

# Community-based Comprehensive Recovery: Closing collaboration gaps in urban disaster recovery

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## ABSTRACT

Disaster recovery in urban environments is a complex process. Because of high population densities and the presence of many societal and infrastructural dependencies, urban areas are prone to severe loss of self-reliance in case of a disaster. Rebuilding such areas to a self-sustaining state is a daunting task, and requires a high degree of community effort and comprehensive knowledge about the affected environment. All too often, these requirements are not properly met, leading to a long recovery trajectory and misalignments between recovery efforts and community needs. We suggest that most issues in disaster recovery stem from ‘collaboration gaps’: flawed organisational structures between stakeholder parties that exist between levels of operation and between phases in the recovery process. We introduce two innovation pathways to close these gaps, and present the COBACORE project that will explore these pathways, and create a collaborative platform for effective community-based comprehensive disaster recovery.

## Keywords

Disaster recovery, community-building, needs assessment, collaboration, community-involvement.

## CHALLENGES IN DISASTER RECOVERY

Climate change, economic and political shifts and societal trends will lead to more frequent and more significant disasters in developed and urbanised countries than ever before, and make civil protection measures a global necessity. Over the past decade, there have been many natural, industrial and social disasters in well-developed urban areas with severe and long-lasting effects on the livelihood of the affected communities. The European Environment Agency (EEA) reported nearly 100.000 fatalities, 11 million people affected and 150 million EUR in economic losses due to natural or industrial disasters in the 1998-2009 period in Europe alone [1].

Disaster recovery is the process of returning a damaged society to a stable situation in which it can regain its livelihood. This process typically consists of reconstruction of damaged physical and infrastructural objects, and the rehabilitation of social and governmental structures [2]. In some case it suffices to bring an affected environment back to its original state; in others the ambition becomes to ‘build back better’. The crucial part of the recovery process is the *damage-* and *needs assessment* as they steer the recovery planning. There are many parties involved in recovery, with many different objectives and individual assessment methods. The humanitarian community has frequently voiced the need for a more harmonised approach to needs-assessments [3], [4]. Despite of various developments on this topic, there is little consensus. Some efforts focus on a deeper inclusion of civilians and volunteer groups in the recovery process, while other efforts focus on harmonising methods and information standards. Other efforts embrace new technologies to improve the timeliness and quality of assessment, such as ‘open data’ and social media. The different views make needs assessment a continuous focal point of discussion among stakeholder organisations.

Due to their distinctive characteristics and functions, urban areas suffer differently from disasters than rural areas. Urban areas typically have a high population density and a large number of identifiable communities. These communities usually differ widely in terms of interests and functioning, but depend greatly on each other, economically, socially or otherwise, and collectively make an urban area sustainable. A community can exist

because of a) a solid social foundation that provides for cultural diversity, health and social needs for its members, b) a healthy and diverse ecological system that provides life-sustaining functions and resources, and c) a healthy and diverse economy that provides long-term security to its members [6]. These foundations make communities resilient to adversity, and provide well-being to its members. Conversely, if these foundations are harmed, communities can lose their sustainability over time, and fall apart. Many communities that existed in pre-Katrina New Orleans never returned because their economic and social foundation was lost. With the loss of communities, the well-being of an urban area as a whole becomes jeopardised.

Urban areas are also typically the regional economic center of activity, and the center from which vital infrastructures are deployed and managed. Vital infrastructures are services to society that, in case of disruption over a prolonged period of time, cause major human or economic loss. Vital infrastructures such as energy systems, information and communication technology, fresh water supply, food provisions, health services, public administration services, financial systems, and transportation lines form the basis for sustainable urban environment, and therefore need to be a key priority in needs assessment and recovery planning. It is obvious that these services are highly interdependent, but in general, there is little comprehensive understanding of the wider consequences in case of disruption [7]. Other less-vital societal functions, such as cultural or leisure services, can only recover once vital infrastructures have been restored, but may be crucial to rebuild the identity of a city. In addition, the indirect damage of loss of vital infrastructures is many times larger than the direct damage because of ripple effects to a much wider area than the actual affected area. For example, loss of transportation in an urban area might make it impossible for a suburban population to work in the inner city, which, in turn, might lead to economic and social problems outside the 'hotzone'. The reconstruction of these infrastructures is crucial to proper recovery, and requires a deep understanding of their dependencies and the role they play in the affected environment and beyond.

In conclusion, disaster recovery of urban areas requires in-depth knowledge of the social and infrastructural fabric of the affected society, and a clear planning towards a self-sustaining state; a state in which all natural and critical dependencies are properly restored, and in which the society can regain its original, or newly desired functions, and in which community members feel confident to jointly rebuild their future.

