

*Space-based, terrestrial
technologies and resilience
towards a sustainable city :
an academic point of view*

Youssef DIAB

Professor of Urban Planning
University Paris Est
Scientific director of EIVP

MAIRIE DE PARIS



Pole of research and higher education (PRES)

Universities,
«*Grandes Écoles*»
and research institutes:
A driving force on interdisciplinary
issues



Université Paris-Est – Key figures

- **20** universities, "*grandes écoles*", research institutes and competitiveness cluster members
- More than **100** research laboratories and programs
- **50 000** students
- **1 400** doctoral candidates including 50 % international doctoral candidates
- **2 000** academics and researchers
- **500** engineers and technicians
- **6** doctoral schools
- **100** active international partnership agreements



2 main campuses and 2 focus areas



*Health and
Society*

*City, environment
and their
engineering
sciences*

Rationale

- ▣ The context : New technologies, new models, complexity, resilience
- ▣ Space based technologies : examples for UP
- ▣ The concept of 'Urban Engineering'
- ▣ Examples
- ▣ Cross fertilisation

Autolib – self-service electric cars : not a car sharing



Designers Associés & High-Graph Architecture

Source : Ville de Paris



Hammarby Sjostad, Stockholm



Risk and resilience

- Hazard and vulnerability (colloque Risque et GC 2000, Unesco)

Uncertainty on the behavior of materials, on the conditions of their implementation, their durability; uncertainty on the geologic, hydraulic, marine environment; and on the extreme conditions of operation of the works.

- Law Barnier (1995) and codes (earthquakes et Prevention plans)

- Human sciences : Research on risk

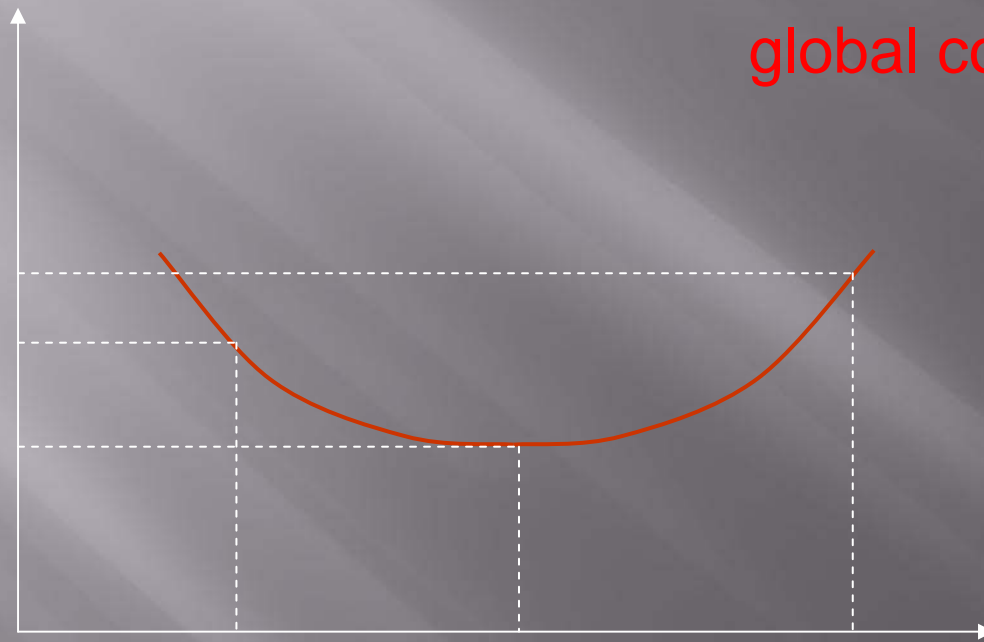
De Vanssay (Kobé earthquake 1995 remake of Canto 1923)

Futuribles 1997 : Responsables, images...

