

An aerial night view of Barcelona, Spain, showing the city's dense urban landscape with illuminated buildings and streets. The sky is a deep blue with scattered clouds, and the city lights create a warm glow against the dark background. The title text is overlaid on the left side of the image.

BARCELONA REILIENCE MODEL PRELIMINARY PROFILE

MIQUEL CORRAL – Data Management Specialist
December, 2017

Introduction

Barcelona resilience strategy

CRPT basis for BCN profile

BCN preliminary profile

- › Data gathering process
- › Preliminary profile explained
- › Profile results – Resilience Platform

introduction and background

location



Spain

19 autonomous
communities



Catalonia

4 provinces /
948 municipalities

introduction and background

Barcelona: managing urban complexity



1 large metropolitan area (3,5 million people)
1 large city (1,6 million people)
10 districts
73 neighbourhoods

City Council

2,000 buildings
10,000 employees

-  Social services
-  Health
-  Public & private assets
-  Economic development
-  Tourism
-  Mobility
-  Infrastructure & services
-  Energy supply
-  Water cycle
-  Telecommunication network
-  Cultural heritage
-  Environment
-  Land use

introduction and background

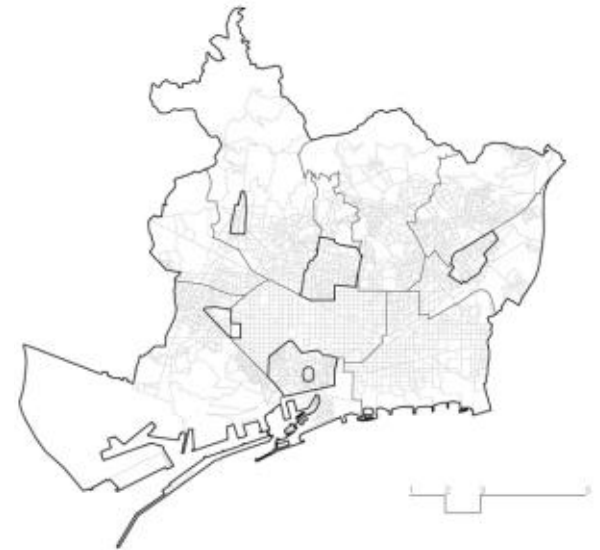
the evolution of the city



A Roman origin



Eixample expansion towards
peripheral towns



The city nowadays

introduction and background **a dense urban tissue**



Density: 15.803 inhab/km²

Ex: London - 5.500 inhab/km²

Impacts & stresses (1st phase)

Barcelona: resilience preliminary profile



¿how we responded? (until 2008)

Barcelona: resilience preliminary profile

sectorial actions



Impacts & stresses (2nd phase)

Between 2006 y 2007 Barcelona suffered a series of critical situations in a short period of that stressed its vulnerabilities

Problems with railroad transport system, extreme drought and massive power outage*



- 323.337 users affected
- Over 56h

¿how we responded? (from 2008)

Barcelona: resilience preliminary profile

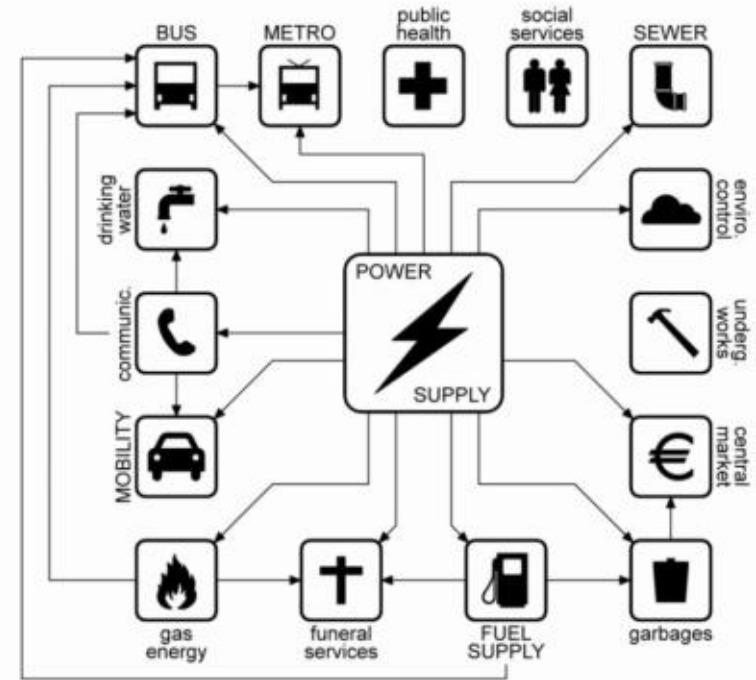
cross-sectorial actions

1. Diagnose:

Vulnerability assessment. 3Ss project

Goals:

- › Identify the weak points/risks in the networks of infrastructures and services, taking considering interdependencies
- › Collect and structure information to improve decision making



¿how we responded? (from 2008)

cross-sectorial actions

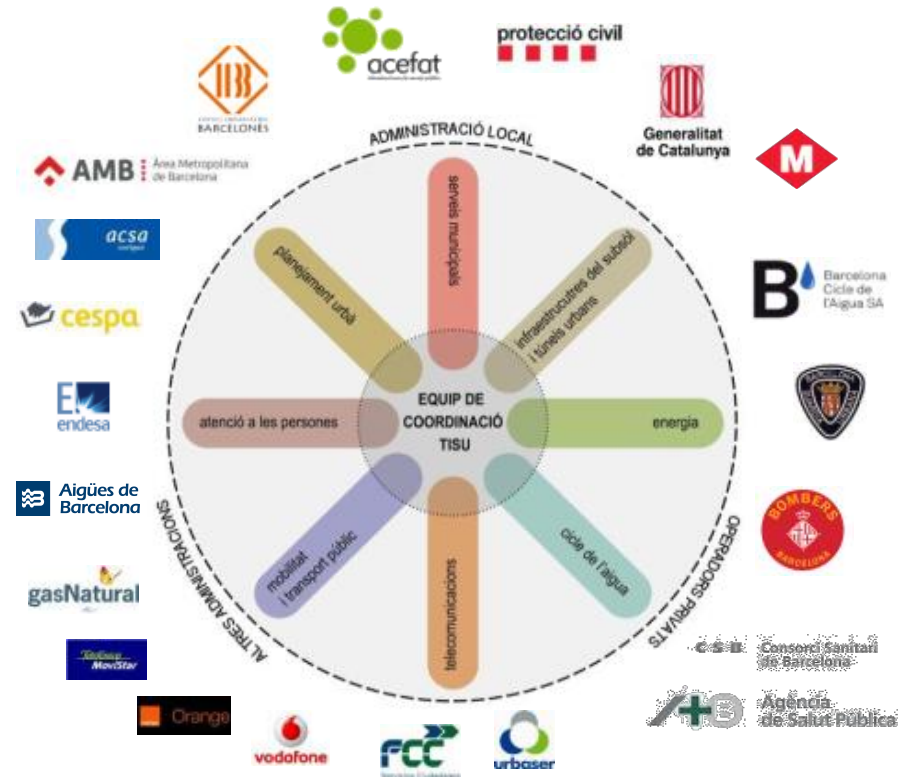
2. Action plan Resilience Boards

Goal:

- › Implementation of projects to reduce or eliminate detected risks

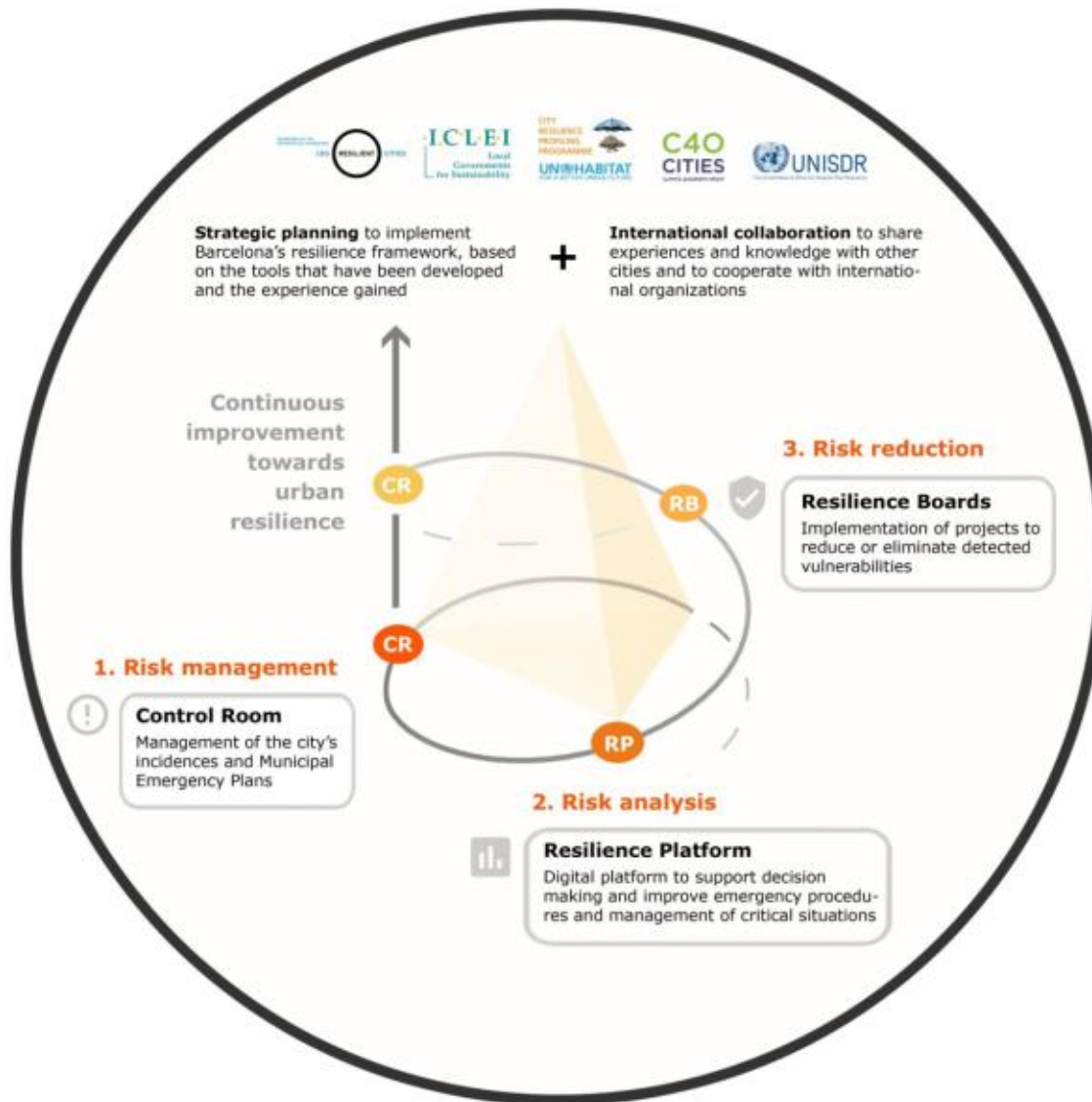
- ! Stakeholder engagement
- ! Cross-sectorial work

Barcelona: resilience preliminary profile



- › + **20 entities** (public+private)
- › + 70 professionals
- › 1 coordination team

Urban Resilience Department



city vision

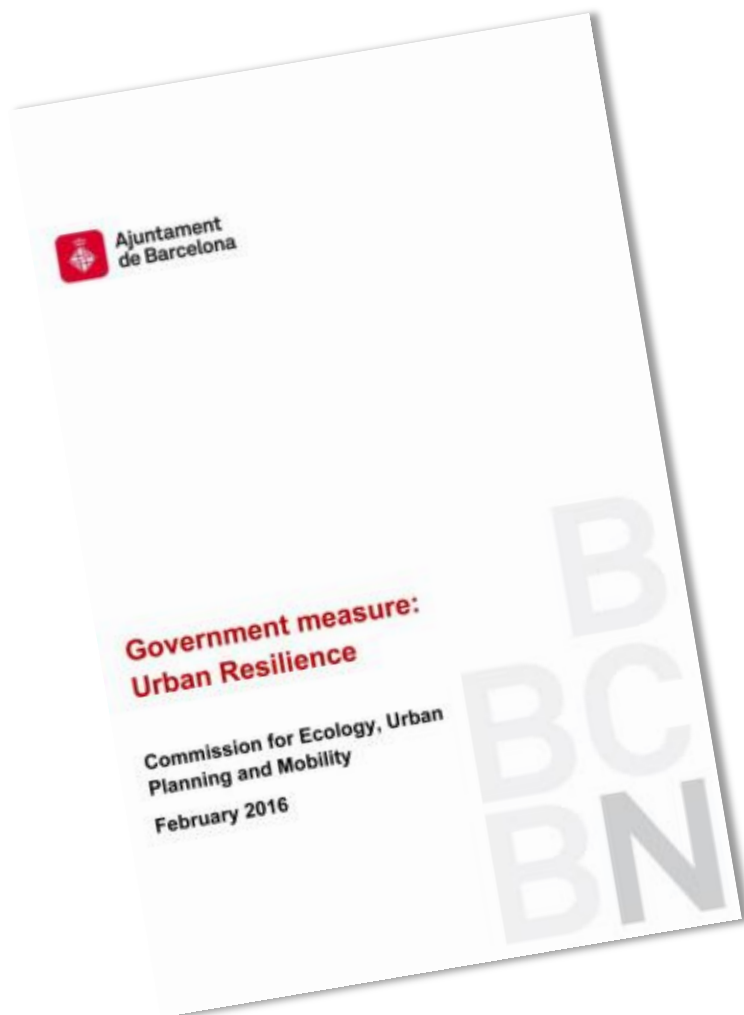
[strategy]

