of risk reduction planning alternatives on reducing the risk now and in the future and support decision makers in selecting the best alternatives" (IncREO, 2013, p. 9) and therefore fulfils several purposes by addressing issues stakeholders previously identified as problematic.

4 Conclusions

This paper discussed the roles and competences of spatial planning and emergency management in risk reduction, while highlighting furthermore the fact that risk management activities of spatial planning and emergency management are interrelated. In this context the examination of four case study sites revealed several issues would be worth addressing in the future in order to strengthen or even improve the respective regions' and/or municipalities' risk reduction efforts.

In summary, it can be stated that there are indeed a few positive examples of approaches in the case study sites that show links between spatial planning and emergency preparedness to a certain extent. Yet, the case study in Romania is in fact the only example of a two way communication process. Here processes are even institutionalized and have a formal, legal basis. A benefit for this could be seen in the comprehensive role of the ISU which encompasses both civil protection units and firefighting units and consolidates several competencies under one roof. In the French case study this process takes place at least in one direction, i.e. the responsible unit for emer-

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gency management gives an opinion or a recommendation on the content of spatial planning documents. Here the already existing practices that try to link emergency management services and local planning could benefit from a more effective information exchange which promotes a two way communication and information flow. The fact that risk prevention and emergency preparedness and response are considered equally important constitutes a great asset for the development of more coordinated risk management strategies and for closer linking of all actors involved. In contrast, in the Italian and Polish case studies there is almost no coordination or exchange of information between the two actors. In such cases, there is considerable merit in reconsidering formal communication processes. Management strategies could benefit from institutionalizing such processes, for instance within the urban planning law and from formally intensifying coordination and cooperation between emergency services and spatial planning authorities.

Moreover, in many places computer information systems, web platforms or other databases exist that are predominantly used for emergency related activities, while spatial planners have limited access or use their own systems (e.g. GIS software). As mentioned in Sect. 3, an information exchange between spatial planning and emergency management can facilitate the work of both. This information exchange can be enabled through geo-informational systems that are shared by several bodies and entities and which allow access to risk-related information at a spatial and temporal scale. This need has been particularly stressed in the Romanian case study, where a comprehensive system or platform that extends over several fields, connects diverse actors and integrates all necessary information is regarded as a major support that could immensely facilitate risk reduction efforts. For the Italian and Polish case study sites the authors suggest that by extending the user group of already existing and planned future (geo)-information systems, different actors would be enabled to share common, essential information.

In regard to the orientation of the risk management approaches, some similarities and differences were observed. Especially in the case study sites of Romania and Italy,

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risk management approaches are rather disaster reactive; whereas in France, disaster prevention, preparedness and response are considered equally important. While in the French, Italian and Romanian case study sites structural mitigation measures form an important part of the prevention strategy, in Poland structural mitigation measures are rarely implemented. Instead, zoning regulations as a form of non-structural mitigation are considered more practical. Generally speaking, France and Italy dispose of separate hazard/risk prevention instruments (PPR and PAI), while in Poland and Romania different bodies provide maps displaying present hazards. In the specific example of the Polish case study, the Polish Geological Survey is currently working to develop and provide more useful landslide hazard maps, whereas in the Romanian case study hazard maps are not available yet but also currently in the course of being developed. In comparing the different approaches, the Polish case study appears to demonstrate a comparably high role of spatial planning in risk management and in the French and Italian case study sites, risk prevention instruments legally provide for proper consideration of natural hazards. For the Romanian case study site, opportunities are evident and should be encouraged in favor of strengthening spatial planning competencies in order to fully consider its potential contribution in risk reduction. This would require an enforcement of zoning regulations as well as greater resources directed toward current and increased awareness raising efforts for both local authorities and the public, especially for those efforts which help acknowledge the importance of spatial planning related decisions and regulations.