The price which the society is ready to pay so that the future generations live in a better protected environment : legal system to relieve the consciousnesses (Czitorm)

Influence of the security on the global cost of a project

Global cost



Insuffisant security

Optimal security

Excessive security



Choice of an acceptable probability of service or failure



Risk function

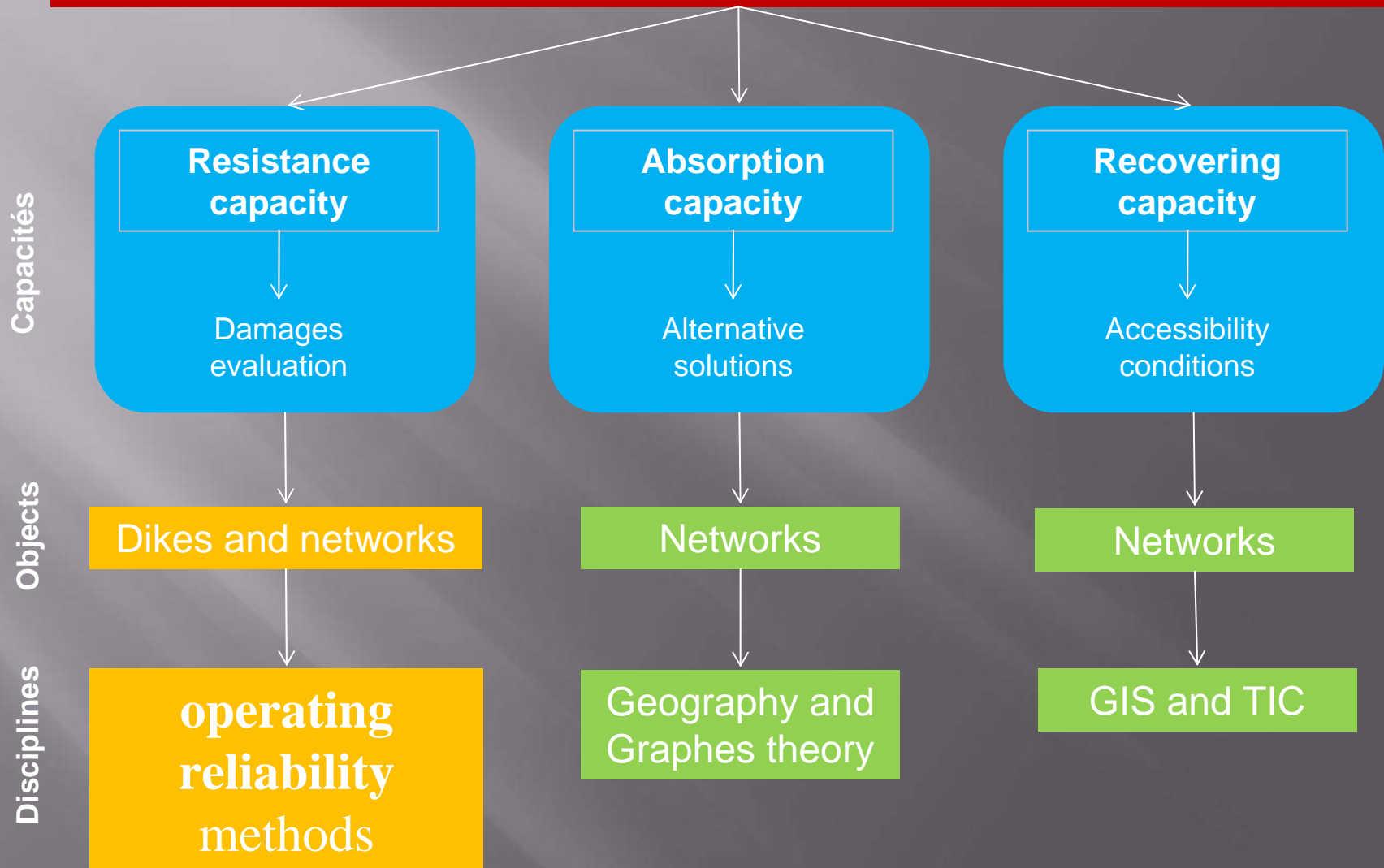
A multidisciplinary concept ...