[management]

[operation]

implementation

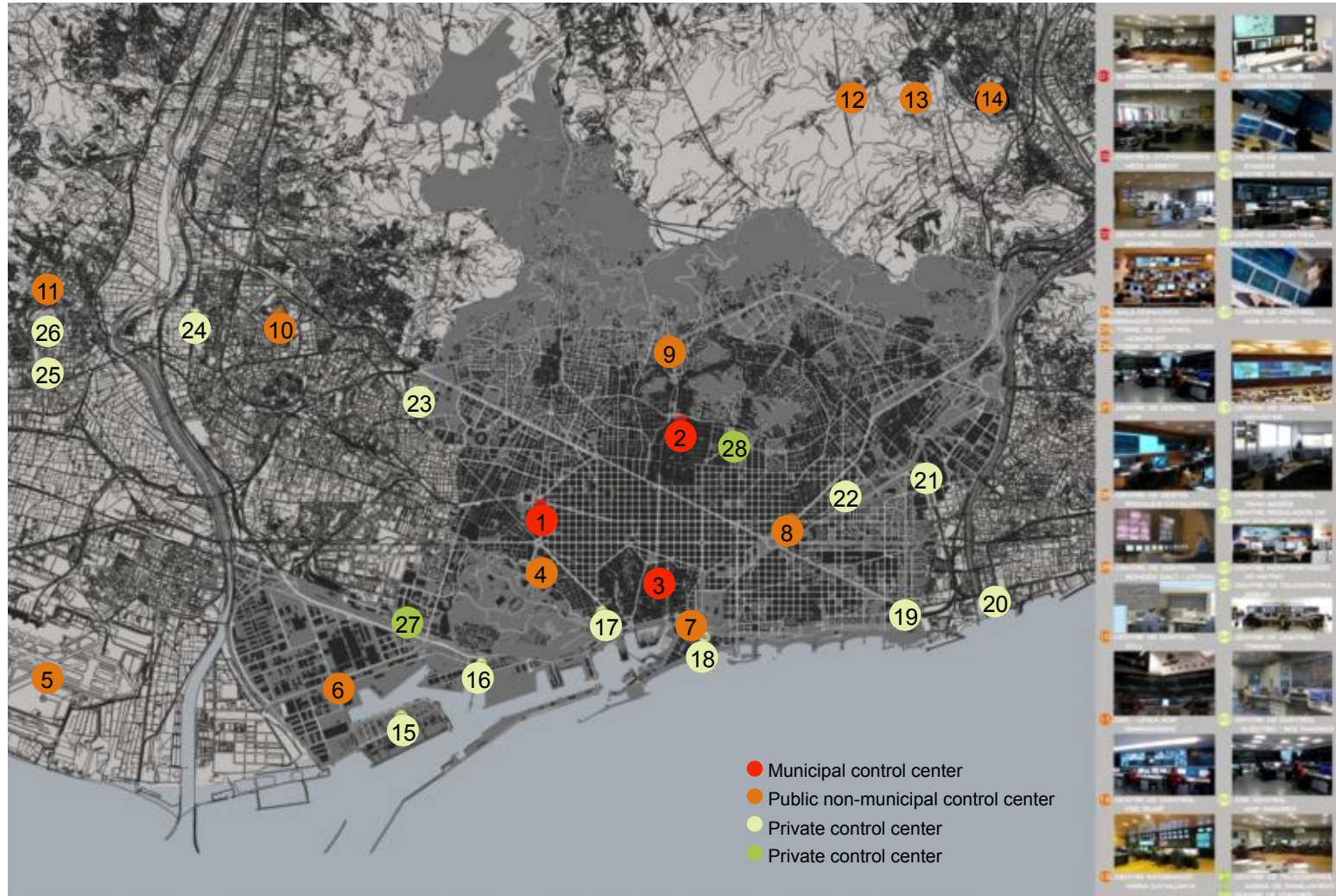
Urban Resilience Government Measure approval



1. Introduction.....	2
2. Background	3
3. Barcelona Resilience Strategy	7
3.1. Vision, mission and values	7
3.2. Continuous improvement	8
3.3. Municipal control centres: integration	10
3.4. Analysis tools	12
3.5. Resilience Boards.....	13
3.6. International city networks.....	20
4. More singular projects in progress	21
4.1. Assisting people: Barcelona, Refuge City	21
4.2. Mobility: Road Safety.....	22
4.3. Urban services and civil defence: Protocols with service companies	22
5. Strategic planning	23
5.1. Plan for resilience and adaptation to climate change.....	23
5.2. Social Resilience Plan	27
5.3. Resilience Indicators	27
5.4. Creating resilience based on the analysis of objective data	28
5.5. City Resilience Profiling Programme.....	29
6. Participation and communication	31
6.1. Barcelona Resilience Week	31
7. International co-operation	33
7.1. UN Habitat resilience office	33
7.2. UN ISDR	34
7.3. Network of 100 resilient cities.....	34
7.4. C40	35
7.5. Medellin Collaboration for Urban Resilience (MCUR)	36

urban resilience building process

1. Urban ecology operations centre

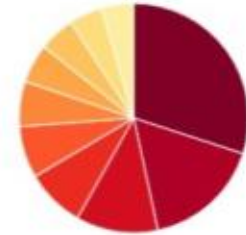


urban resilience building process

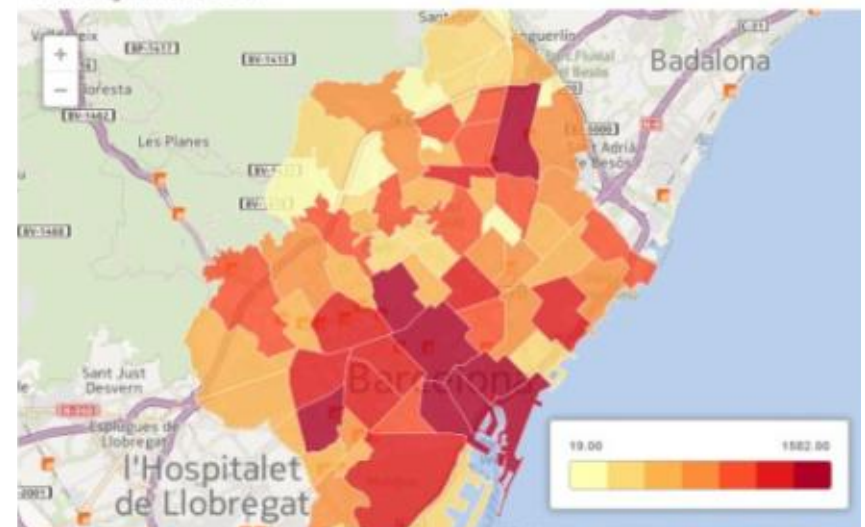
1. Urban ecology operations centre

A key element:

- › To improve **coordination with other** centres of operations and **communication joint** with stakeholders
- › To improve the **city's capacity of response**
- › To improve **continuity of service** of the city
- › To improve **knowledge on city performance**



Inidències Habitat Urbà
Incidències registrades darrers 30 dies



urban resilience building process

2. Resilience platform

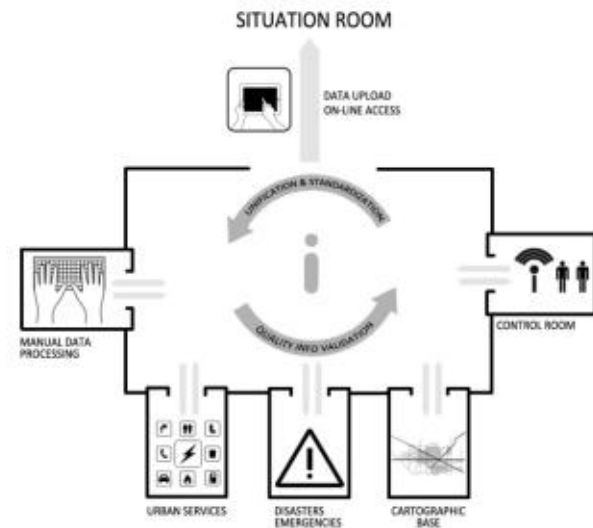
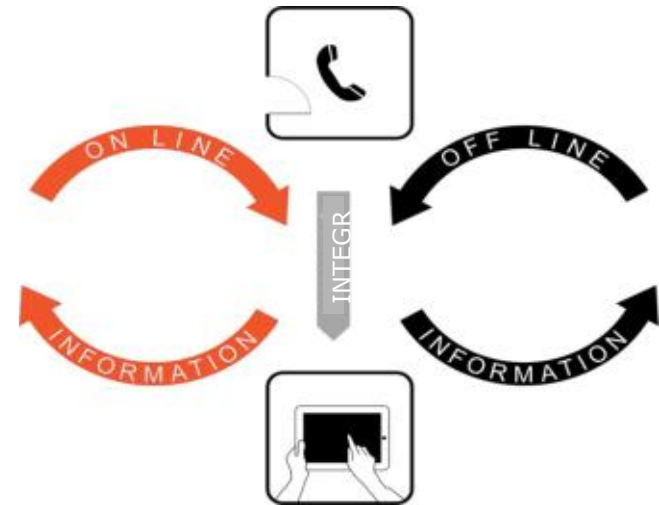


urban resilience building process

2. Resilience platform

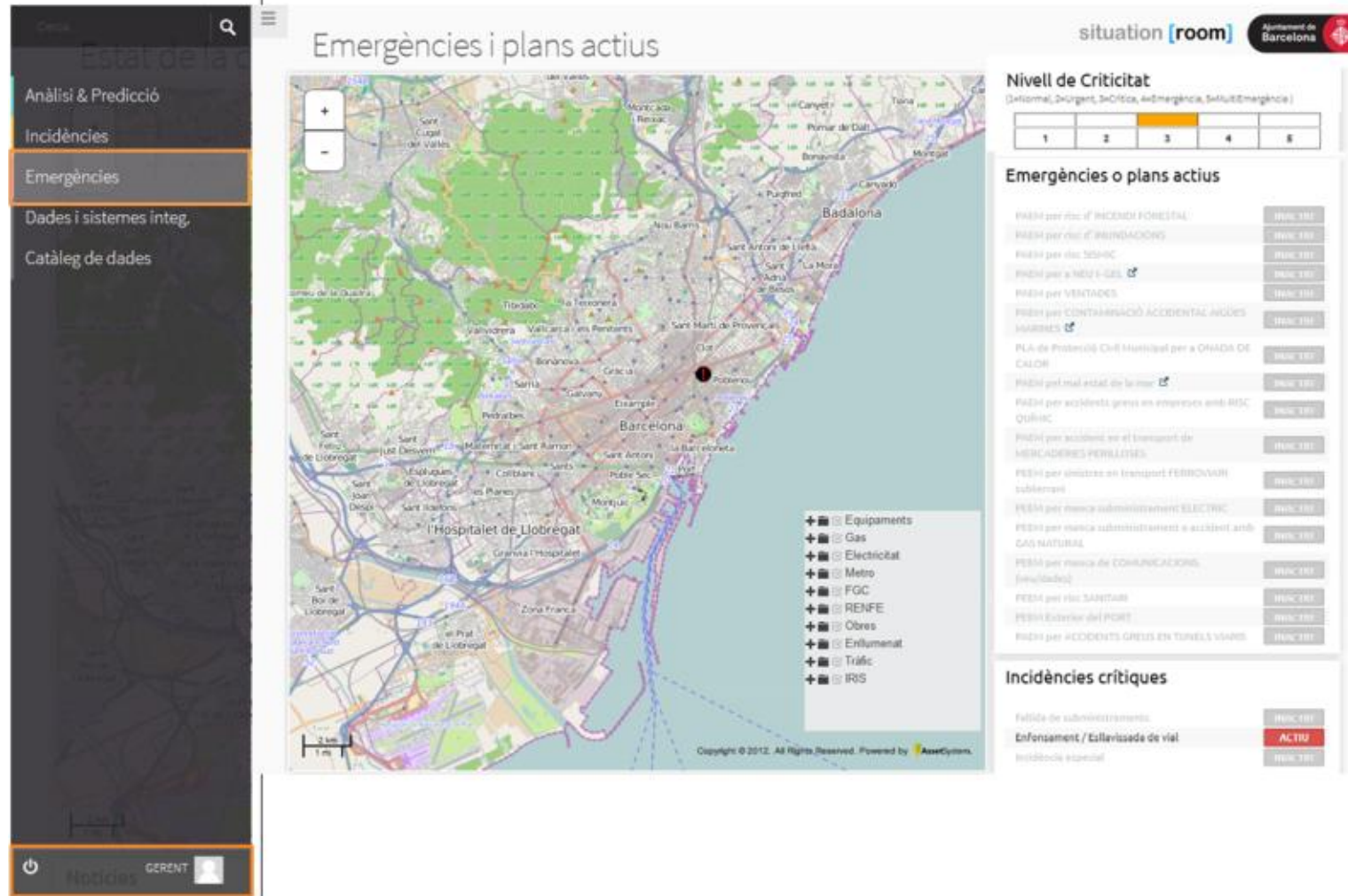
It is a set of analytical tools providing a comprehensive overview of how the city is running

The platform brings together all the information considered relevant from the different systems comprising it.



