



HAL
open science

Modelling the complex system of the response to a natural disaster by a multilayer network approach

Chantal Cherifi, Aurélie Charles, Guillaume Bouleux

► **To cite this version:**

Chantal Cherifi, Aurélie Charles, Guillaume Bouleux. Modelling the complex system of the response to a natural disaster by a multilayer network approach. Conference on Complex Systems, Oct 2021, LYON, France. hal-03410528

HAL Id: hal-03410528

<https://hal.science/hal-03410528>

Submitted on 1 Nov 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

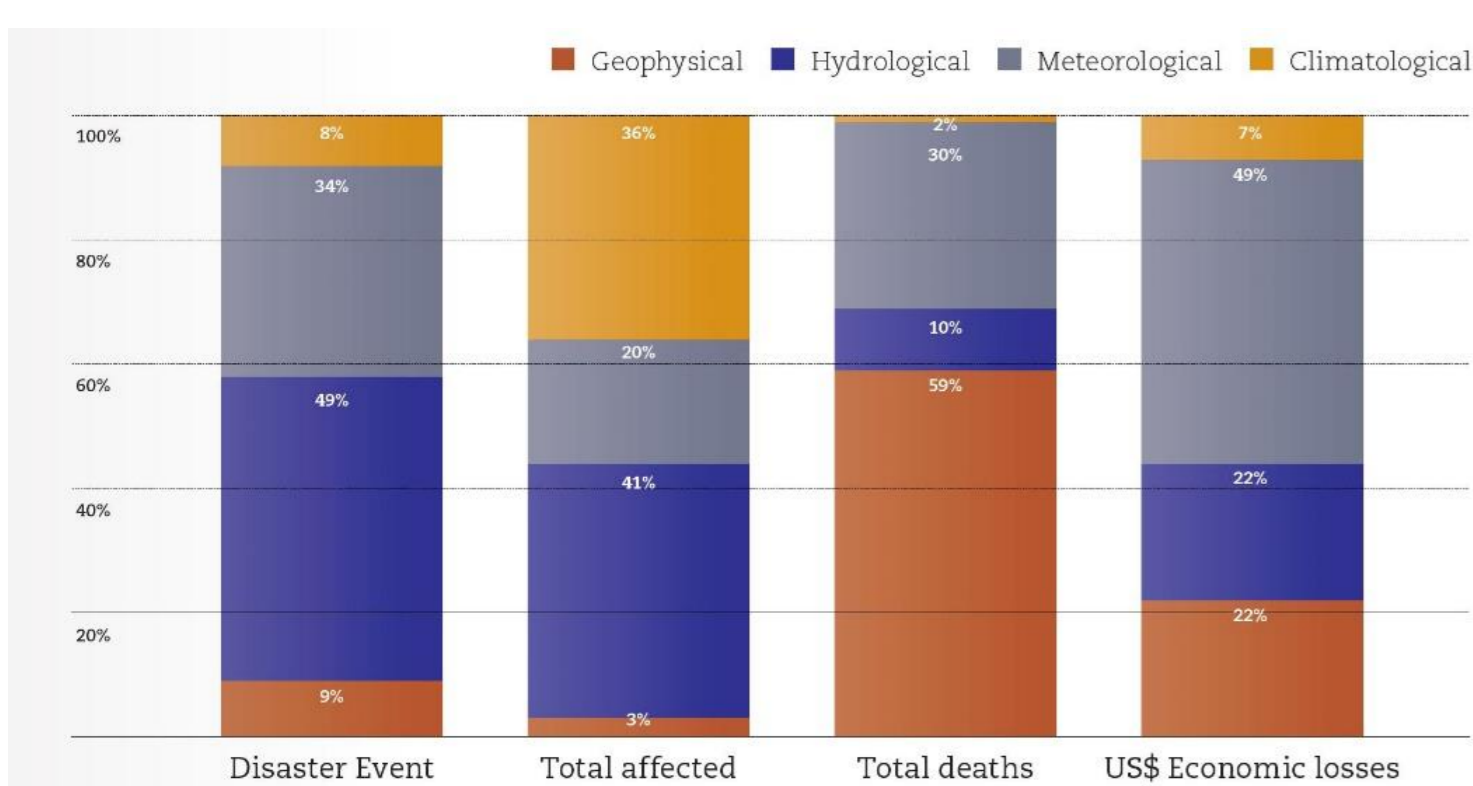
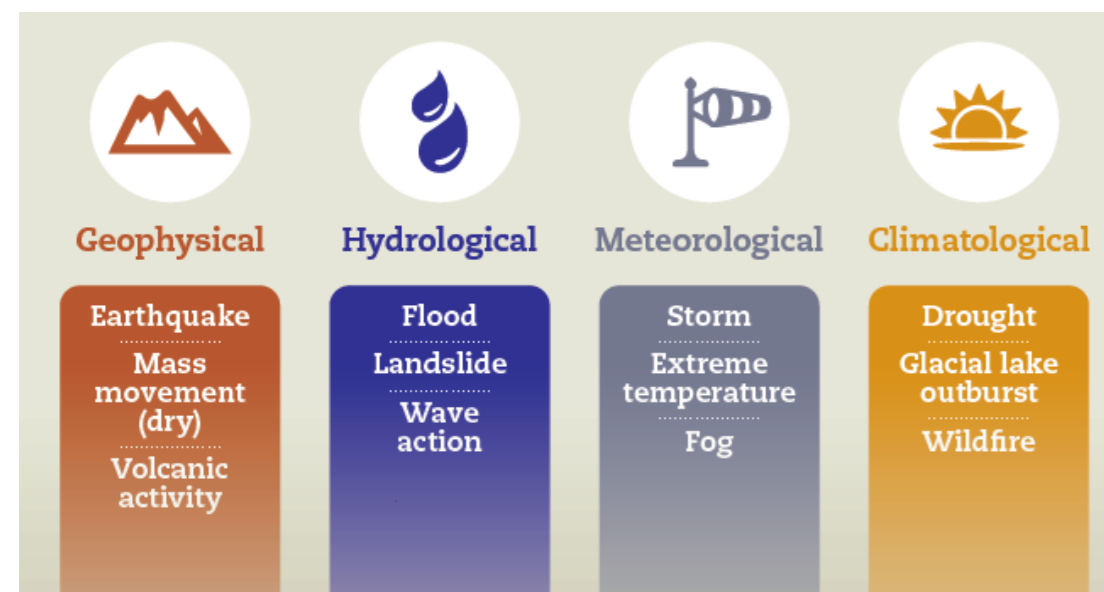
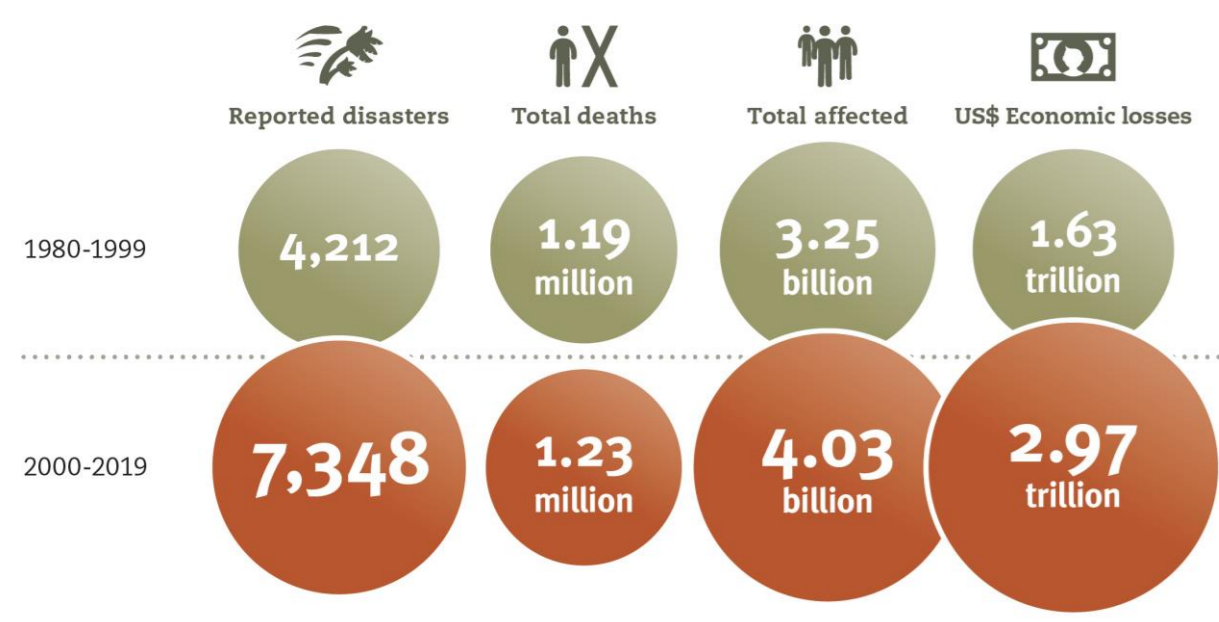
L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Modelling the complex system of the response to a natural disaster by a multilayer network approach