### COLLABORATION GAPS DURING DISASTER RECOVERY

Many evaluation reports from recent disaster recount the same issues that have hampered the recovery process: disconnects between relief organisations and local communities, a lack of information sharing between organisations, incompatible work practices, misalignment between needs and recovery actions, and shortsighted decisions on funding and courses of action. [1, 2, 3, 4, 5, 8, 9]. Such issues often cause the recovery to become a long and bumpy ride with local residents frequently feeling left out. We believe that these issues can be traced back to 'collaboration gaps'. A collaboration gap appears when critical parties in a cooperative effort are not collaborating in the most effective way. In the worst case, there is no collaboration at all, or parties are left out of the main recovery effort. Under better circumstances, a formal or informal collaboration between parties exists, but is failing because of other reasons. A collaboration gap refers to the disparity between the actual and the ideal collaboration between mission-critical parties. These gaps may be caused by organisational causes (ineffective organisational structures, lack of organisation awareness, opposing beliefs, backgrounds or work practices), knowledge-related causes (insufficient means to obtain critical information, lack of contextual knowledge about the environment, conflicting views of the situation), contextual causes (the social, political, economic situation under which a recovery process takes place), or other causes that have a detrimental effect on the effectiveness of the undertaking.

In the disaster-recovery domain, we believe there are three types of collaboration gaps (Figure 1): a) the collaboration gap between the affected community and the supporting community, b) the collaboration gap between the local and higher level of operations, and c) the collaboration gap between organisations active in different phases of recovery. The parties that are supporting the recovery process need to work closely with their counterparts in the affected area. Failure of collaboration between both sides leads to misinterpretation of needs and will unavoidably lead to a misguided recovery process. There needs to be a clear understanding about the needs of

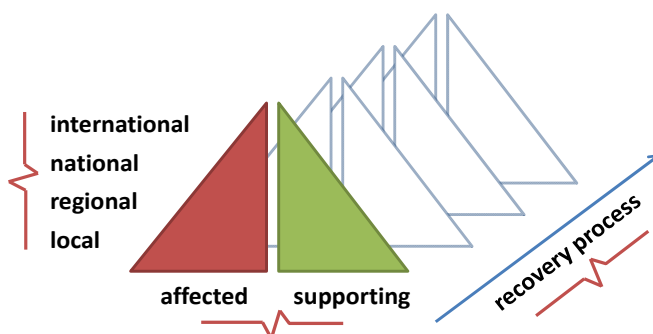


Figure 1: Collaboration gaps in the disaster recovery process

the affected communities, their remaining capabilities and their recovery ambitions. This requires suitable information channels between both sides, mutual awareness and trust, and an appropriate division tasks and responsibilities. Secondly, a collaboration gap between stakeholders at the local and higher levels of operation could lead to bad implementation of essentially decent strategic recovery plans, and thus jeopardising the accountability of the operation as a whole. This happens, for example, when activities by local relief organisations are not properly coordinated and interfere with each other, and consequently harm the bigger recovery plan. Thirdly, the focus of the recovery process will change over time from immediate, to short-term to long-term goals. Consequently, over time, different organisations will need to become involved. The handover of information, priorities and plans between parties active in different phases is critical for a good continuation of the recovery process in the long term.

## INNOVATION PATHWAYS IN DISASTER RECOVERY

Given the gaps identified in the previous section, we suggest two synergetic innovation pathways for improving the disaster recovery process: a) the development of methods for community-wide collaboration building and b) the adoption of a comprehensive approach in needs-assessment and recovery planning. These approaches can recognised in various innovation efforts in the field, but are not often seen as mutually enhancing developments.

The ultimate goal of disaster recovery is to regain a sustainable state of well-being for affected communities. As quality of life and well-being are subjective matters, community members from the affected area need to be involved. Assumptions about what constitutes a successful recovery need to be grounded in reality. The inclusion of representatives from affected communities enables community-needs to be correctly defined, as communities have an excellent understanding of their own particular needs and priorities. Conversely, what can and cannot be done in terms of recovery activities depends on the capabilities of partaking relief organisations, funding opportunities and environmental, social and legal constraints. These pieces of knowledge need to be disseminated properly throughout the community and become a foundation for recovery planning. Failures on this part may lead to misconceptions about the recovery process and the embrace of unattainable goals.

**The development of methods for community-wide collaboration building.** In disaster recovery, it is crucial to develop community-wide collaborations. The word ‘community-wide’ not just refers to the affected communities and locally deployed relief organisations, but to all groups that have a stake in the disaster recovery process. This also includes regional and national organisations, local companies, supporting volunteer and technical communities, financial institutions, and other groups that contribute directly or indirectly to the relief effort. In this sense, community-wide collaboration building refers to the effort of creating suitable information and cooperation agreements between essential stakeholder parties, so that the right collaborations take place at the right time, at the right place, and in the right form.