Lhomme et al., 2010

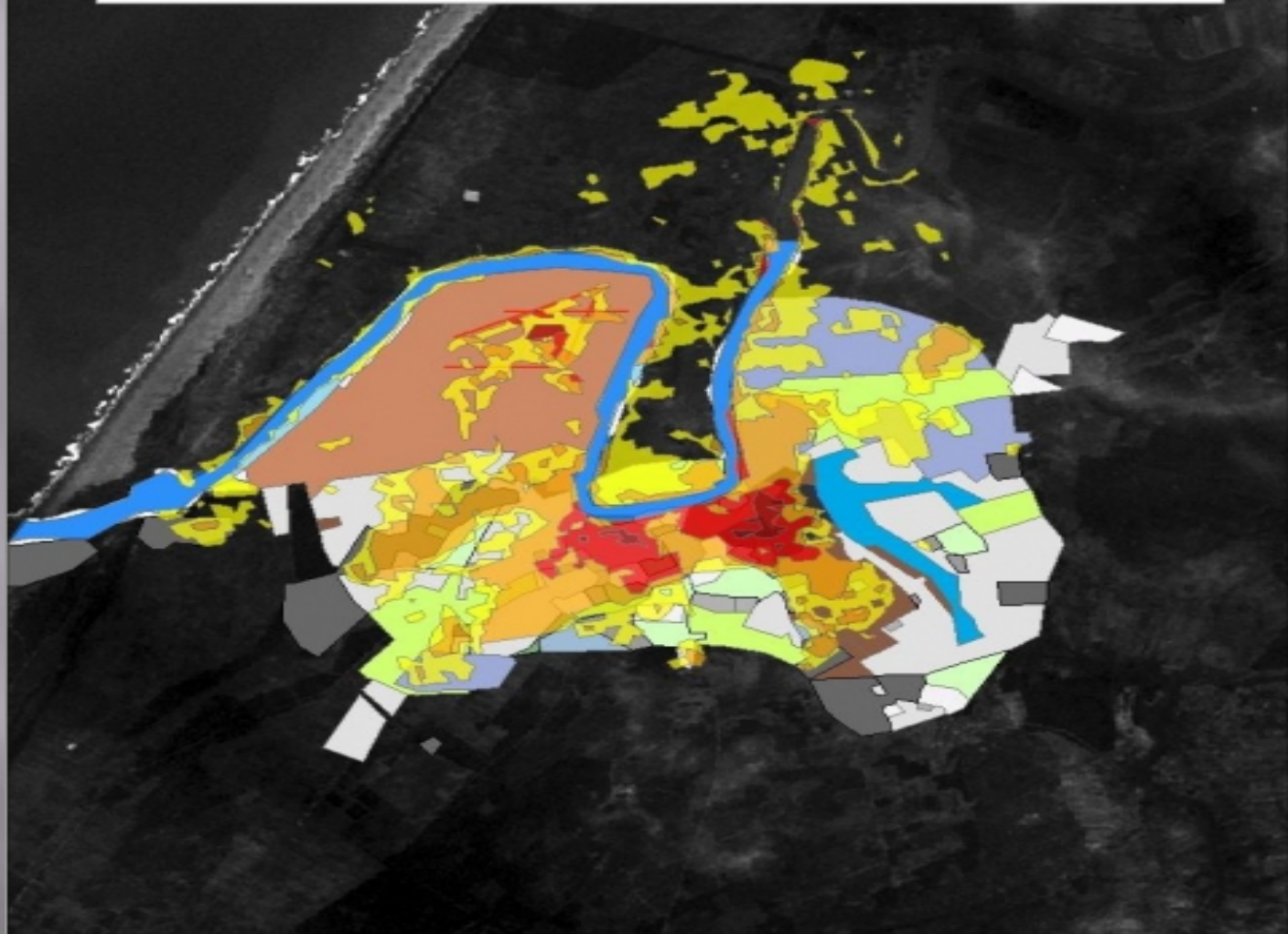
Evaluation of Urban Resilience

Urban resilience = operating in a recovering way and degraded mode



**Pertinent examples of the use of
Space based technologies for
resilience and disaster
management**

Densité du bâti de Kenitra et occupation du sol



Légende

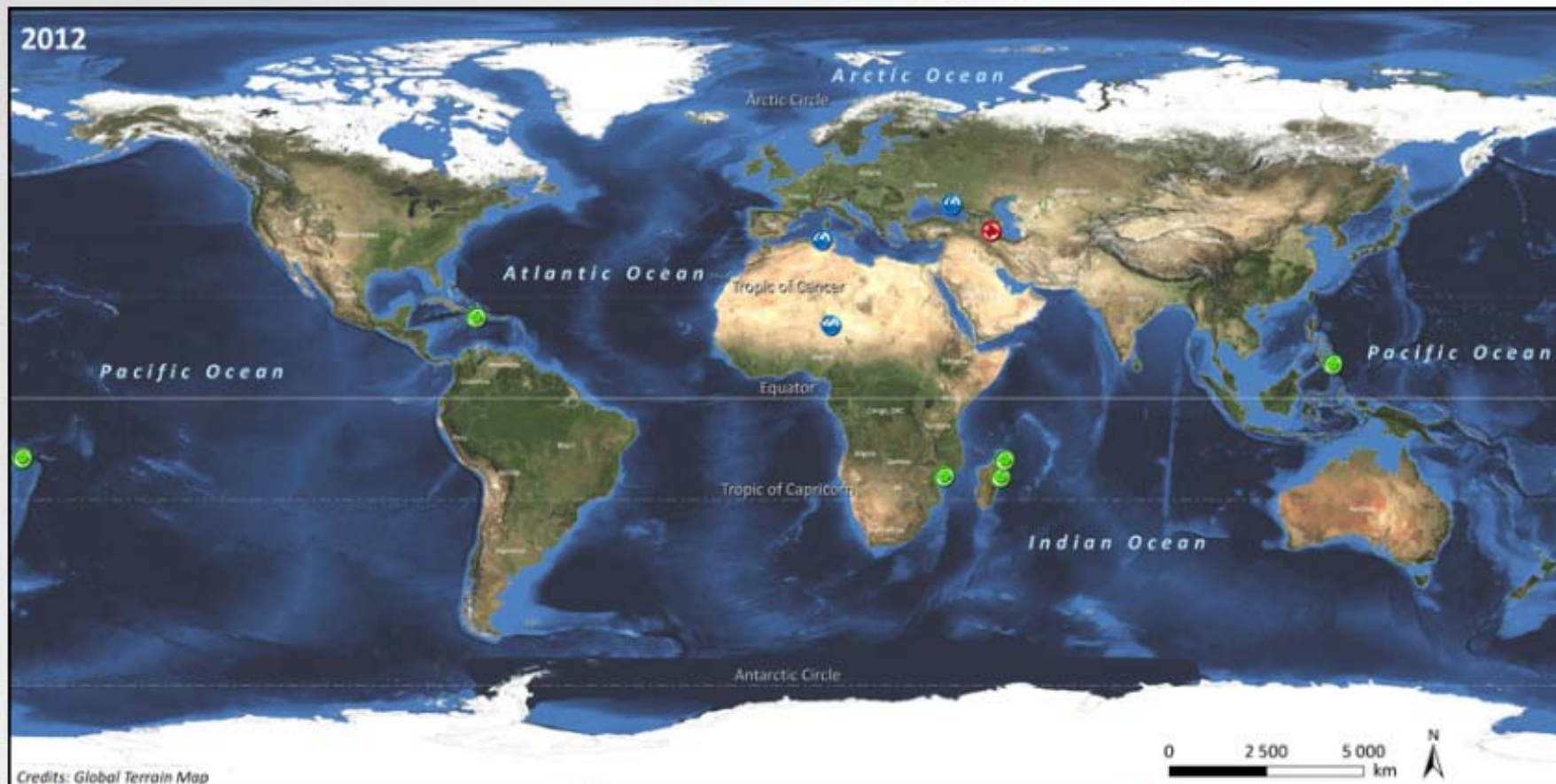
Densité du bâti



Landsat 5 TM Bande 1



2012



Credits: Global Terrain Map



Inondation / Flood



Tsunami



Cyclone / Hurricane - Tropical Storm



Tempête / Storm



Séisme / Earthquake



Eruption volcanique / Volcanic eruption



Glissement de terrain / Landslide



Incendie / Fire



Déplacement ou rassemblement de population / Population displacement or large meeting



Accident industriel / Industrial incident



Exercice - Simulation / Exercise - Simulation

[Display product metadata on Geonetwork](#)

HAITI Jacmel

Densité de bâtiments endommagés et zones de rassemblement Situation le 15 janvier 2010

Carte de localisation



Légende

Dommages

Densité de bâtiments endommagés

	Forte
	Faible

Secteur non analysé

Zone de rassemblement

Sté Héline Quartier

Réseaux de communication

	Route secondaire
	Autre route
	Aéroport

Interprétation

Le 12 janvier 2010 à 21h53 (GMT), 19h53 (locale), un violent séisme de magnitude 7 sur l'échelle de Richter a secoué Haïti. L'épicentre est localisé à 15 km au SW de la capitale Port-au-Prince causant d'importants dégâts ainsi que de nombreuses pertes humaines.

Cette carte présente la densité de dégâts observés et les zones de rassemblement de population sur une image DigitalGlobe acquise le 15 janvier 2010 sur la ville de Jacmel. La surface de comptage est un cercle de 0,1 km² sur un secteur analysé de 21 km². Les résultats de cette carte doivent être utilisés avec précaution, l'exhaustivité n'est pas garantie.