Chantal Cherifi¹, Aurélie Charles¹, Guillaume Bouleux²
¹DISP Lab University of Lyon 2, ²DISP Lab INSA Lyon



CONTEXT



Impact of disasters

Humanitarian crisis response involves :

- Many entities of various types
- High diversity of field actors (international organizations, local NGOs, army, governments ...)
- Infrastructures (air, health, water, road, telecom ...)
- Transportation means
- Affected populations
- Available resources.

The complexity of a humanitarian crisis makes its global vision difficult.

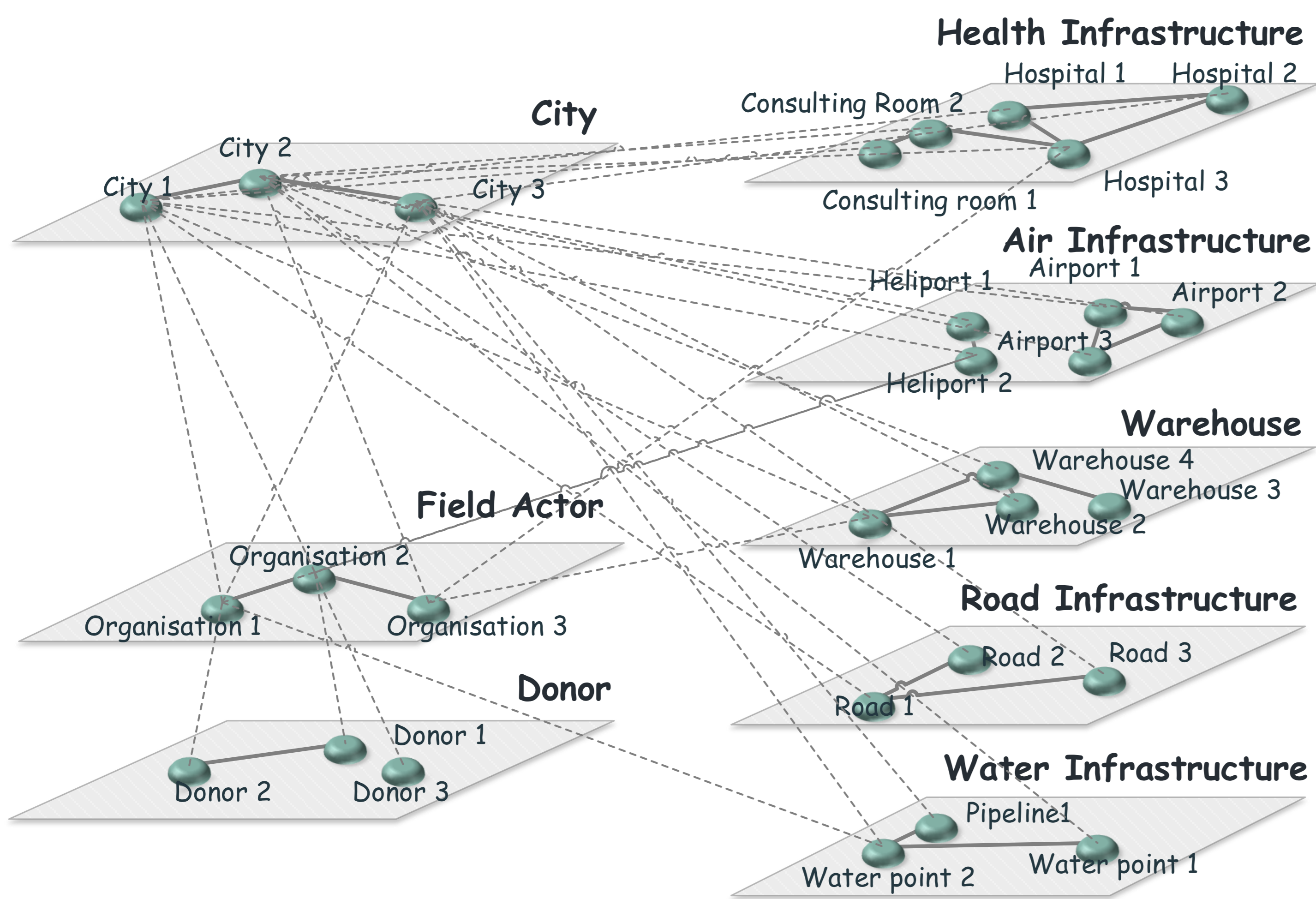
PROBLEMATIC

How to provide an exhaustive view of the situation ?