Community-building can be challenging as members need to be willing and able to participate, and might be influenced by other factors such competitiveness and distrust between groups, struggles for media attention, and the exploitation of the situation for ideological, political or financial gains rather than addressing the needs of the affected society. As community groups have different needs and motivations, the community-building process must be well-negotiated and coordinated, and based upon open dialogue and partnership.

Most of existing collaboration-building frameworks [e.g. 10] set forth a number of iterative activities in which collaborators 1) *position themselves* (e.g. goal formulation, stakeholder analysis, partner selection, partner negotiation, collaboration decisions); 2) *shape collaboration* (e.g. partnership agreement, partnership design, and preparation); 3) *execute collaborative work* (e.g. information management, boundary spanning, monitoring & evaluation, corrective measures) and 4) *terminate or transform the collaboration* (e.g. transfer of tasks and responsibilities, partnership evaluation). In dynamic task environments, it is important to have knowledge about the needs, capabilities and tasking of other parties for properly dividing labour and facilitating information sharing and decision-making [11]. Because disaster recovery is a highly dynamic multi-party environment, explicit community-building will be a constant necessity.

**A comprehensive approach in needs-assessment and recovery planning.** The goal of these multi-party teams is to develop a comprehensive needs picture in different phases of the recovery effort. The development of matrices of community needs, recovery activities, and their corresponding acting parties support the identification of duplication and missing efforts and priorities. This requires information sharing from whole of community sources and interoperability in multiple ways. A comprehensive picture of community needs is built up by community members and is grounded in their short and long-term needs for sustainable well-being. Accountability of recovery efforts can be supported by making explicit relations between identified community needs, recovery activities and involved organisations explicit. A comprehensive community needs picture could consist of information about: 1) *drivers of the crisis*, 2) *scope of the crisis*, 3) *profiles of affected community*, 4)

*the needs of community members in the affected area, 5) local and regional capacities for recovery and reconstruction, 6) capacities outside the area 7) coverage of community needs and gaps, 8) strategic priorities.* As time progresses, the focus of recovery will shift from short to long-term and the community needs and action plans will need to shift accordingly. By maintaining explicit relationships between these pieces of information, recovery objectives can be formulated that can be monitored through time as identified needs are met and new ones emerge. This approach facilitates progress monitoring, improves accountability, and stimulates unity of effort because the baseline picture is made through a collaborative effort of all involved parties.

## THE COBACORE PROJECT

Through a research grant of the EU Seventh Framework Programme (FP7), we will be able to explore the lines of development of the previous section and work towards innovations for the disaster recovery domain. The Community-Based Comprehensive Recovery project (COBACORE) is a pan-European project and is due to start mid-2013. The project aims to support disaster recovery efforts in post-crisis environments by implementing a comprehensive approach to needs assessment and by encouraging community-wide involvement in information acquisition. The COBACORE project will develop an online collaborative environment that provides methods and means for collaboration-building and comprehensive needs picture development. The platform will make it easier for stakeholder parties to get to know each other, share information from different perspectives, and jointly put the pieces of the disaster recovery puzzle together. The environment is targeted for application in disaster-stricken urban areas, where there is enough intrinsic economic, social and infrastructural capital to recover from severe disasters, but which are difficult to recover, due to the complexity of modern urban environments.

The ambition to create a collaborative platform in disaster response is not new, and neither is the assumption that information technology can help to share situation awareness between communities. However, most collaborative information systems that are in use by disaster recovery organisations have been developed under the assumption of a closed organisational structure and have a limited range of target user groups – usually only the selected relief organisations. Examples hereof are the Red Cross' Disaster Management Information System (DMIS), or the UN-OCHA's Virtual On-Site Operations Coordination Centre (OSOCC). These systems are not designed for wide-community-based information sharing, and when used in that fashion can constrain rather than enable collaboration. The rise of 'volunteers and technical communities' and the wide adoption of social media technologies [4] make it a pressing issue to close this gap. Open voluntary communities can use their skills and technical capacities to create ad-hoc communication channels for individuals, so they can express their needs and capabilities in areas of distress. Many recent large disasters saw the involvement of volunteer and technical communities [4] to provide crowdsourced data (e.g. Haiti (2010), Japan (2010), Libya (2011), Hurricane Irene, 2011, London Riots, 2011), but still, these so-called CrowdMaps are still very much disconnected from workflow of the larger relief operations and do not connect well to existing information channels. The COBACORE platform will embrace this notion, and will feature means to connect local communities, online communities and relief organisations so that an enhanced sense of teamwork may evolve during urban disaster recovery [12].

The core of platform is a set of interconnected mechanisms that maintain three information models: the community model, the context model, and the needs model. The community model contains information about the affected community, such as the various social groups that exist in the affected area, key community leaders, cultural aspects and other relevant societal information. It will also include information about the organisational layout of the recovery community. The situation model contains information about the state of the environment before the disaster, as it is, and how it is projected to be. The needs model represents the identified needs, their relationships, and their corresponding recovery actions. Jointly, these models provide a comprehensive picture of the recovery process, the target environment and the participating communities.