Uncertain future developments and changes as well as usually limited funds and resources issue inevitable challenges to decision-makers. Risk managers need to take decisions for measures and activities now that are supposed to be still as effective in the future. Accordingly, the best options available should be chosen, which also call for a coordination of different actors (see Sect. 3). Especially in case study sites where an integrated risk management framework is missing, i.e. where the focus is on one or two actors, while there is a minor (or no) role of other actors aiming at risk reduction, the SDSS developed by the CHANGES project could prove to be an asset. Due to the

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inclusion of different future scenarios, the SDSS does not only help in analyzing the current level of risk and the best alternatives under current conditions but also looks at how these alternatives will develop under changing conditions. The SDSS could, therefore, support decision makers in the CHANGES case study sites in choosing the best alternatives by applying a comprehensive risk management approach that coordinates activities of all actors involved on different spatial and temporal scales.

However, further research should still focus on testing and validating such prototype tools and systems in order to address the needs of the actors involved and adapt them to different contexts.

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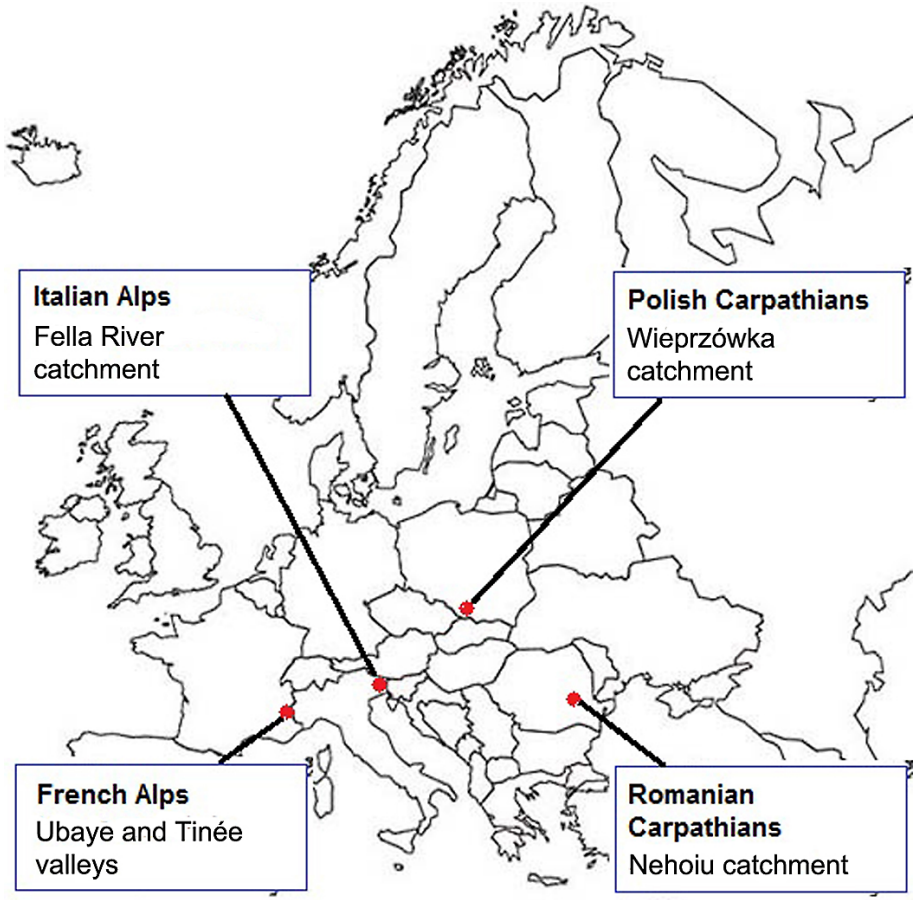

Fig. 1. Location of study areas.