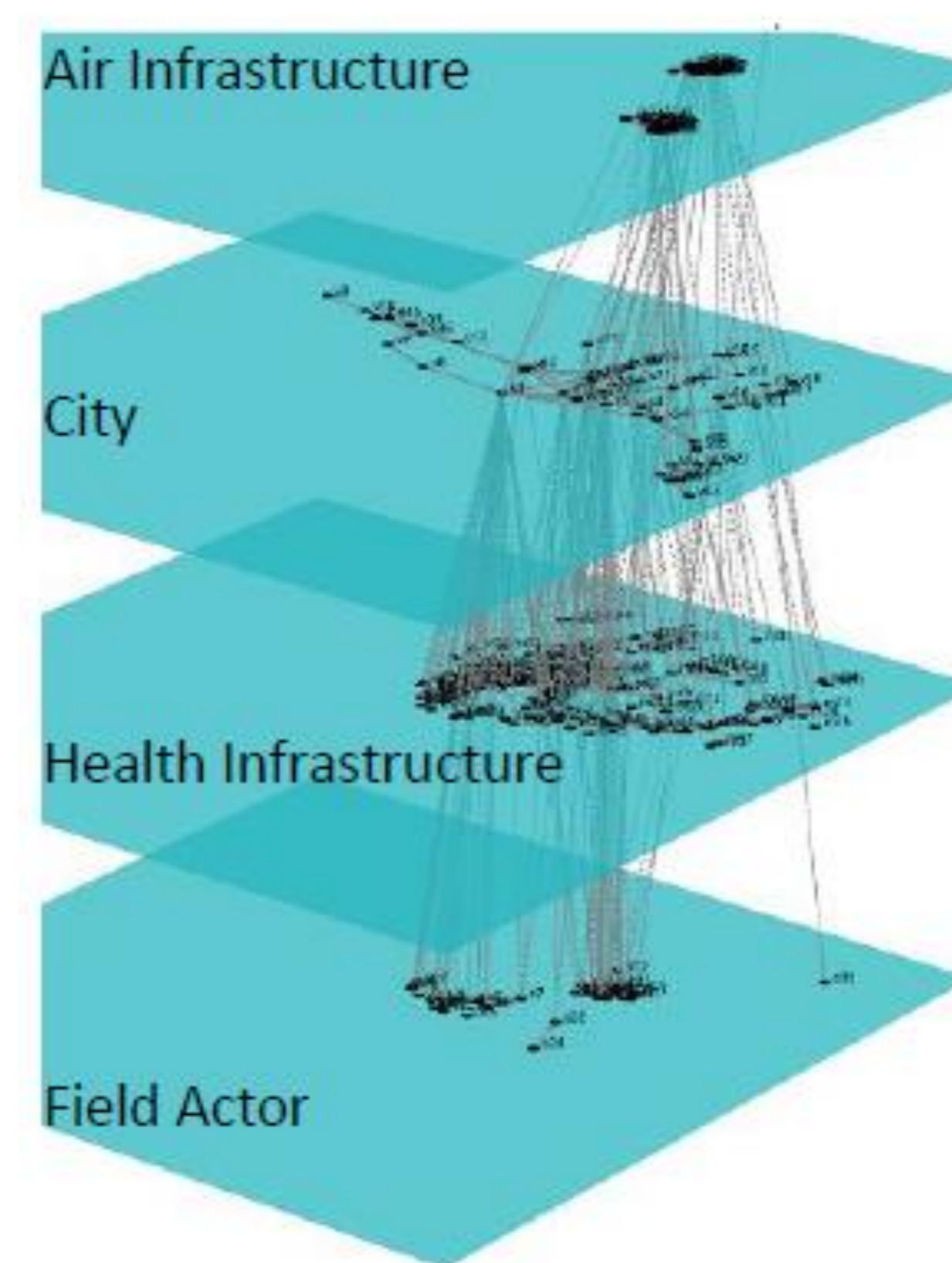


Haiti earthquake 2010

MULTILAYER NETWORK MODEL

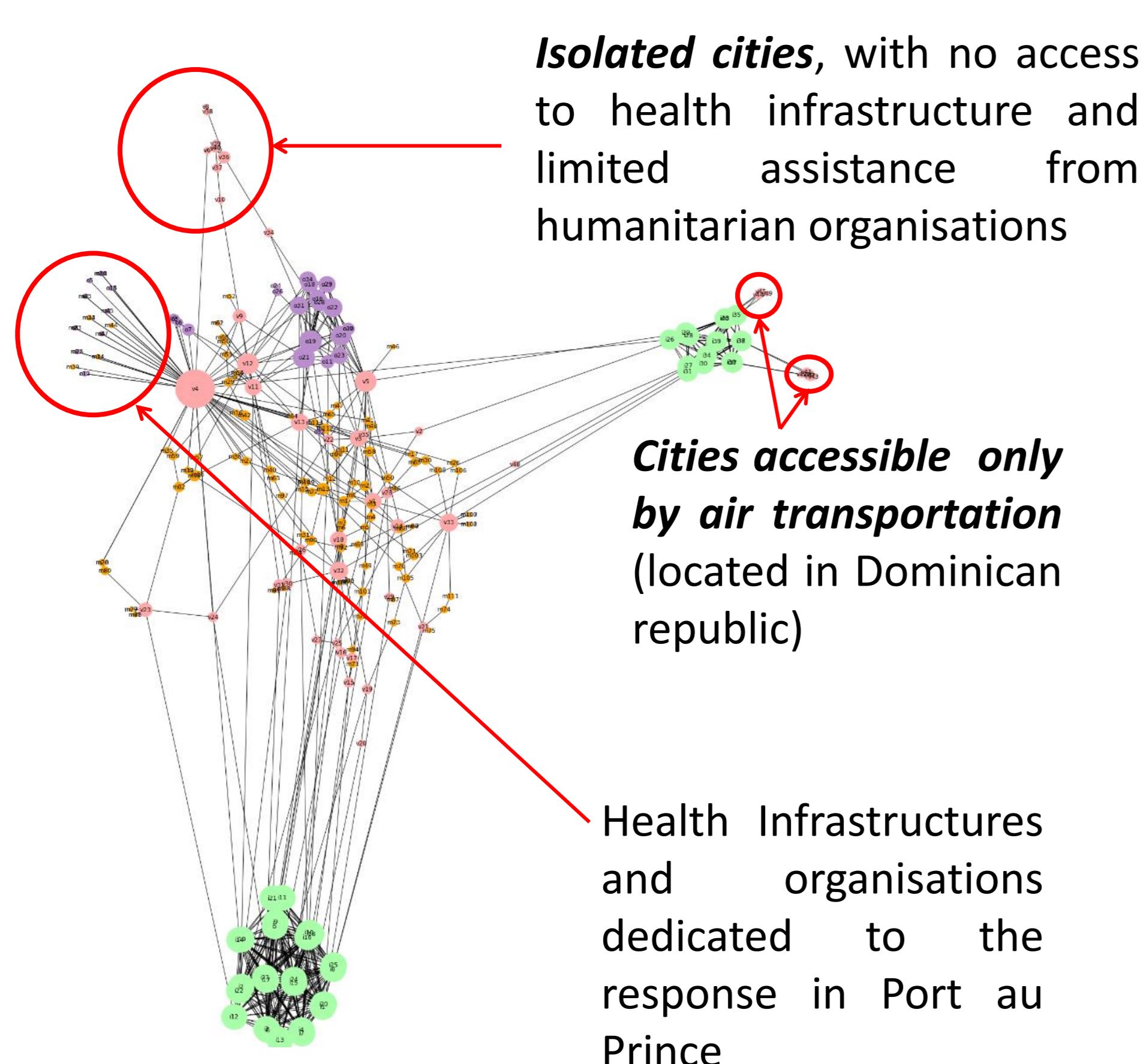


CASE STUDY



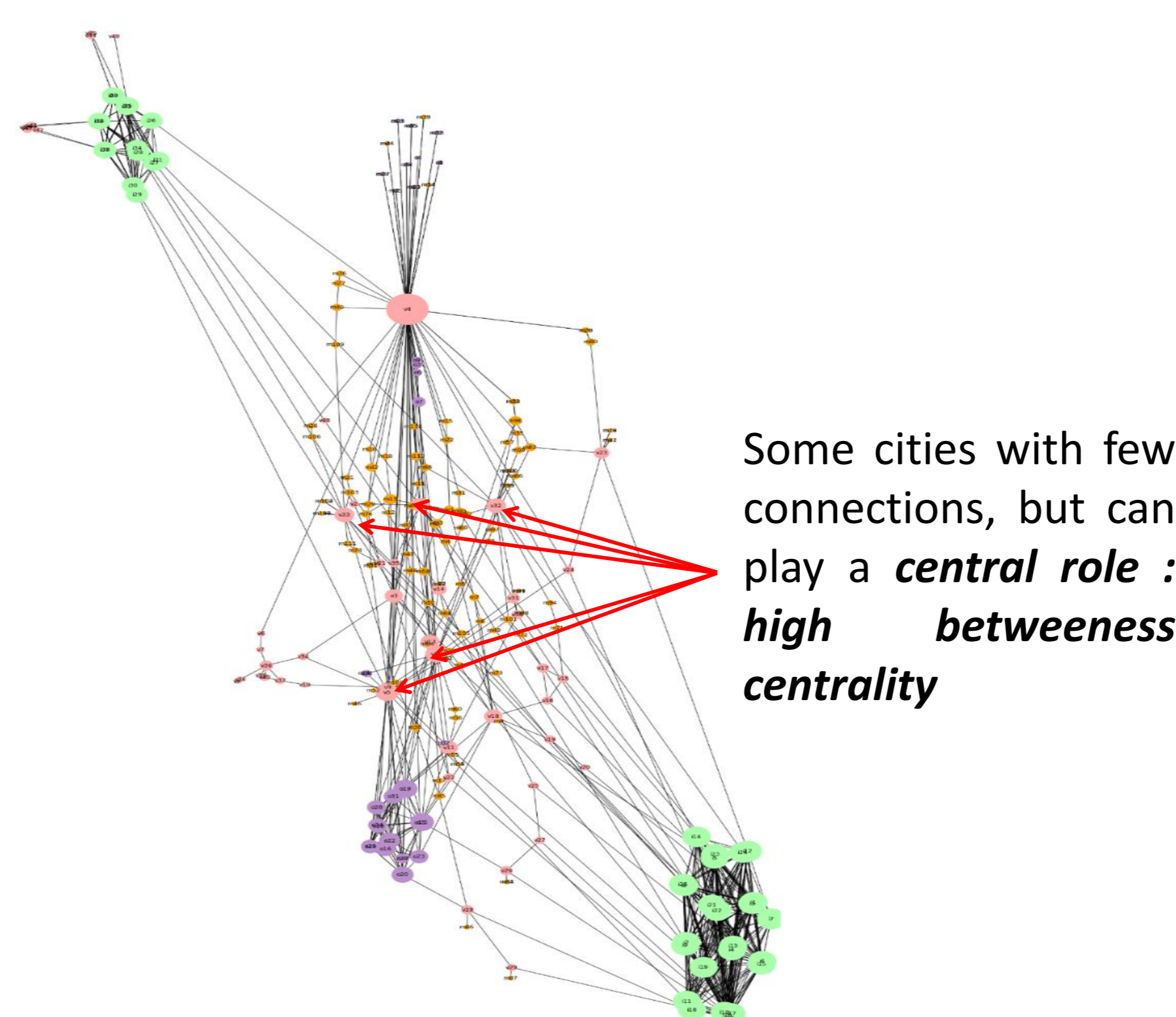