The information contained in these models is provided by stakeholders in different forms, such as personal observations over social media channels, existing geospatial or open data sources, or update reports from participating organisations. This information is used to inform community groups about the plans and status of the recovery process and for inviting groups to work together to provide missing information and keep the picture current. For example, local community members might be asked to provide an update about the quality of the power-supply in their specific area, as to monitor the recovery of a stable energy infrastructure. Accompanying community-building methods ensure that community groups understand each other's objectives and responsibilities, and simplify collaboration. For example: the platform can provide local community members with an overview of which organisations are responsible for which recovery action in their area, and make it possible to open up a lines of communication in case of urgent issues.

The COBACORE project is a co-creation- and participatory project, in which the project team will work closely

with national and international humanitarian organisations during the development and evaluation of the concepts. It will feature a large-scale field disaster recovery exercise on the Dutch-German border to validate its value to the humanitarian community. Given the typical problems with the availability of telecommunication means in disaster areas, the project will look at various on- and offline options in which the COBACORE vision can take shape. The same holds for dealing with typical social, political and organisational issues that may hamper the introduction of the COBACORE environment; the project team will listen carefully to the demands and opinions of potential end-users, and shape the environment in its most practically usable form.

## CONCLUSION

In this work-in-progress paper, we discussed typical challenges in disaster recovery, with a particular focus on the needs assessment and recovery planning process. We believe most challenges in this area are of an organisational nature, and can be brought back to the notion of ‘collaboration gaps’ – failure to attain the proper collaboration structures between parties that play a part in the recovery process after a disaster. We introduce two pathways of innovation to close these gaps: the adoption of a comprehensive approach to needs assessment and recovery planning, and the development of community building methods in disaster recovery. The upcoming COBACORE project is an effort to prove that these two pathways are central to improving disaster recovery, and can lead to tangible improvements in this domain.

## REFERENCES

1. European Environmental Agency (2010). *Mapping the impacts of natural hazards and technological accidents in Europe. An overview of the last decade*. EEA Technical report No 13/2010, Copenhagen, 2010.
2. Quarantelli, E. L. (1999). *The Disaster Recovery Process: What We Know and Do Not Know from Research*. Preliminary Paper. Disaster Research Center. Newark: University of Delaware.
3. Garfield, Richard, with Courtney Blake, Patrice Chatainger and Sandie Walton-Ellery (2011). *Common Needs Assessments and humanitarian action*. Humanitarian Practice Network (HPN) Network Paper, Number 69, January 2011.
4. Harvard Humanitarian Initiative (2011). *Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies*. Washington, D.C. and Berkshire, UK: UN Foundation & Vodafone Technology Partnership.
5. Inter-Agency Standing Committee (IASC) - Needs Assessment Taskforce (NATF) (2011). *Operational Guidance for Coordinated Assessments in Humanitarian Crises*.
6. Eadie, C., Emmer, R., Esnard, A-M., Michaels, S., Monday, J., Philipsborn, C., (2001). *Holistic disaster recovery: Ideas for building local sustainability after a natural disaster*. Fairfax, Virginia: Public Entity Risk Institute.
7. Luijff, E.A.M, Nieuwenhuijs, A., Klaver, M.H.A., Eeten, M. van, Cruz, E. (2008). *Empirical Findings on Critical Infrastructure Dependencies in Europe*. In proceeding of: Critical Information Infrastructure Security, Third International Workshop, CRITIS 2008, Rome, Italy, October 13-15, 2008.
8. Bhatt, M.R., Pandya, M., Murphy, C. (2005). *Community Damage Assessment and Demand Analysis*. Experience Learning Series 33. All India Disaster Mitigation Institute, Ahmedabad, October 2005.
9. UN OCHA Assessment and Classification of Emergencies (ACE) Project (2009). *Mapping of Key Emergency Needs Assessments and Analysis - Final Report*. UN Office for the Coordination of Humanitarian Affairs (OCHA), February 2009.
10. Tuckman, B., Jensen, M., (1977). *Stages of Small-Group Development Revisited*, Group Organisation Management, vol. 2, pp. 419-427.
11. Ren, Y., K. M. Carley, L. Argote. 2006. *The contingency effects of transactive memory: When is it more beneficial to know what others know?* Management Science, 52(5), pp. 671-682.
12. Koning, L. de, Huis in 't Veld, M., Buul, K. van, Dongen, K. van, Hemert, D. van, Paulissen, R. (2012). *MIRROR: Improving coordination in multidisciplinary crisis management teams*. Proceedings of the 9th International Conference on Information Systems for Crisis Response and Management (ISCRAM 2012), April 2012.