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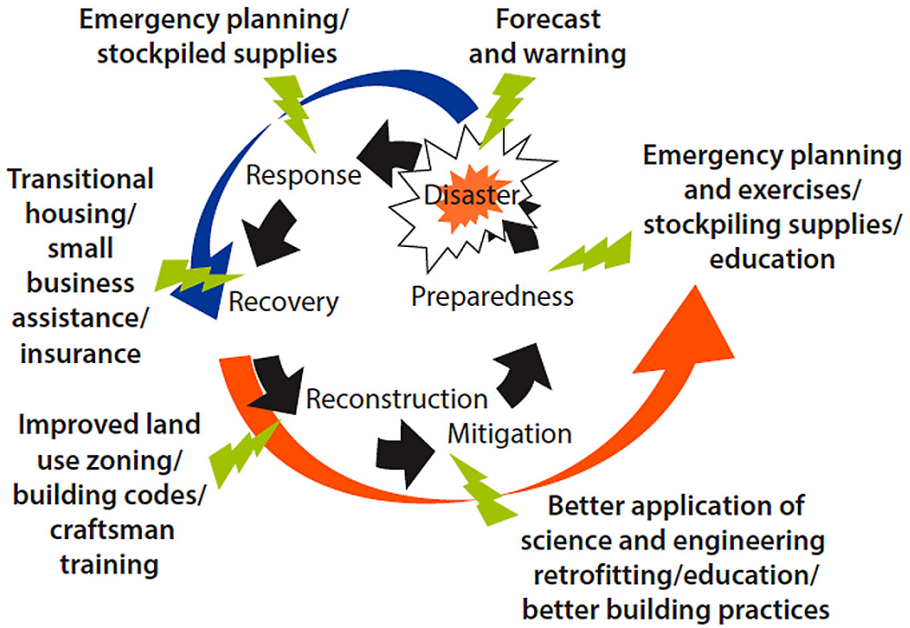

Fig. 2. The phases of the disaster risk cycle (Jha et al., 2013).

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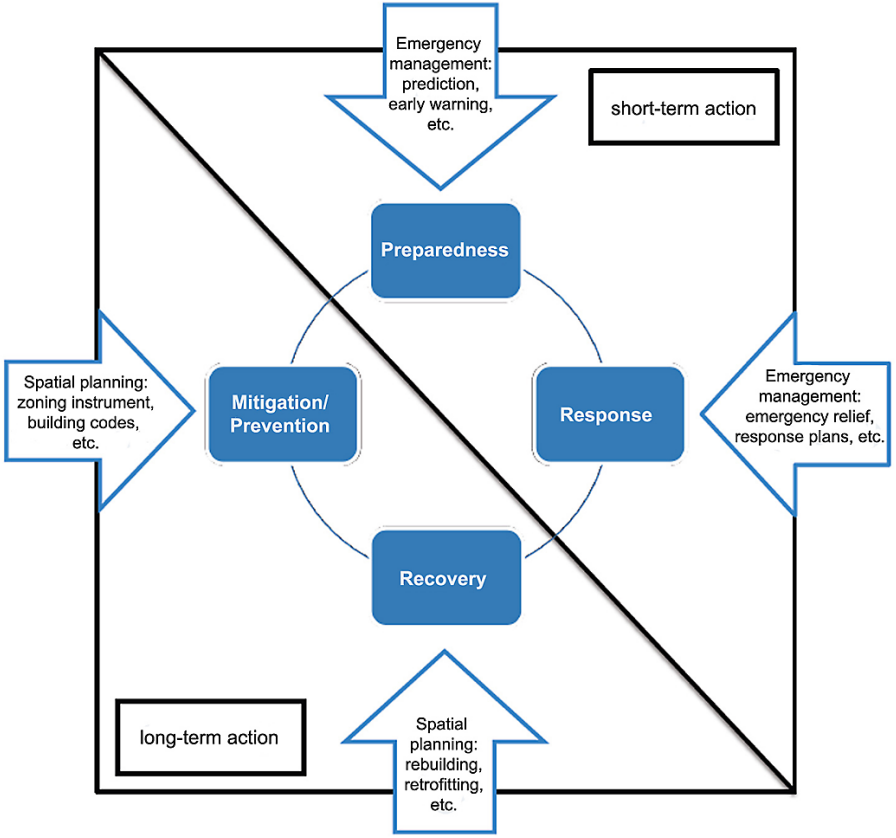

Fig. 3. Short-term and long-term activities within the disaster management cycle.

