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Critical infrastructures, mobility and risks within the Metropolitan District of Quito (Ecuador)

Florent DEMORAES¹

Key words: daily mobility, urban transport, lifelines and critical infrastructures, vulnerability, accessibility, risks, urban preventive planning, Quito.

The objective of my PhD. research² (defended in 2004) was to suggest a reflection on the risks the Metropolitan District of Quito is exposed to, considering more specifically road network vulnerability and accessibility issues. The analysis was conducted within the framework of a research programme called "Information System and Risks in the Metropolitan District of Quito" carried out between 1999 and 2004 by the French Development Research Institute (IRD) in partnership with the Municipality of Quito.

We argued that in order to prevent efficiently the risks a city is exposed to, it is indispensable to first pinpoint the critical infrastructures and lifelines on which the mobility relies. Indeed, the loss of their serviceability is likely to cause a severe disruption within the communications and is likely to generate accessibility issues. The situation is even worse if the critical transportation infrastructures and lifelines are vulnerable and very troublesome if the resulting accessibility issues affects strategic urban facilities (regional hospitals, important educational institutions, central administrations, essential facilities for urban logistics, and vital firms for the local economy...).

The research took advantage of a pre-existing location-based dataset which has been managed since the end of the 80's by the Municipal Metropolitan Studies Bureau in collaboration with the ORSTOM (current IRD). At the beginning, this database³ was above all meant for land planning and daily urban management. One of my first missions was to update and enhance this database in particular in the ambit of mobility. The objective was to convert it into an operative tool intended to support the stakeholders' decisions for preventive planning and crisis management. This evolution was essential as the risk management became a responsibility granted to the Municipality after the eruption of the *Pichincha* volcano in October 1999.

The first step was to identify and locate the critical transportation infrastructures and lifelines. It implies beforehand an analysis of the daily interchanges and movements and also a detailed diagnosis of the transportation system. The second step was to assess the vulnerabilities of these critical transportation infrastructures, as vulnerabilities predispose them to damages and failures. Six forms of vulnerability, determined within the frame of the programme, were considered: (1) intrinsic vulnerability, (2) dependence, (3) exposure to hazards and likeliness to damages, (4) control capacity, (5) alternatives and, (6) crisis preparedness. The third step was to evaluate the risks the district is exposed to, taking into account the expected accessibility issues attributable to the loss of serviceability of the critical roads. To do so, several scenarios with their respective predictable spatial outcomes were proposed.

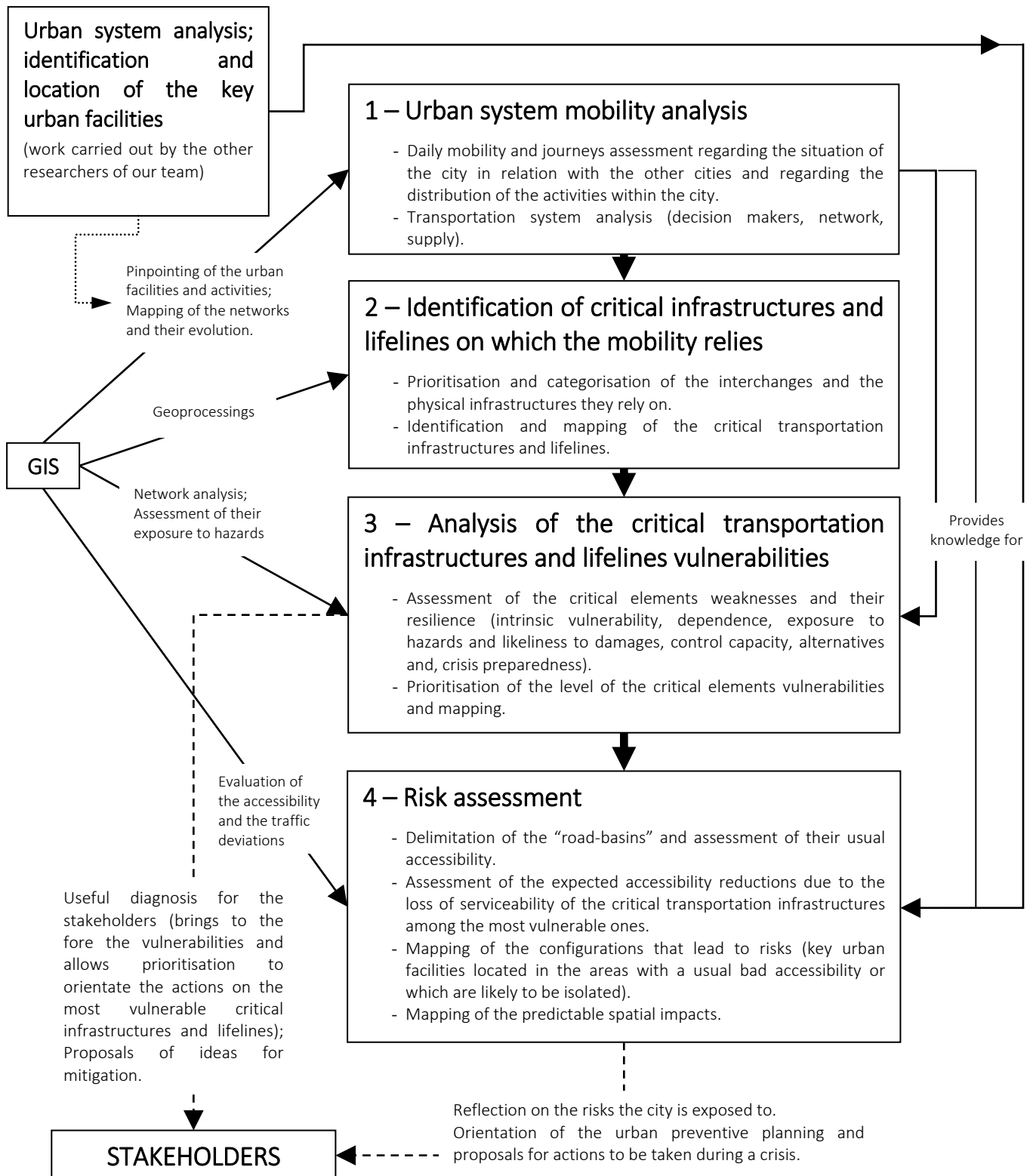
Partly inspired from previous risk assessment methods designed by geographers from the University of Savoy in the cities of Nice and Annecy, this research elaborated in a way such as to be