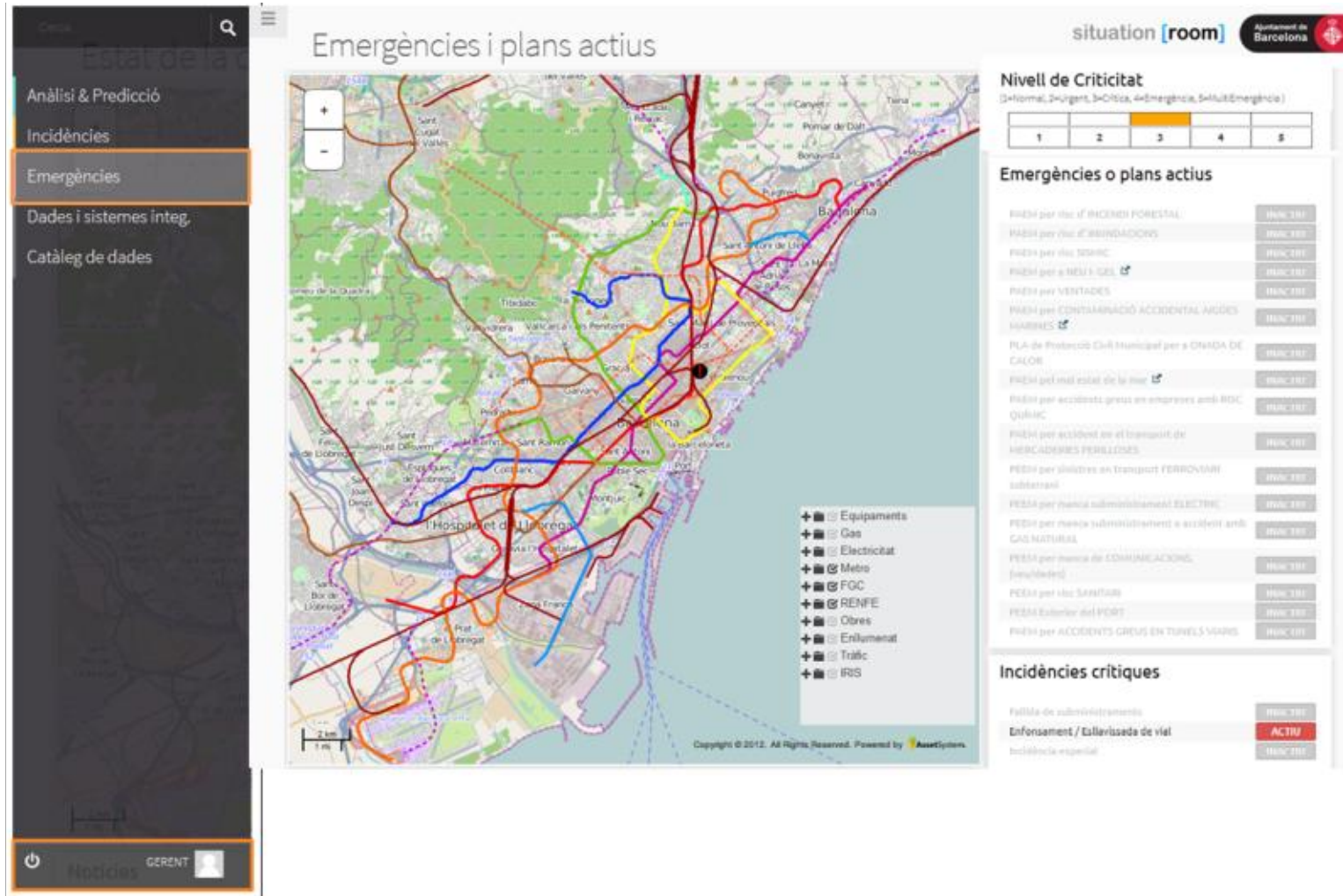
urban resilience building process

2. Resilience platform



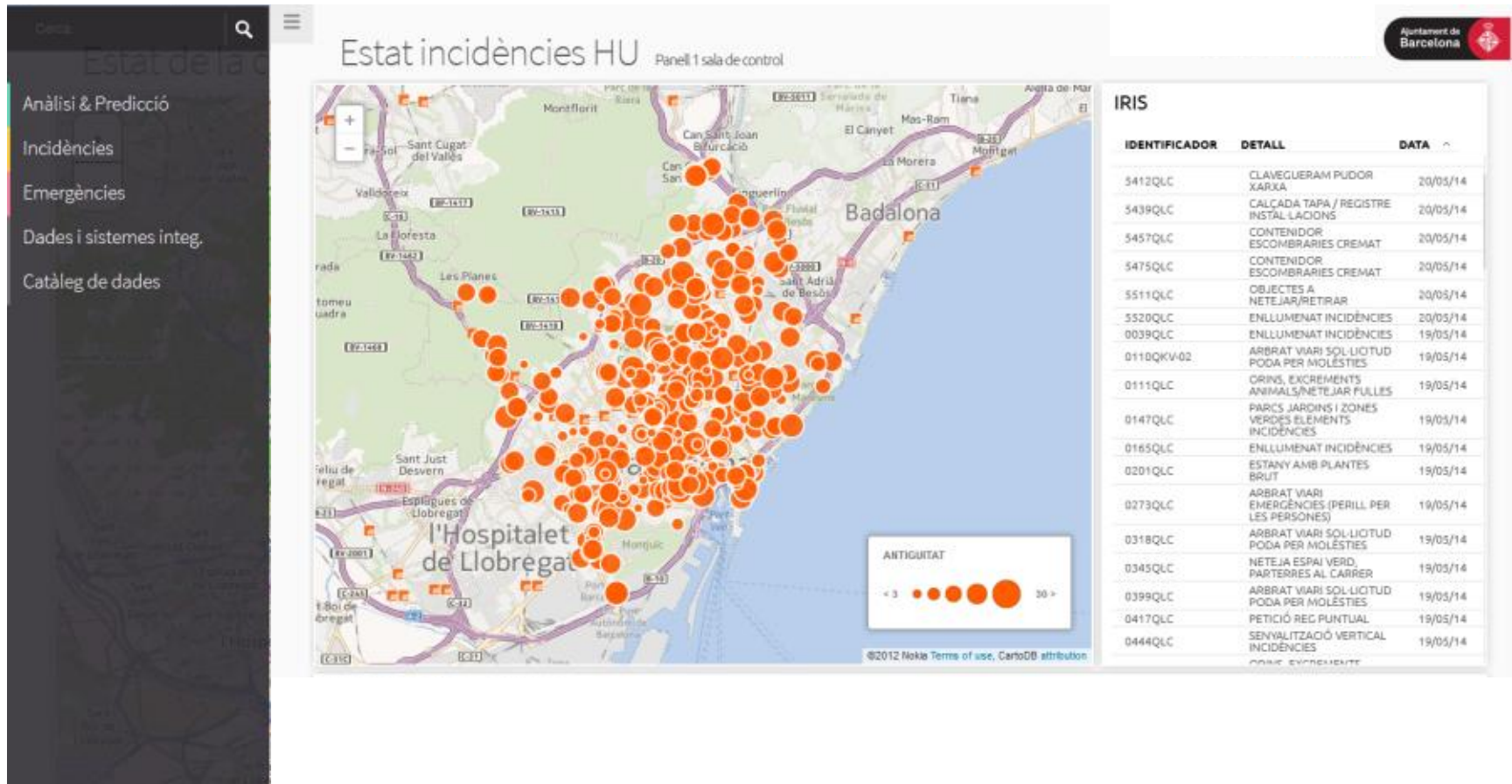
urban resilience building process

2. Resilience platform



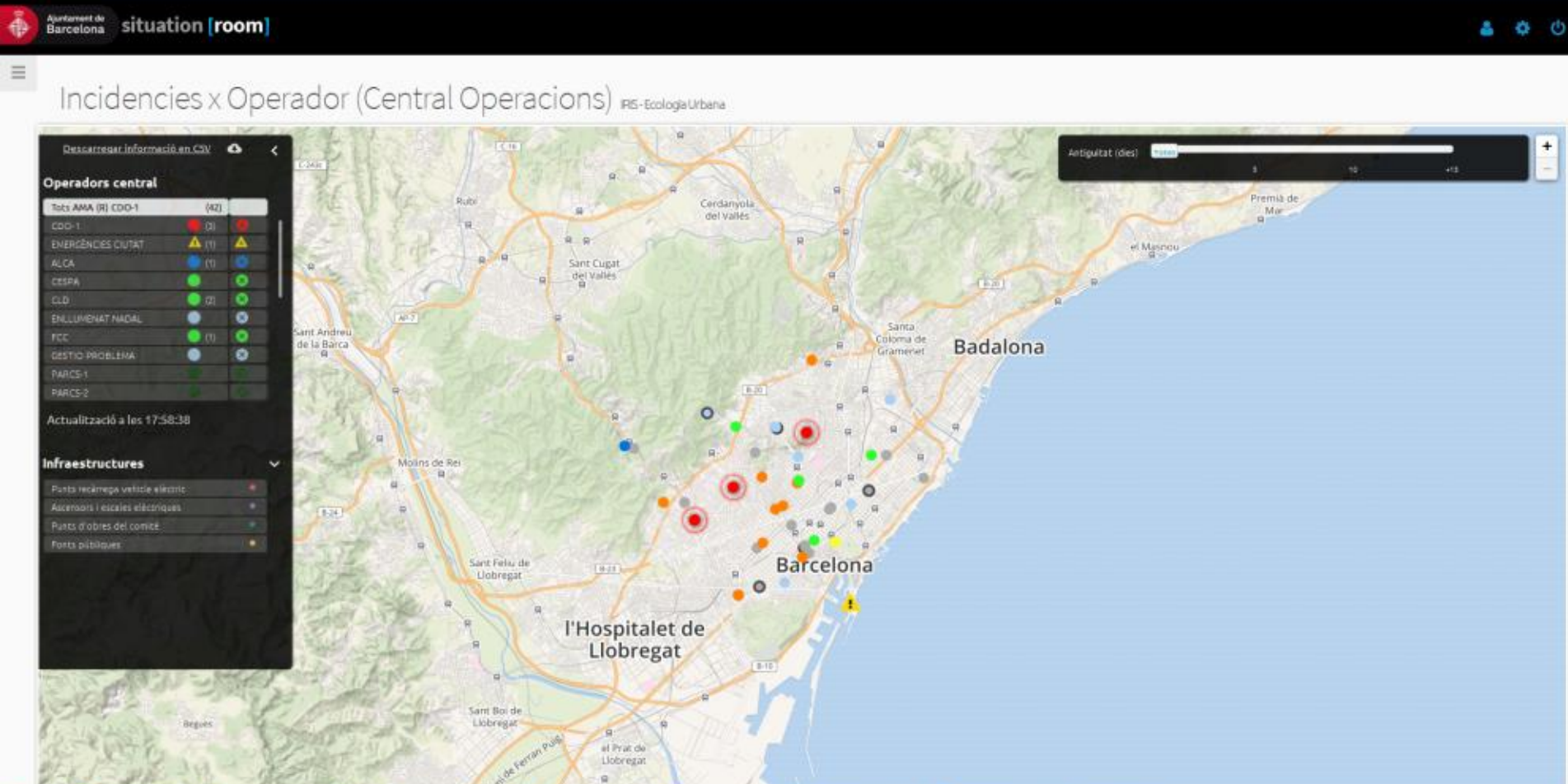
creation of urban resilience in Barcelona