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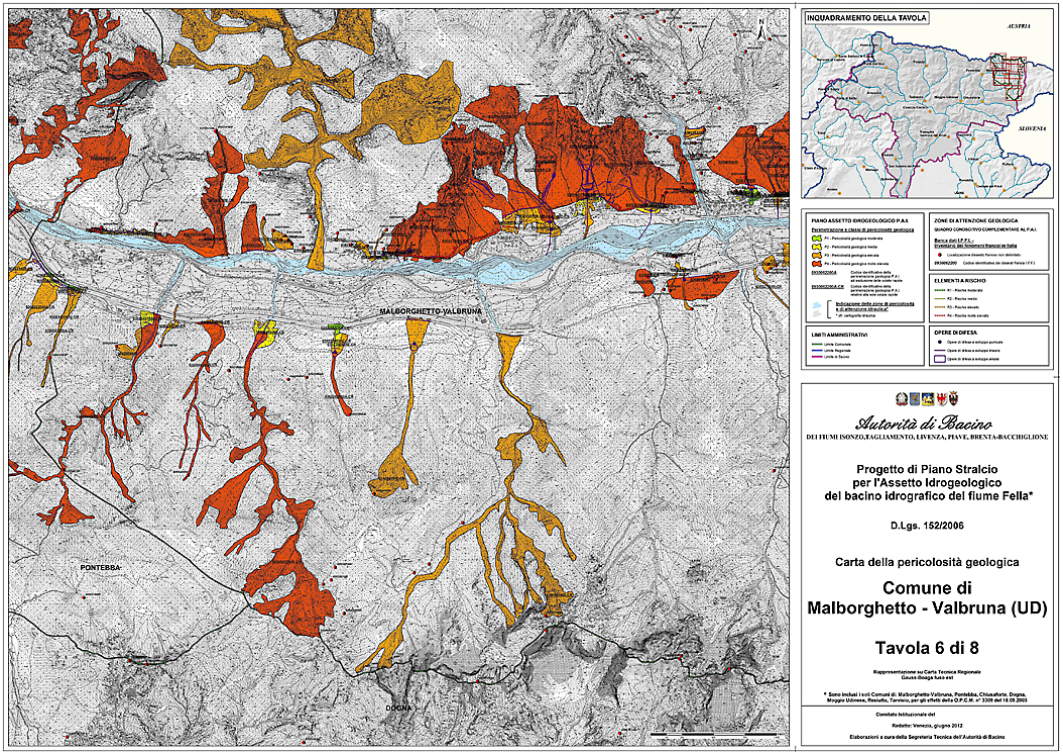

Fig. 4. Geomorphological Hazard Map – PAI, Commune of Malborghetto-Valbruna, Italy (Autorità di bacino dei fiumi dell'Alto Adriatico, 2012).

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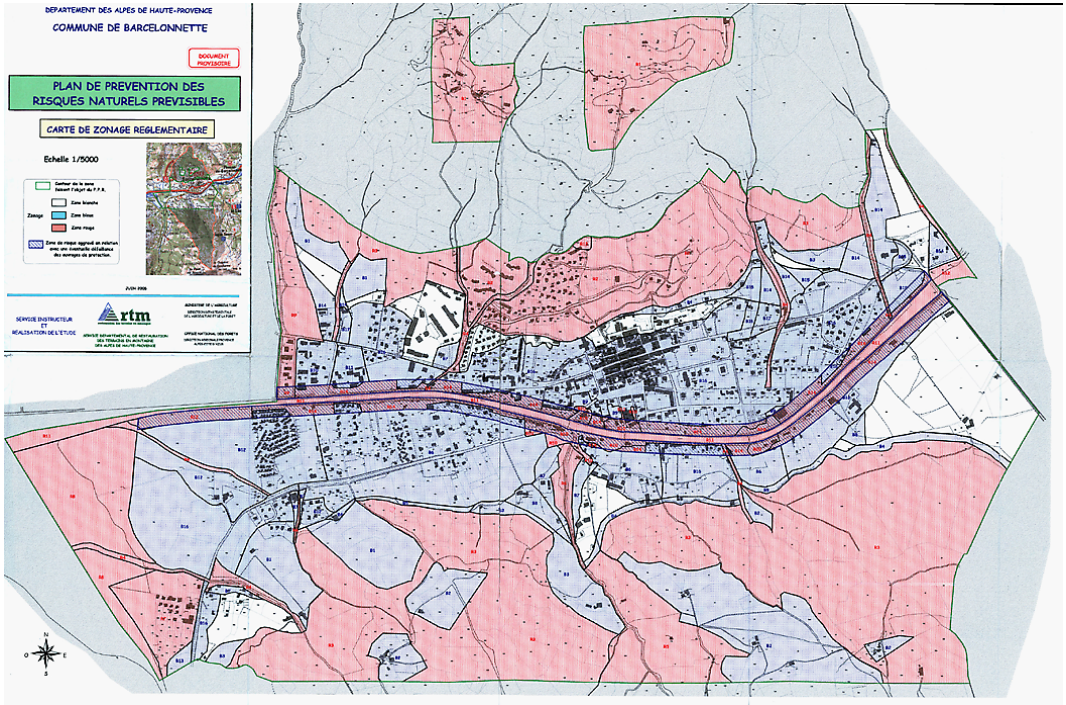