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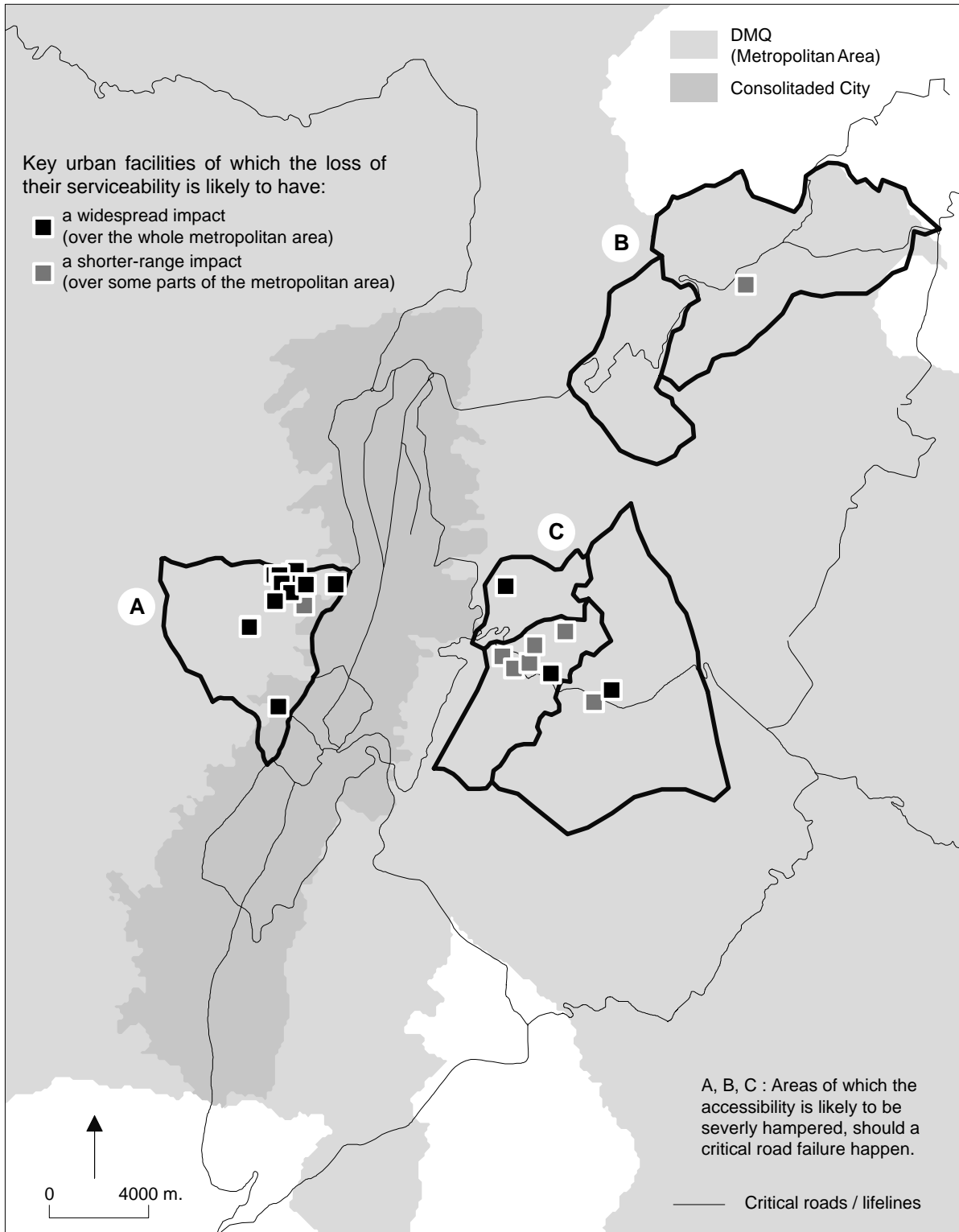
² DEMORAES F. (2004). - *Mobilité, enjeux et risques dans le District Métropolitain de Quito*, Laboratoire EDYTEM – UMR 5204 - Université de Savoie, 587p.

³ This database was managed with a freeware named "SavGIS" which is designed and developed by Marc Souris, computer scientist (IRD).

reproducible, provides some ways to mitigate vulnerabilities and suggests some orientations toward an efficient crisis management.



Methodological framework for assessing territorial risks through the prism of road network vulnerability and accessibility issues



Risk spatial ranges: predicted outcomes derived from a loss of accessibility which could affect key urban facilities, should a critical road failure happen in the metropolitan area of Quito