2. Resilience platform



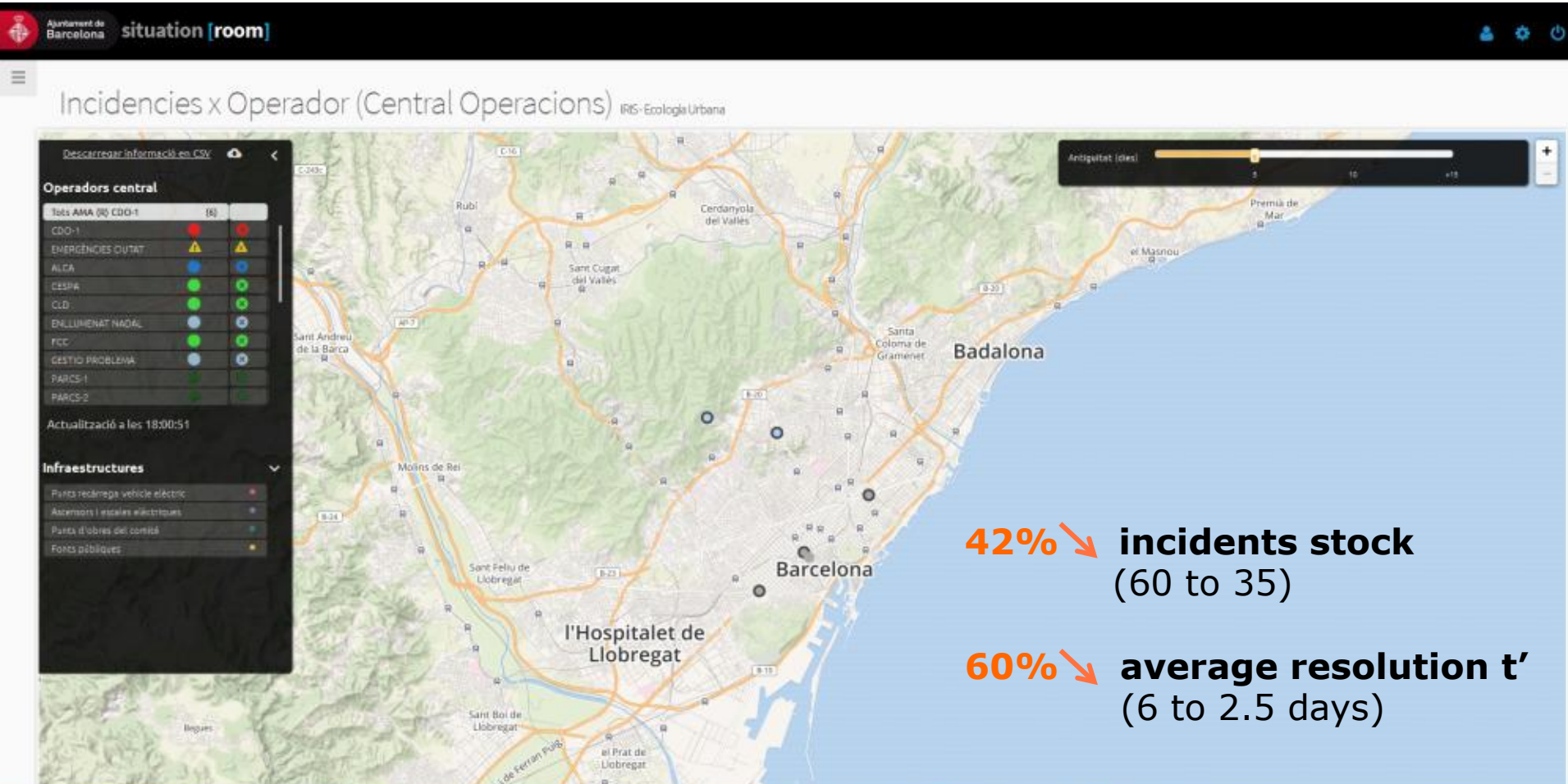
urban resilience building process

2. Resilience platform



urban resilience building process

2. Resilience platform

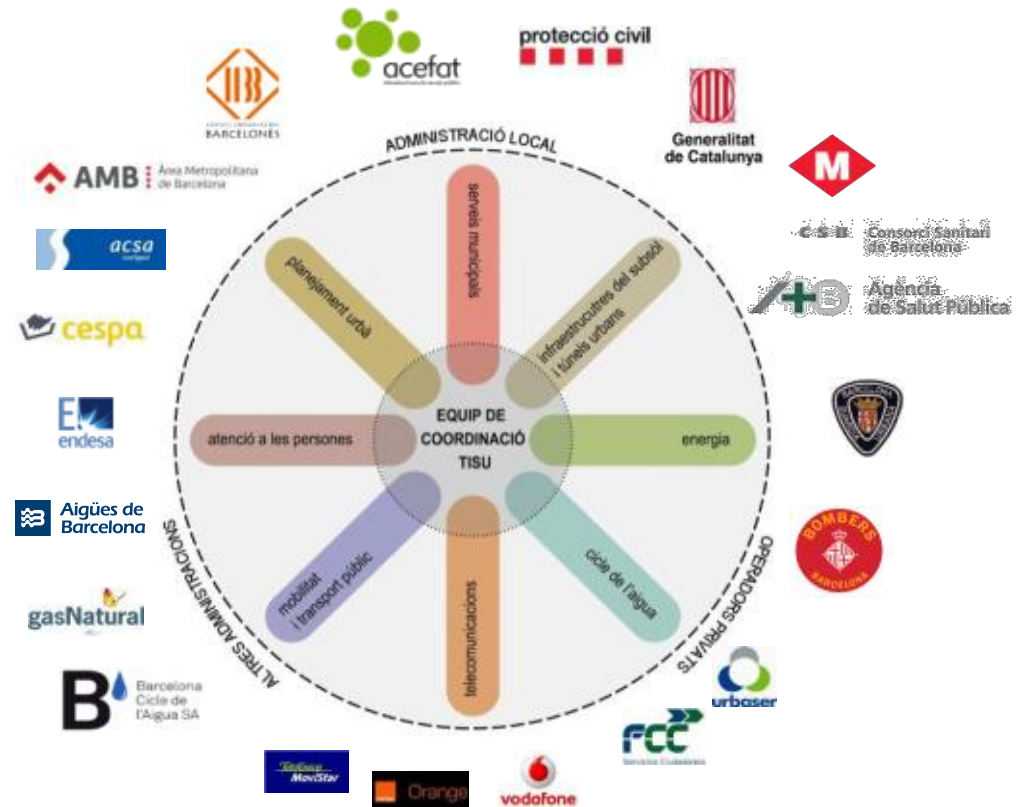


creation of urban resilience in Barcelona

3. Urban resilience boards (TRU)

2009. Creation of a working methodology enhancing **stakeholder engagement** and cross-sectorial coordination

Working groups with a **multidisciplinary approach** (technical staff from the City Council + other non-municipal organisations)

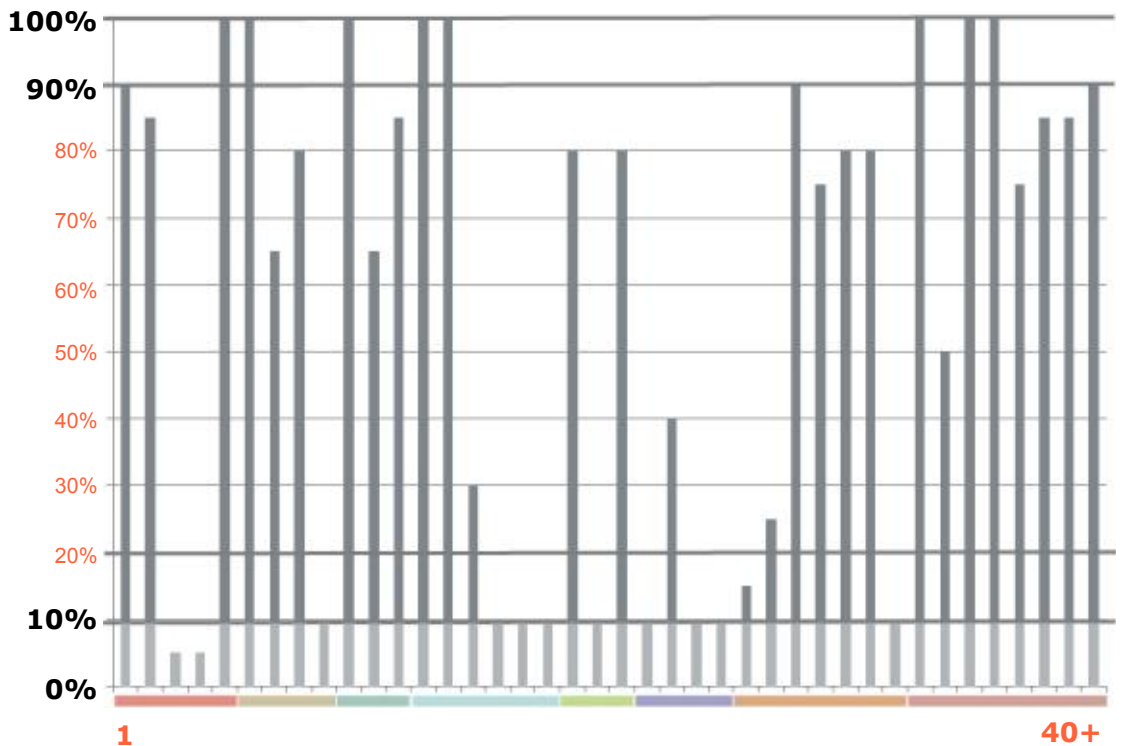


creation of urban resilience in Barcelona

3. Urban resilience boards (TRU)

Project phases

1. Diagnose
2. Definition
3. Development
4. Closure and communication*
5. Reviews

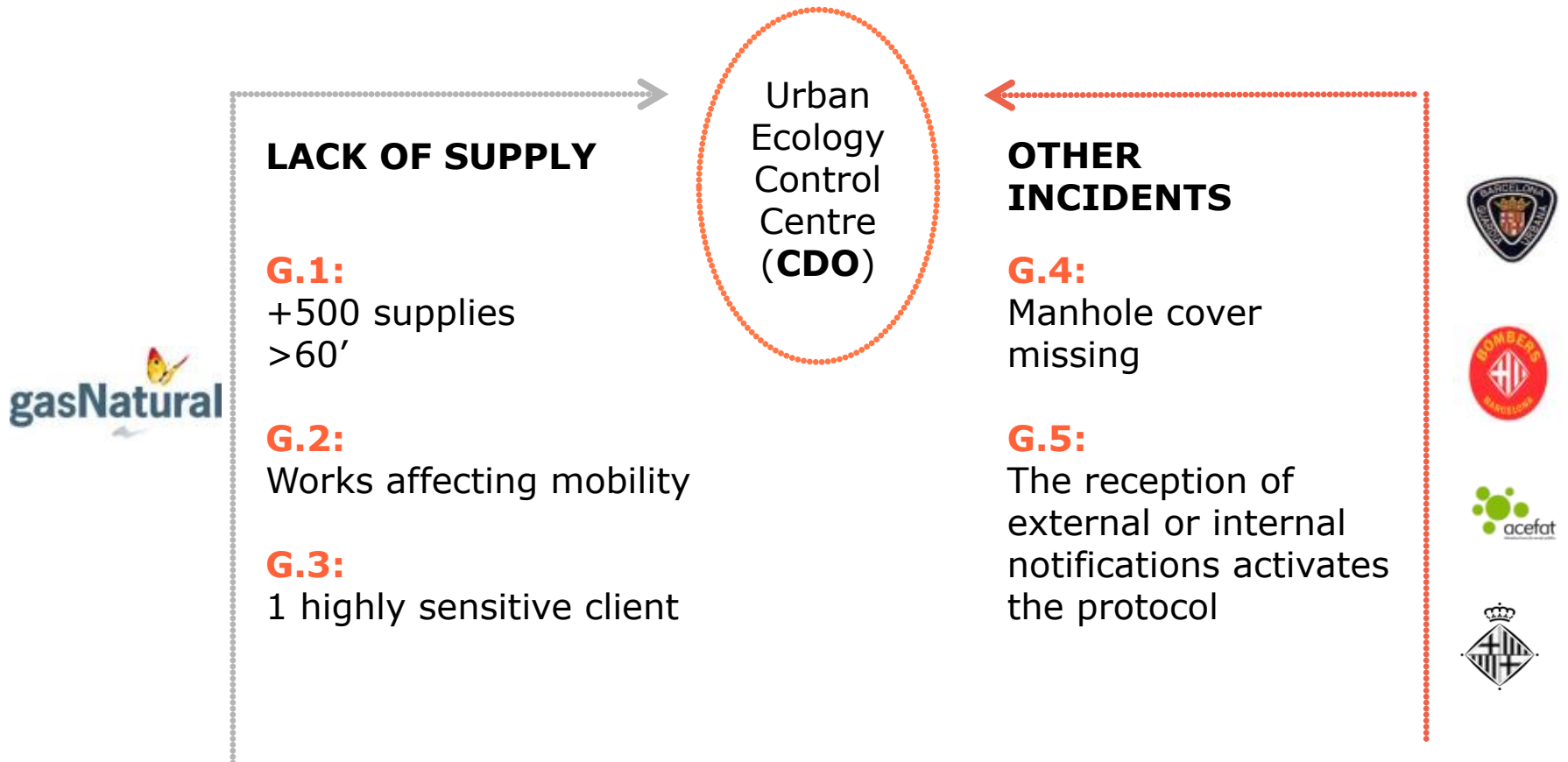


*Crucial step, as not all the agents who need to be aware of the action carried out will necessarily have been involved in its development

more singular projects in progress

protocols with utility companies

Types of incidents and means of communication



strategic planning

structure of Barcelona's urban resilience plan



strategic planning

structure of Barcelona's urban resilience plan



strategic planning

urban resilience and CC adaptation plan

Temporal scope

2015-2050

Geographical scope / boundaries

- › Collserola range
- › Llobregat delta
- › Besòs delta

Administrative scope / area of competence

- › Districts
- › Barcelona City Council
- › Metropolitan Area
- › Provincial Government