Fig. 5. Plan de Prévention des Risques Naturels of Barcelonnette, France (RTM, 2006).

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Fig. 6. Structural debris flow mitigation measures in Malborghetto-Valbruna, Italy.

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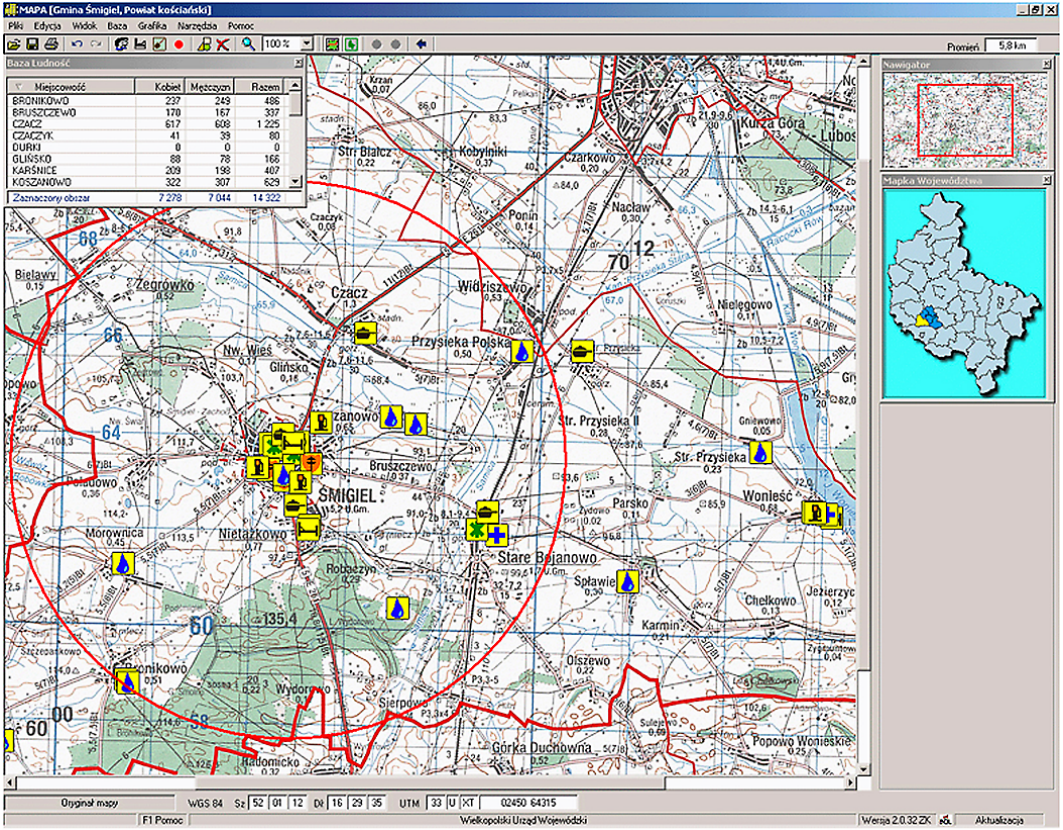

Fig. 7. System ARCUS 2005 (Wielkopolska Provincial Office, Poznan, 2013).

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