N = 240 and K = 845

CENTRALITY



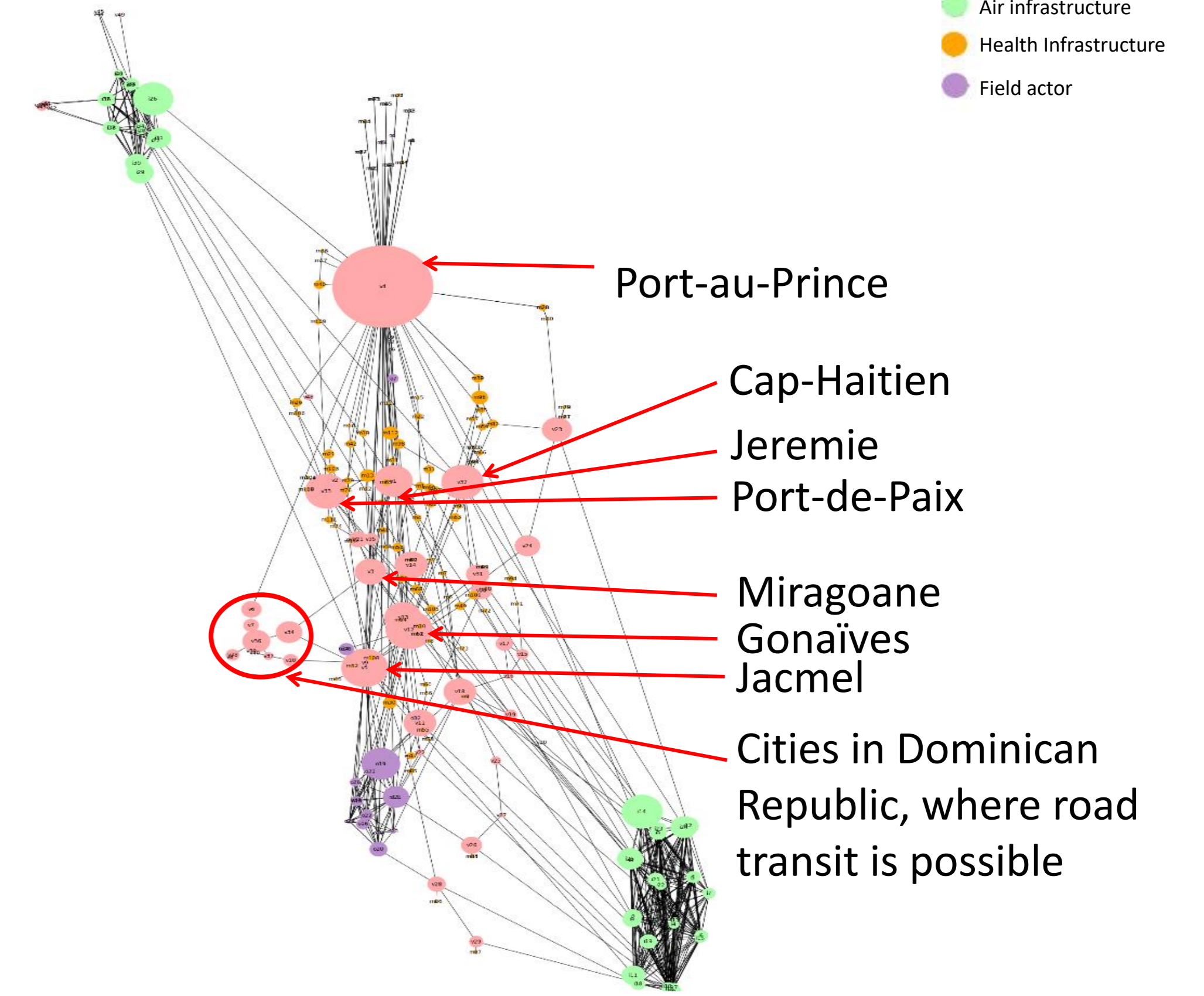
Degree

Layout Force Atlas : Degree



Degree

Layout Force Atlas : Betweenness



Betweenness

Layout Force Atlas : Betweenness

APPLICATIONS

- ✓ Provide useful insights during operations, to better understand the situation, and simulate various response scenarios to choose the best way to use the resources available
- ✓ Can be used in the preparedness phase, to propose ways to improve the resilience of the actual network