- › Catalan Government
- › Spanish Government
- › Port / Airport
- › Consortiums



strategic planning

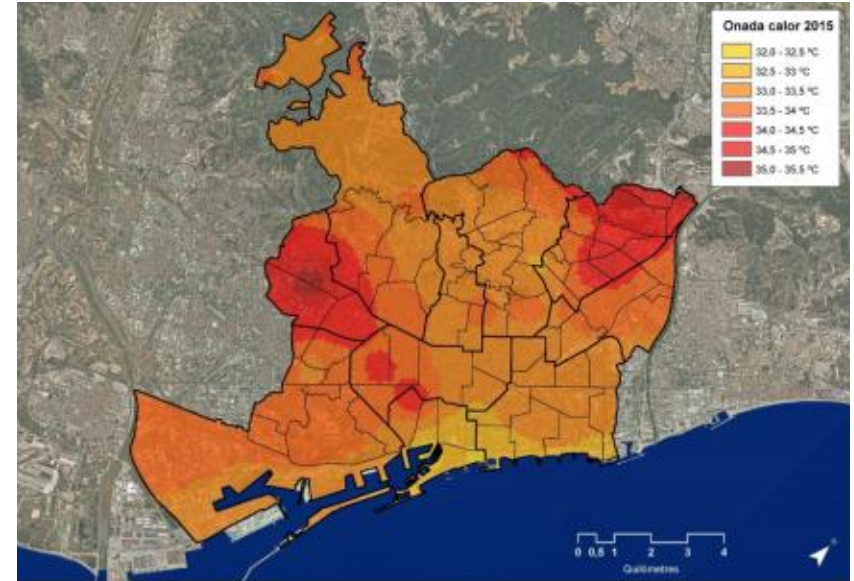
urban resilience and CC adaptation plan

70%

of the expected impacts
resulting from CC are
already being observed
in Catalonia

Barcelona's main risks

Heat wave, wildfire, floodings, sea level rise, air quality
and infrastructure vulnerability



Heat wave | 2015

BR BARCELONA
REGIONAL

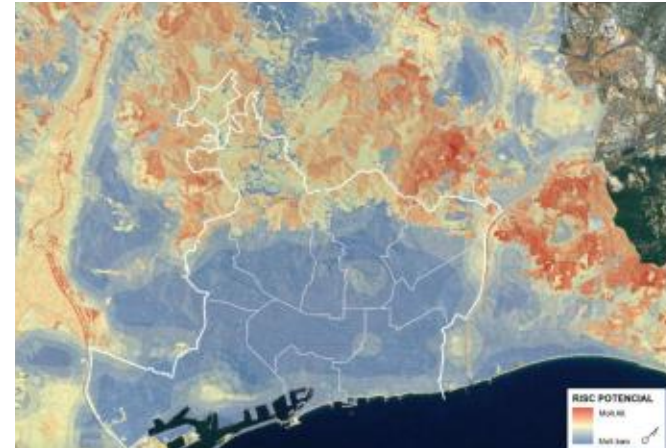
strategic planning

urban resilience and CC adaptation plan

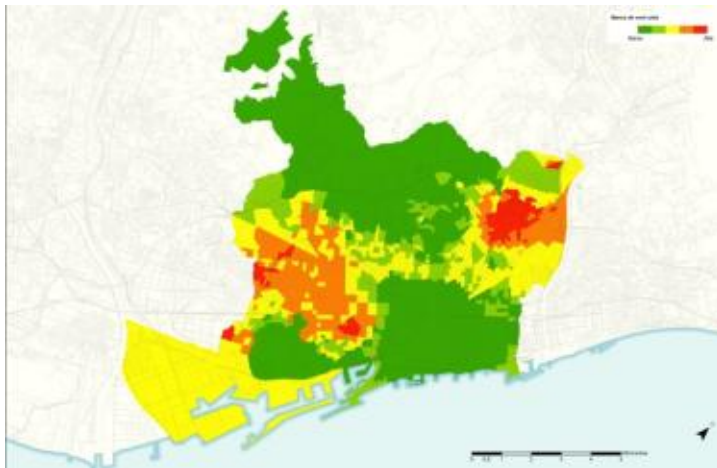
Completing the vulnerability assessment



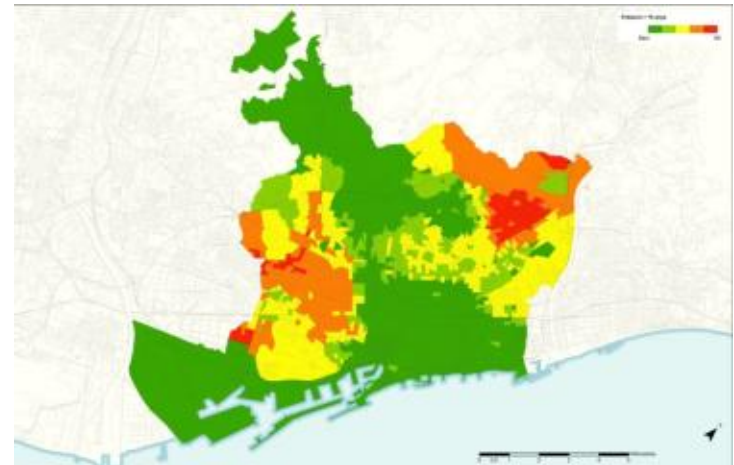
flooding



wildfire



Heat



strategic planning

urban resilience and CC adaptation plan

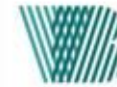
review of existing measures

PLA DE RECURSOS

HÍDRICS ALTERNATIU



Pla d'energia,
canvi climàtic
i qualitat de l'aire
de Barcelona
2011-2020
(PECQ)



PLA DEL VERD
I DE LA BIODIVERSITAT
DE BARCELONA 2020



! Incorporating resilience & adaptation criteria

international collaboration

City Resilience Profiling Programme (CRPP)

**Agreement to establish UN-Habitat's
resilience office in Barcelona**

CRPP de UN-Habitat

UNISDR

100RC

C40 Climate Leadership group

MCUR



Ajuntament
de Barcelona

Basis for the profile

CRPT Status

City Resilience Profiling Tool

- › Built upon previous profile experience in June 2015
- › Indicators deeply developed during 2016
- › First version of scoring algorithm
- › First idea of relationship between elements, hazards, stakeholders

Data gathering

Fact sheet

Region



02° 07' 31" E
longitude
41° 25' 10" N latitude
412 m above sea level



10,216 hectares
municipality
158 inhab/ha
density



29.10 km²
green areas
4,395 m beaches

Climate



15.8 °C annual average
35.1 °C maximum
-1.6 °C minimum



967.0 hPa average
987.2 hPa maximum
932.6 hPa minimum



580.0 mm total
40.2 mm
maximum rainfall
112 days of rain
9 days of storms



2,776.4 hours
of sunshine per year



69 % relative humidity

Population



1,611,822 inhabitants
4,788,422 inhabitants in the
metropolitan region
82.6 % population Spanish
17.4 % population foreign



83 years
life expectancy (2012)
8.2 birth rate
9.2 death rate



7,571,766 tourists
16,485,074
overnight stays

Data gathering

Indicators

Social indicators



€18,700/year
disposable household
income per capita



18.3 %
at risk of
poverty (2011)



89.40 %
secondary school
graduation rate
(2012-2013)



78.1 %
households with
internet access

Economic indicators



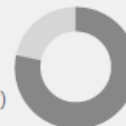
€38.500
average GDP at market
prices per inhabitant
Base year 2000



17.2 %
unemployment



78.0 %
participation
rate (4th quarter)



65.4 %
employment

Environ- mental indicators



18.1 m²/inhab
green areas
✓ 2003 - 17.39 m²/inhab



16,782 GWh
total energy consumption
(2012)
✗ 1999 - 15,664.78 GWh



108.4 l/inhab per day
domestic water consumption
✓ 1999 - 137.5 l/inhab. per day



730,285 tonnes
urban solid waste
✓ 2003 - 860,338 tonnes



36.2 %
separated waste collection
✓ 2003 - 23.95 %



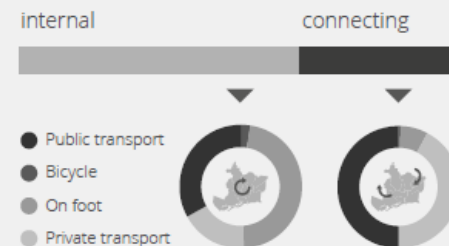
7.7 million
trips per day



40 micrograms/m³
average annual level of NO₂
✓ 2003 - 55 micrograms/m³



24 micrograms/m³
average annual particle
level (PM₁₀)
✓ 2008 - 36 micrograms/m³



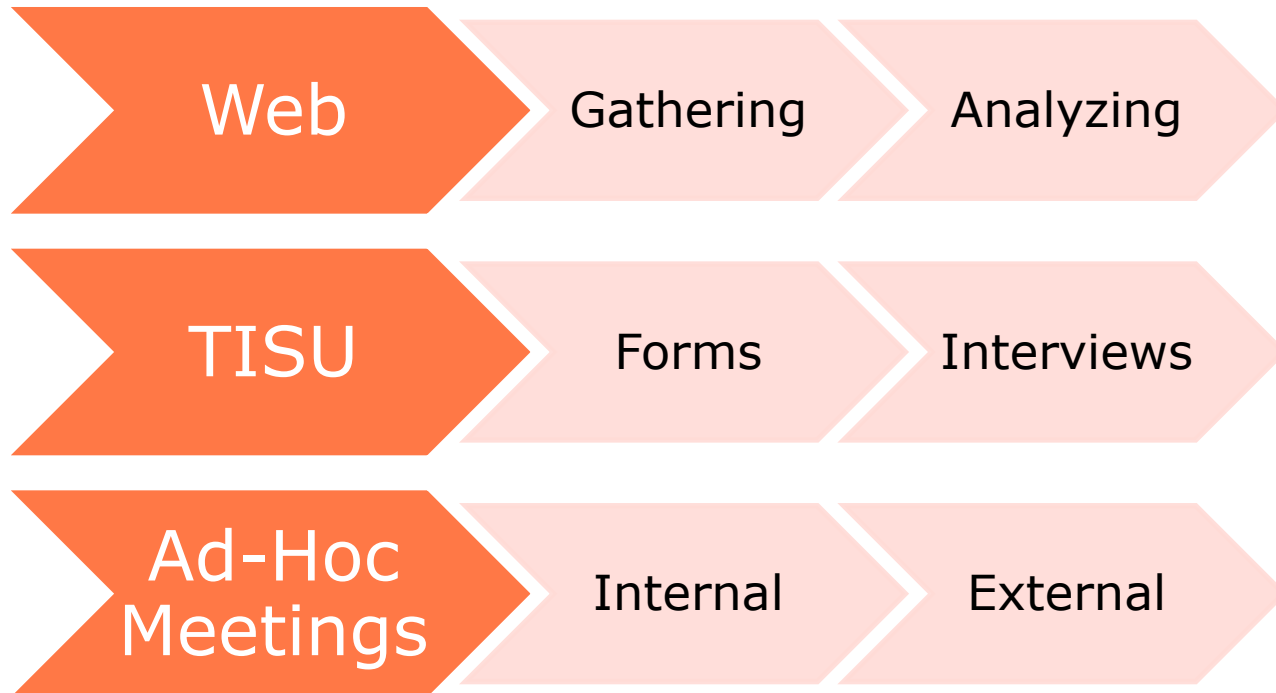
Data gathering

Multiple Sources



Data gathering

The process



Data gathering

The challenges

Information Management

- › Multiple sources
- › Different scales
- › Different levels of aggregation
- › Different moments of time
- › Reliability
- › Quality
- › Relevance
- › Need to make estimates
- › Sometimes too specific/sometimes not



Source: flickr – janneke staaks

Data gathering

The challenges

Organizational

- › Sensitivity
- › Self knowledge risk
- › Indicators linked to territory
- › Mixing information
 - › From different stakeholders
 - › Maybe not from all of them
- › Resources needed
 - › Data gathering exercise
 - › Maintenance of this experience



