ENHANCING URBAN RESILIENCE: A DECISION-SUPPORT APPROACH BASED ON INPUT-OUTPUT MODELING, GEOGRAPHIC INFORMATION SYSTEM AND PARTICIPATIVE PROCESSES

GUILLAUME BAILLY; MATEO CORDIER
REEDS - UVSQ.

Abstract:

In this paper, we develop a decision-support approach to help stakeholders to implement resilience in urban areas. This approach relies on three methods: input-output (I-O) modeling (Cordier et al., 2011), participative decision processes and Geographic Information System (GIS). The technical part of the approach (I-O coupled to GIS) is tested on the territory of the CAMY that gathers 17 French municipalities into one territorial entity.

To better understand the need for resilience analysis, we give an introduction on urban and territorial contexts. Competition and collaboration at economic or political levels involve modifications of territorial limits of management areas. Competition and collaboration relationships may occur between cities, municipalities or regions. Multiple strategies of collaboration and competition may be developed between territories that generate a panel of territorial configurations.

The multiple territorial configurations are caused by a phenomenon called "glocalization". The cause of this phenomenon can be explained as follows. To remain active, territories need to attract labor forces and entrepreneurs that participate to economic and social activities. To attract them, territorial entities must underline their local assets (e.g. know-how, natural resources, protection against ecological disasters). In a competitive context, those territorial advantages become even more important for territories to distance them from others and avoid leakages of labor forces and entrepreneurs towards more attractive territorial entities. This explains why territorial entities built collaboration strategies in order to become more attractive and offer a greater panel of urban services and infrastructures. For instance, it might be difficult for coastal cities to bear alone the costs required to locally protect human life and activities (crops, industries, etc.) against sea level rise caused by climate changes at global scales. However, doing nothing is not a solution as it will destroy economic activities located on the coast and decrease their competitiveness compared to non-coastal cities. A solution consists in collaborating with other cities located on the coast front and put together human and financial means to built protective dykes.This example shows how territorial configurations may change at a local level to adapt to a global change.This is what we mean by "glocalization" in this paper: the fact that territories modify their collaboration strategies and management scales to protect local resources (e.g. industries) against regional threats (e.g. sea level rise) that are generated at a global scale (e.g. climate changes).

Glocalization implies that stakeholders work together in a territorial network that must be flexible and vary according to the disaster. Maintaining high connectivity between human organizations through networks is one of the three components of urban resilience, a strategy to reduce vulnerability and to quickly rebound after a disaster. These three components are the following: i) resist (reduce material damages), ii) absorb (maintain high connectivity between human organizations) and iii) recuperate after a disaster (come back rapidly to an operational situation).

Increasing urban resilience to ecological disasters is precisely the aim of the participative decision support approach developed in this paper. The first tool of this approach consists in an I-O model. It is used to analyze economic sectors that might be impacted by a disaster and those that might be involved in the implementation of resilient measures. Indirect positive and negative impacts on other sectors are taken into account with the inverse Leontief matrix (I-A)-1.

The advantage of I-O models for participative processes is their capacity to identify and quantify trade-offs. This is an important asset because Multicriteria evaluation techniques, if they cannot solve all conflicts, they can help to provide more insight into the nature of these conflicts by making the trade-offs in a complex situation more transparent to decision-makers. Yet, the trade-offs must be clear and apparent to stakeholders if environmental policies are to be operational.

The results given by the I-O model are entered into a GIS in order to produce maps that help stakeholders to visualize and spatialize information. This should make easier the appropriation and the understanding of the issue by stakeholders inside the participative decision process. The map obtained may show different territorial configurations allowing stakeholders to improve their vulnerability and increase their resilience. The map might become a facilitating tool and help stakeholders to select the scenario that would the best improve their resilience to ecological disasters.

References

Bailly, G., 2008. L'Espace Politique [En ligne], 5 | 2008-2, pp 79-96.

Cordier, M., et al., 2011. Ecol. Econ. 70 (9), 1660–1671.