Source: wikipedia - J. Howard Miller

Data gathering Process result

83%

of questions answered

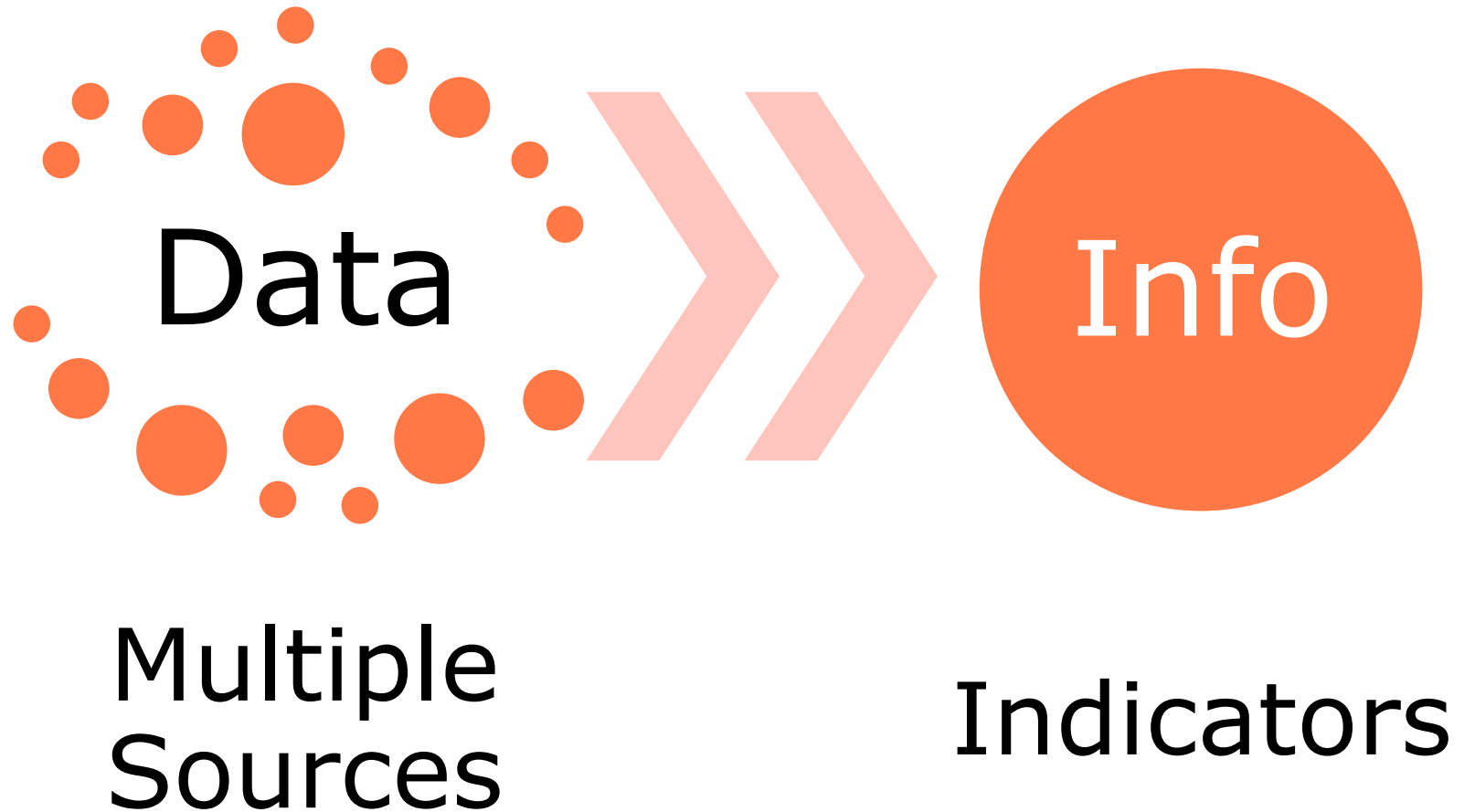


Source: wikipedia - Juank0590

- Official Documents - 60,63%
- Public Knowledge - 35,19%
- Media sources - 4,18%

Duration of the process: **3 months**

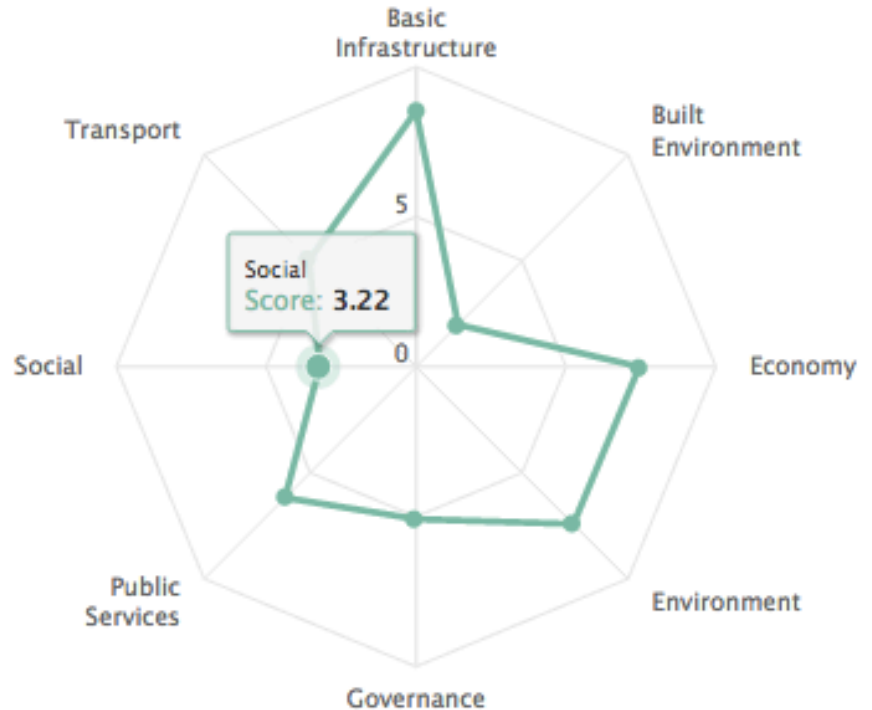
Evaluation of data
Scoring process



BCN Preliminary Profile

Overall results

- > **Not expected:**
 - > Built Environment
 - > Social
 - > Transport
 - > Public Services



BCN Preliminary Profile

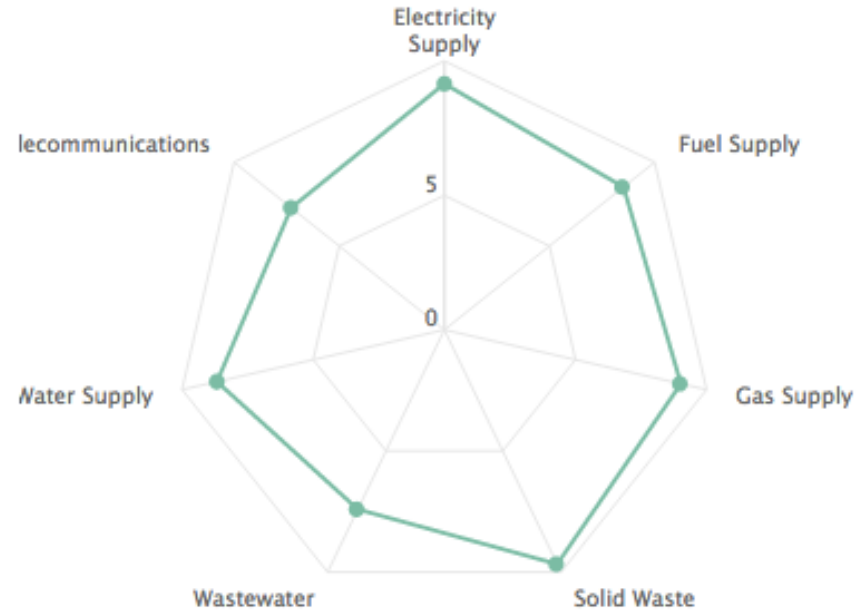
Basic Infrastructure

> **Good things:**

- > Development Plan
- > Contingency Plan

> **Difficulties:**

- > Service subscribers
- > Continuity of operation
- > Competences



BCN Preliminary Profile

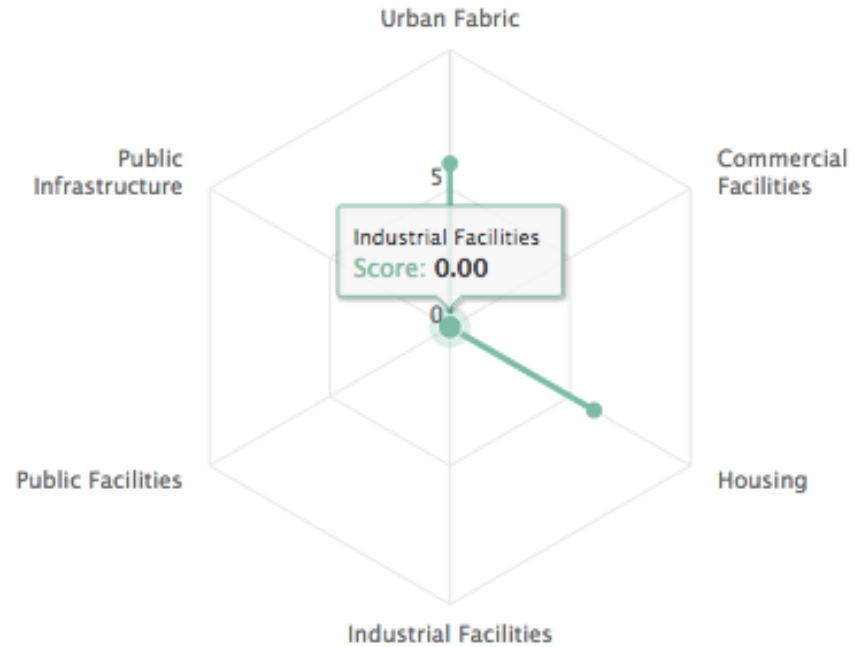
Built Environment

> **Good things:**

- > Housing data

> **Difficulties:**

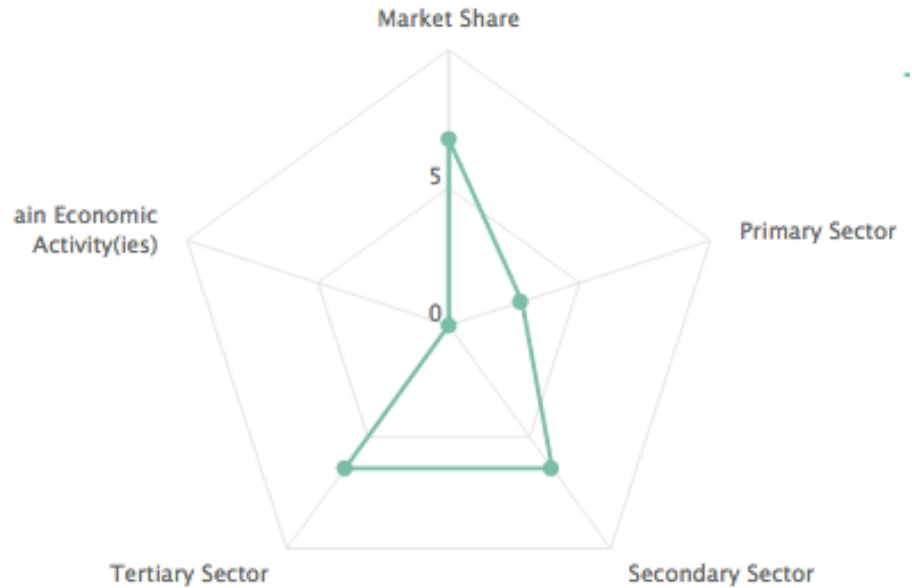
- > Some areas
- > Lack of data about:
 - > Industrial Facilities
 - > Public Facilities
 - > Public Infrastructure



BCN Preliminary Profile

Economy

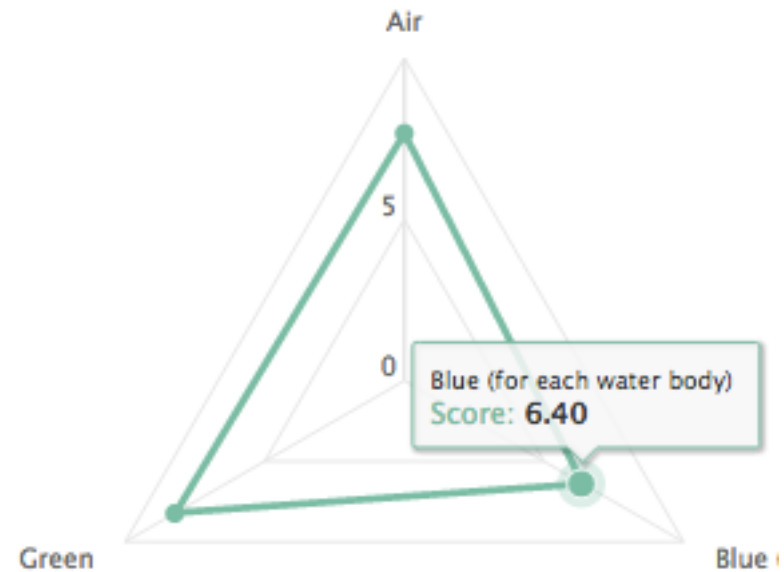
- > **Good things:**
 - > We have data
- > **Difficulties:**
 - > How to score:
 - > Main Economic Activities



BCN Preliminary Profile

Environment

- > **Good things:**
 - > We have data
- > **Difficulties:**
 - > How to score:
 - > Exceedance days
 - > Average concentrations



BCN Preliminary Profile

Governance

> **Good things:**

- > Local Gov. data

> **Difficulties:**

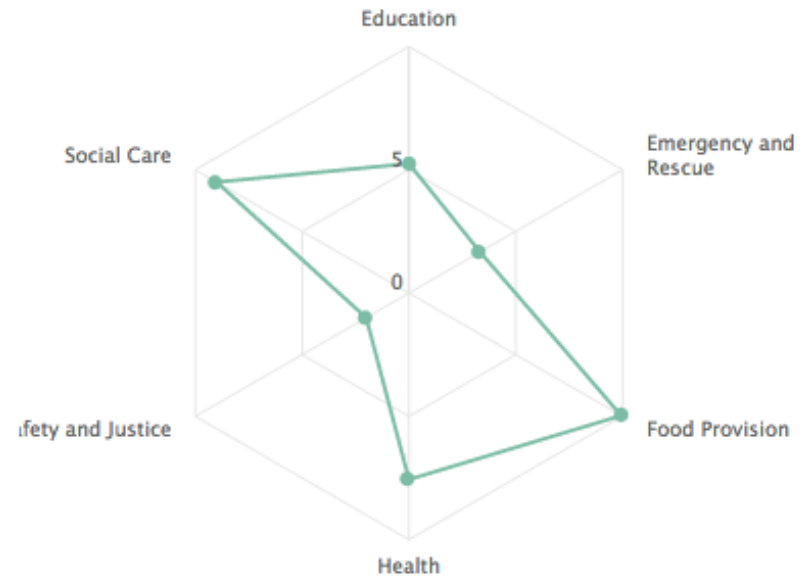
- > Development plans
- > Number of institutions
- > Other Major Institutions
 - > Average concentrations



BCN Preliminary Profile

Public Services

- > **Good things:**
 - > We have data
- > **Difficulties:**
 - > Scoring:
 - > Resources
 - > Continuity of operation



BCN Preliminary Profile

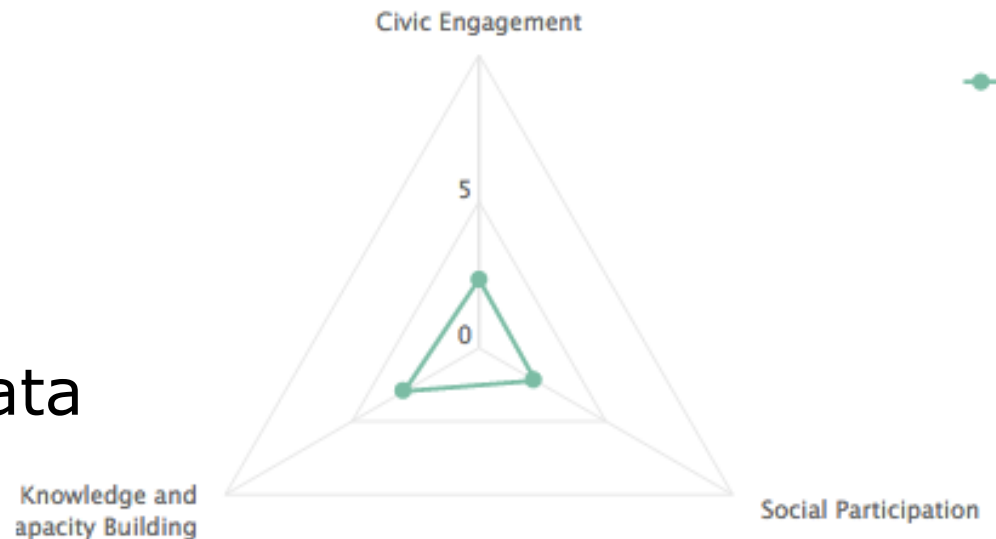
Social

> **Good things:**

- > We have some data

> **Difficulties:**

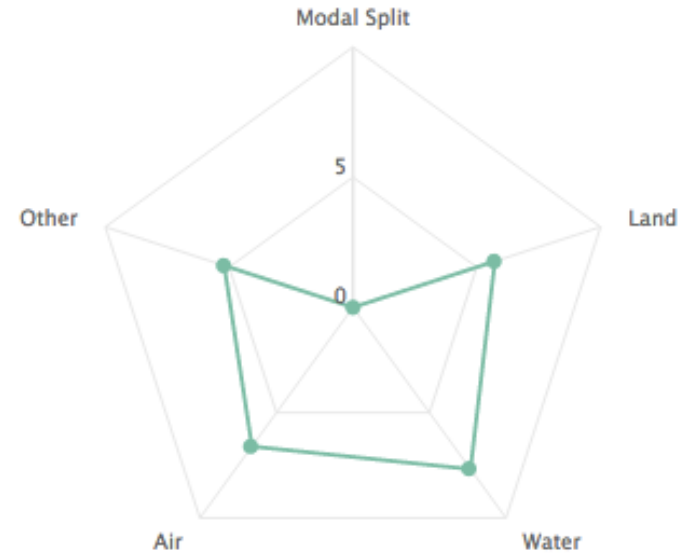
- > Lack of data:
 - > Participation in civil society organizations
 - > Conflicts
 - > Access to means of communication
 - > Population trained in emergencies
- > How to score citizen's candidacy



BCN Preliminary Profile

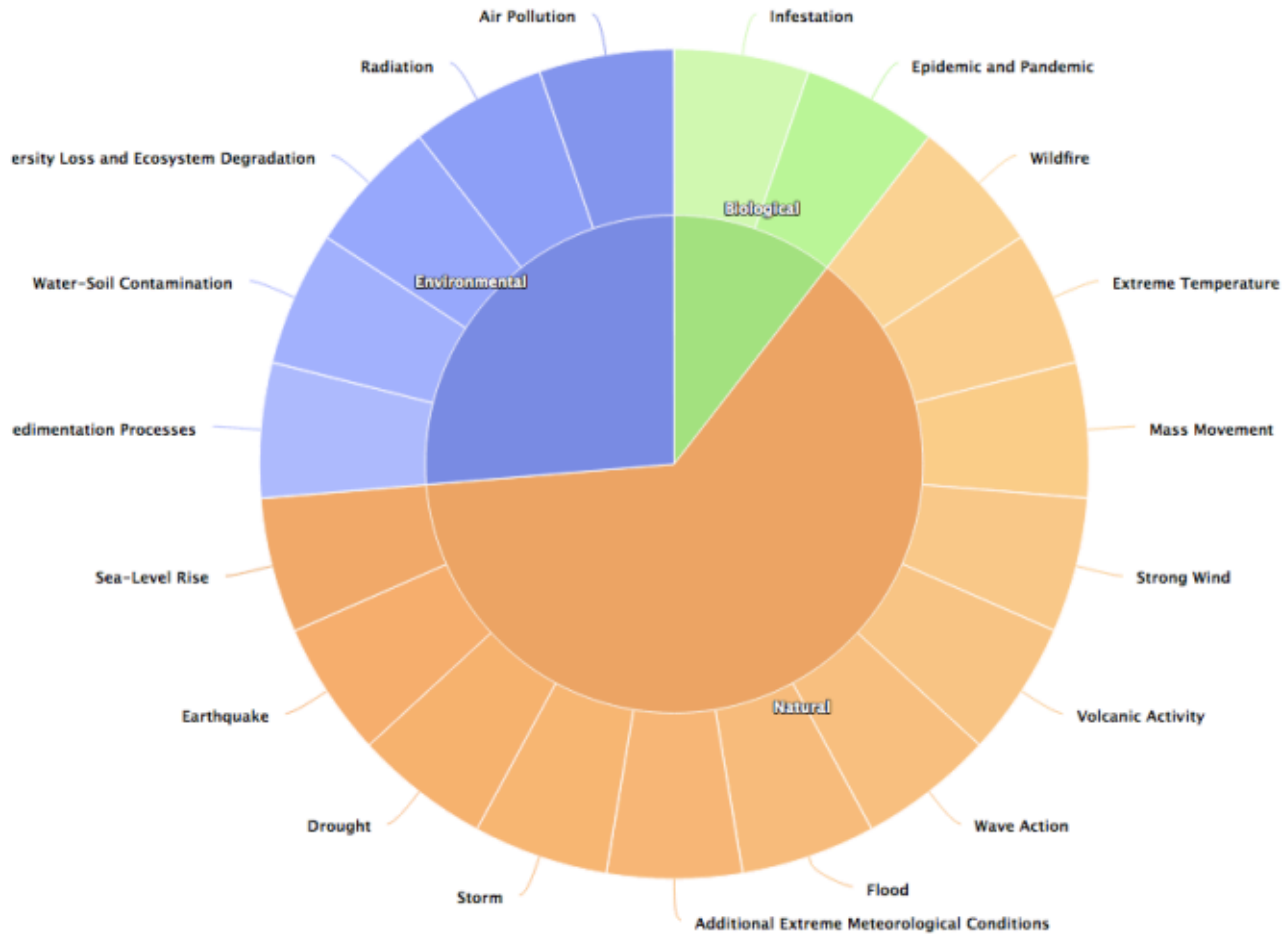
Transport

- > **Good things:**
 - > We have lots of data
- > **Difficulties:**
 - > Lack of data:
 - > Continuity of operation
 - > How to score:
 - > Traffic diversity
 - > Traffic volumes



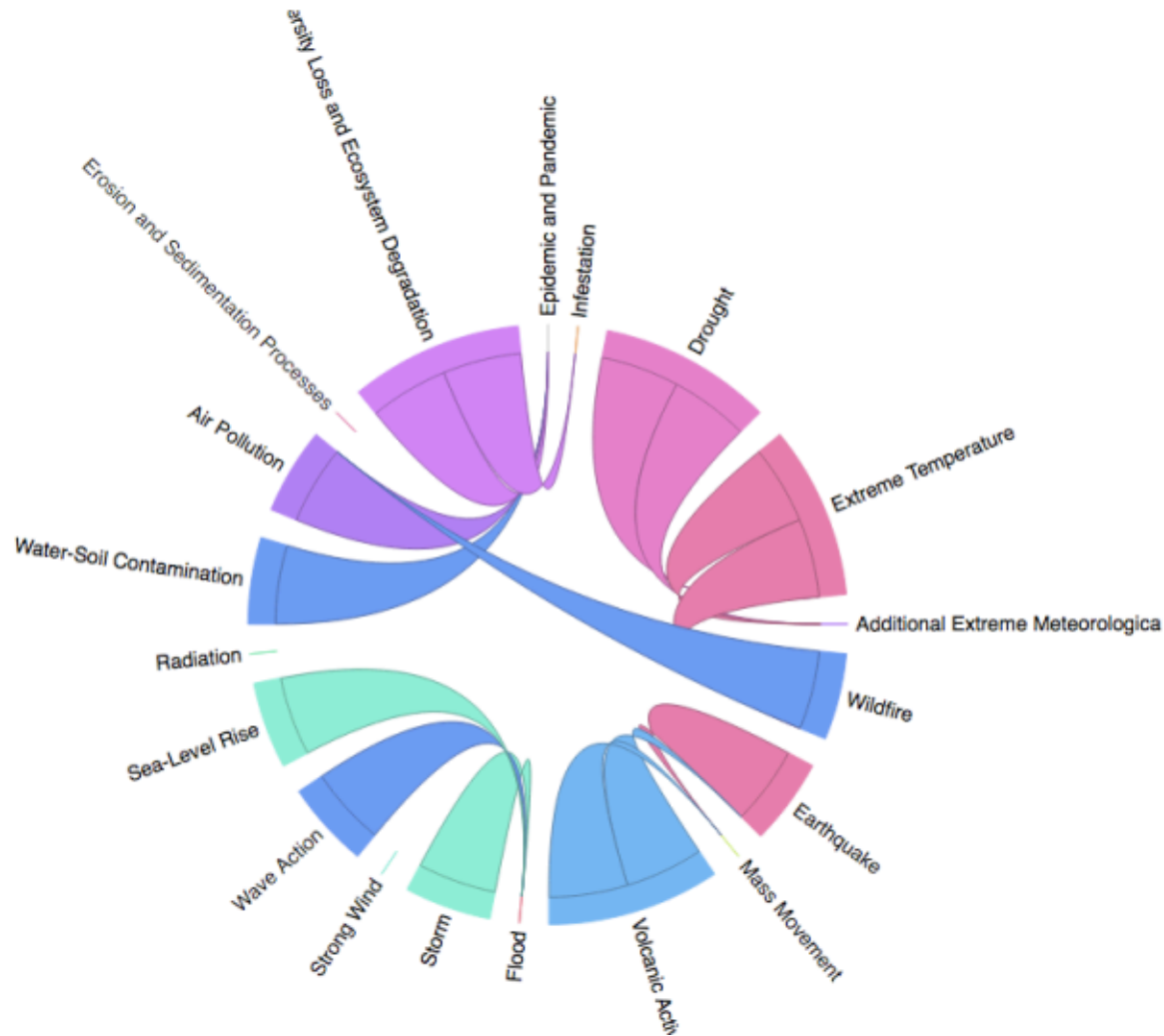
BCN Preliminary Profile

Hazards – Overall view



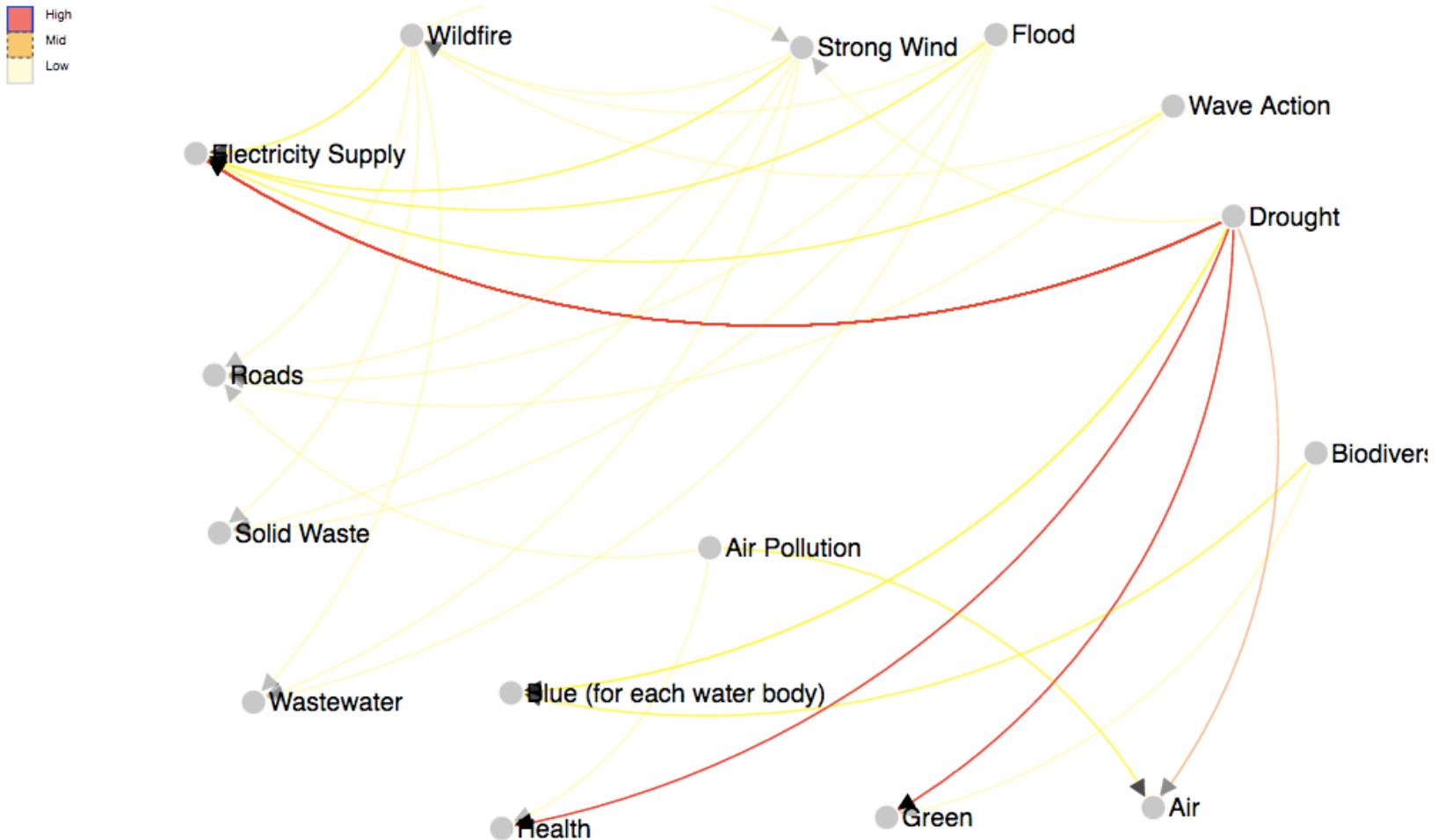
BCN Preliminary Profile

Hazards – Interdependencies



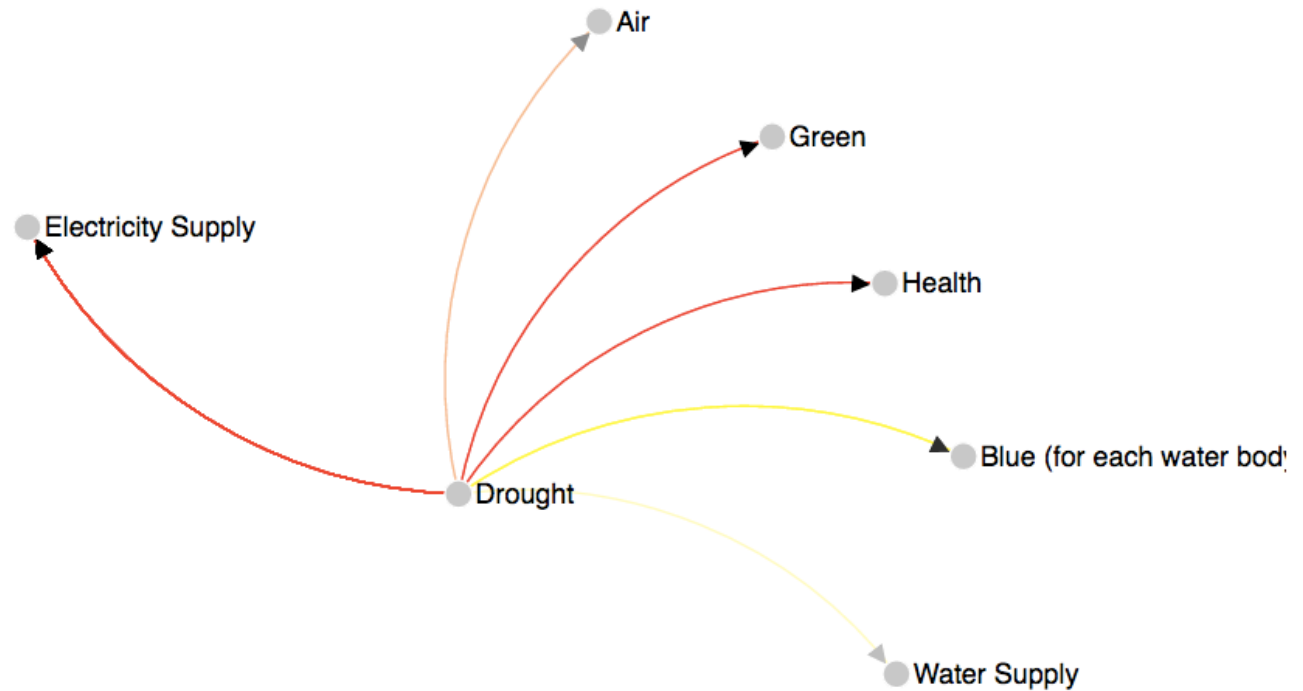
BCN Preliminary Profile

Hazards – Impacts



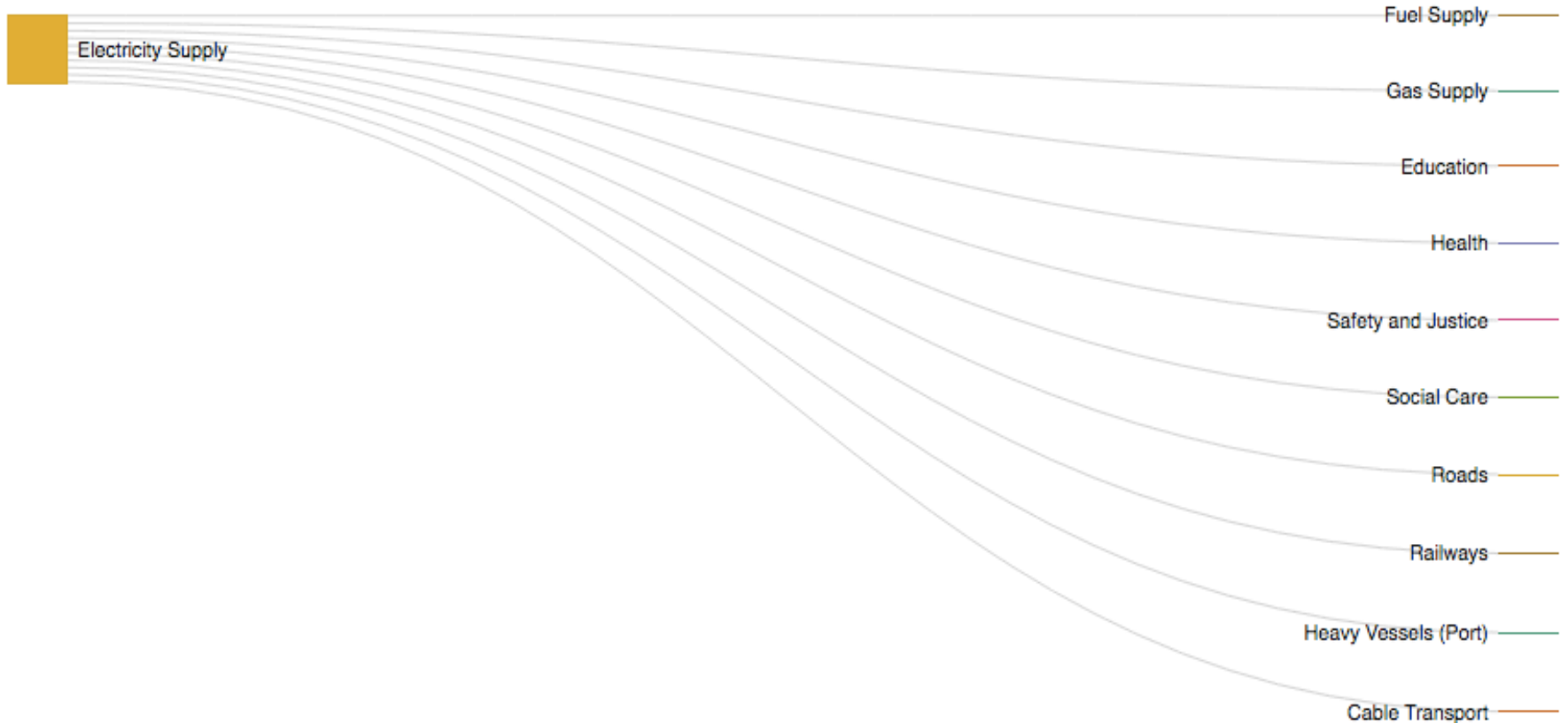
BCN Preliminary Profile

Hazards – Impacts



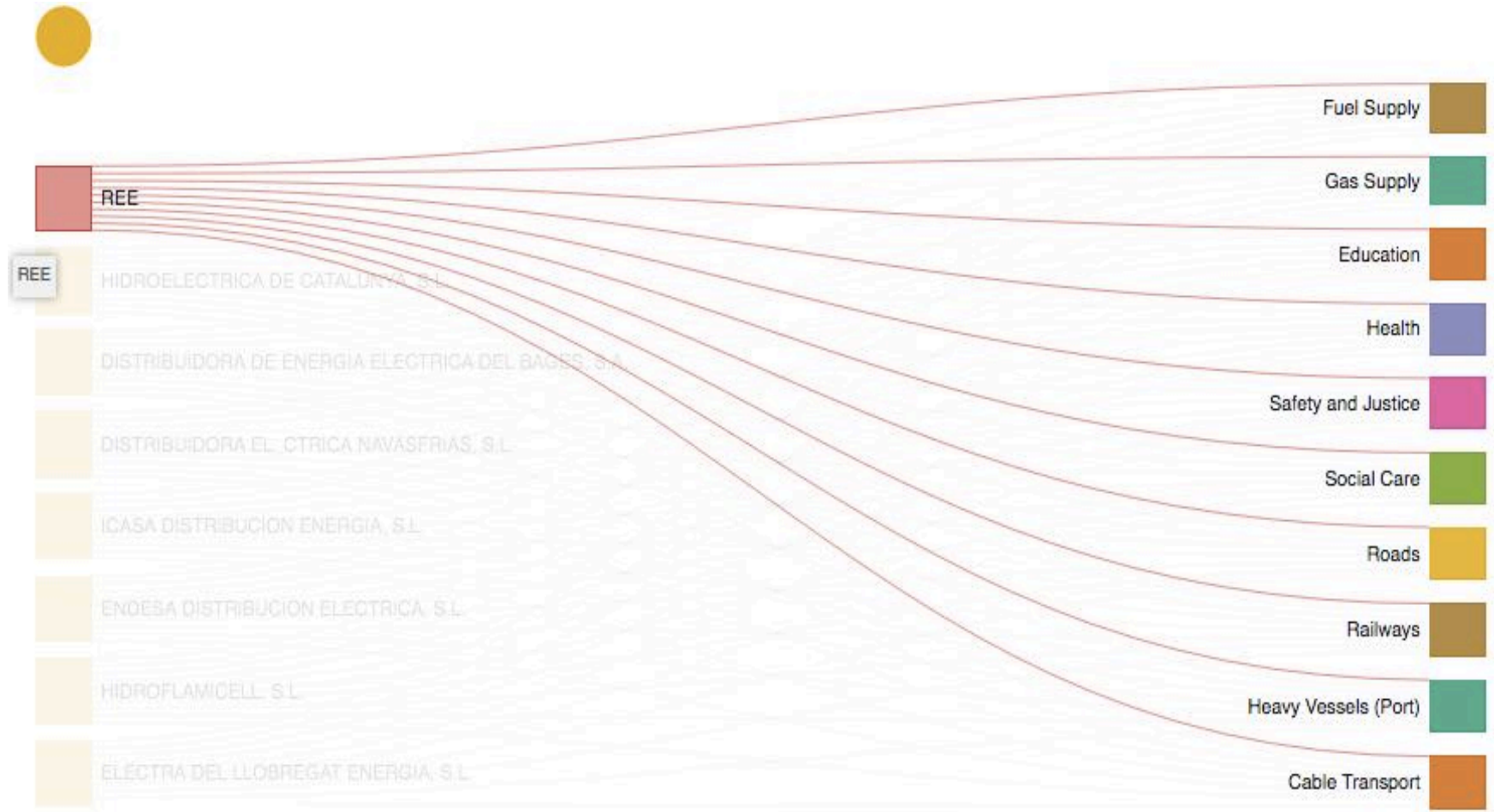
BCN Preliminary Profile

Element dependencies



BCN Preliminary Profile

Stakeholders



Resilience Platform

Where to integrate CRPT results

Governance



Dashboards
City management indicators

Technicians



Analytics Room
Territorial information analytics to enhance risk contingency protocols

Street operations



Smart Editor
Consult and edit information through web forms in case of emergency or street works

Communication



Map Publishing
Map creation and web publishing

BCN Preliminary Profile

Conclusion

- › Great value: **the process!**
- › **Opportunities:**
 - › Increase knowledge of the city
 - › Increase of management tools
 - › Better communication with stakeholders
 - › Raising up projects
- › And we have to face RAP still..



Source: pixabay- geralt