Information cartographique

0 500 1 000 N
m

Projection locale : UTM Zone 18 Nord, Datum : WGS 84
Projection géographique : Lat/Lon (DMS), Datum : WGS 84
Echelle : 1:10 000 pour impression A1

Sources des données

La densité de bâtiments endommagés et les zones de rassemblement sont dérivés d'une image multispectrale DigitalGlobe (0,5 m) acquise le 15 janvier 2010
© SERTIT 2010

Fond cartographique
Image KOMPSAT 2 (1 m) acquise le 21 Janvier 2010
© KARI 2010

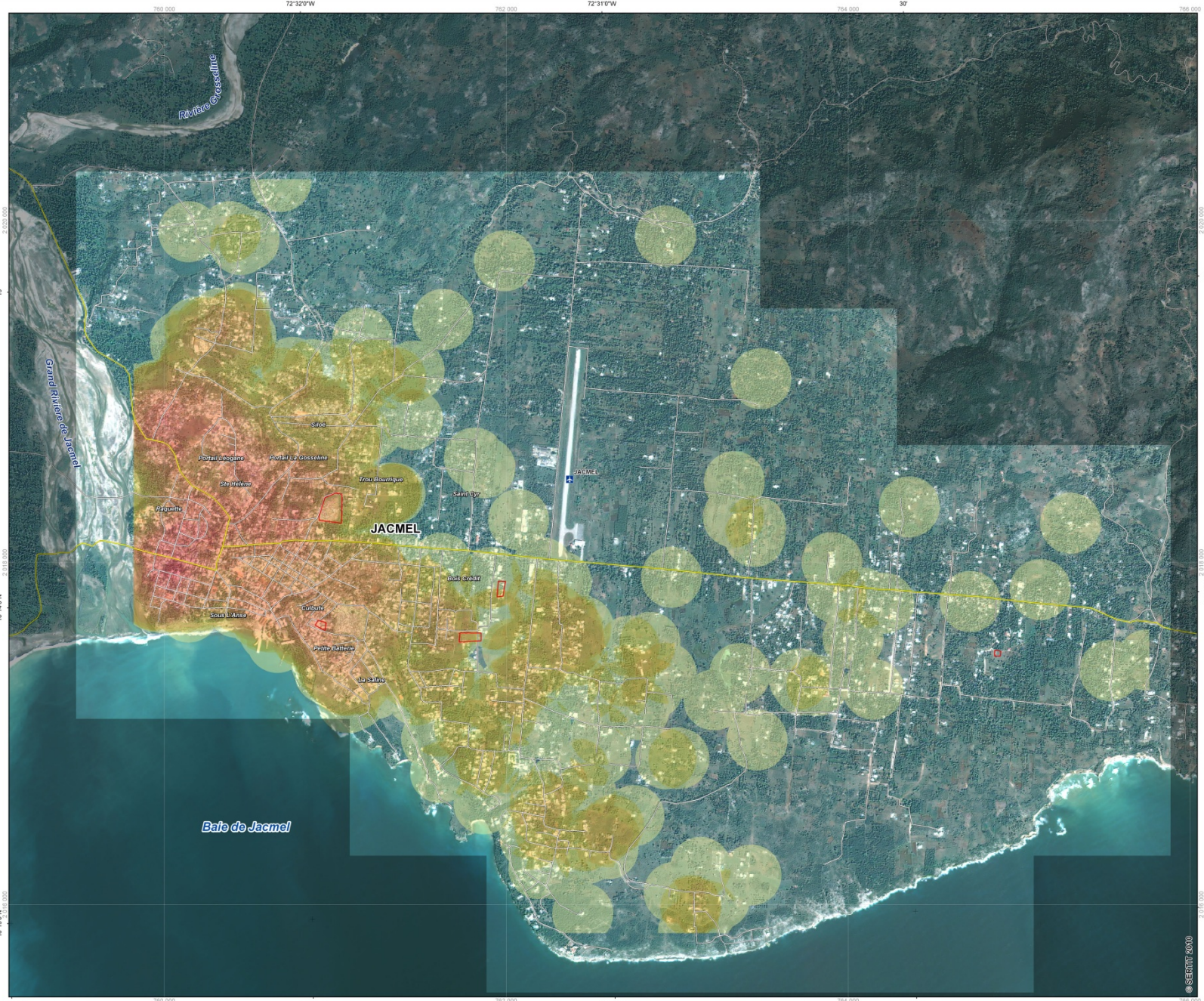
Les routes sont dérivées de l'image SPOT 5 multispectrale (10 m) acquise le 03 Juillet 2007
© SERTIT 2010

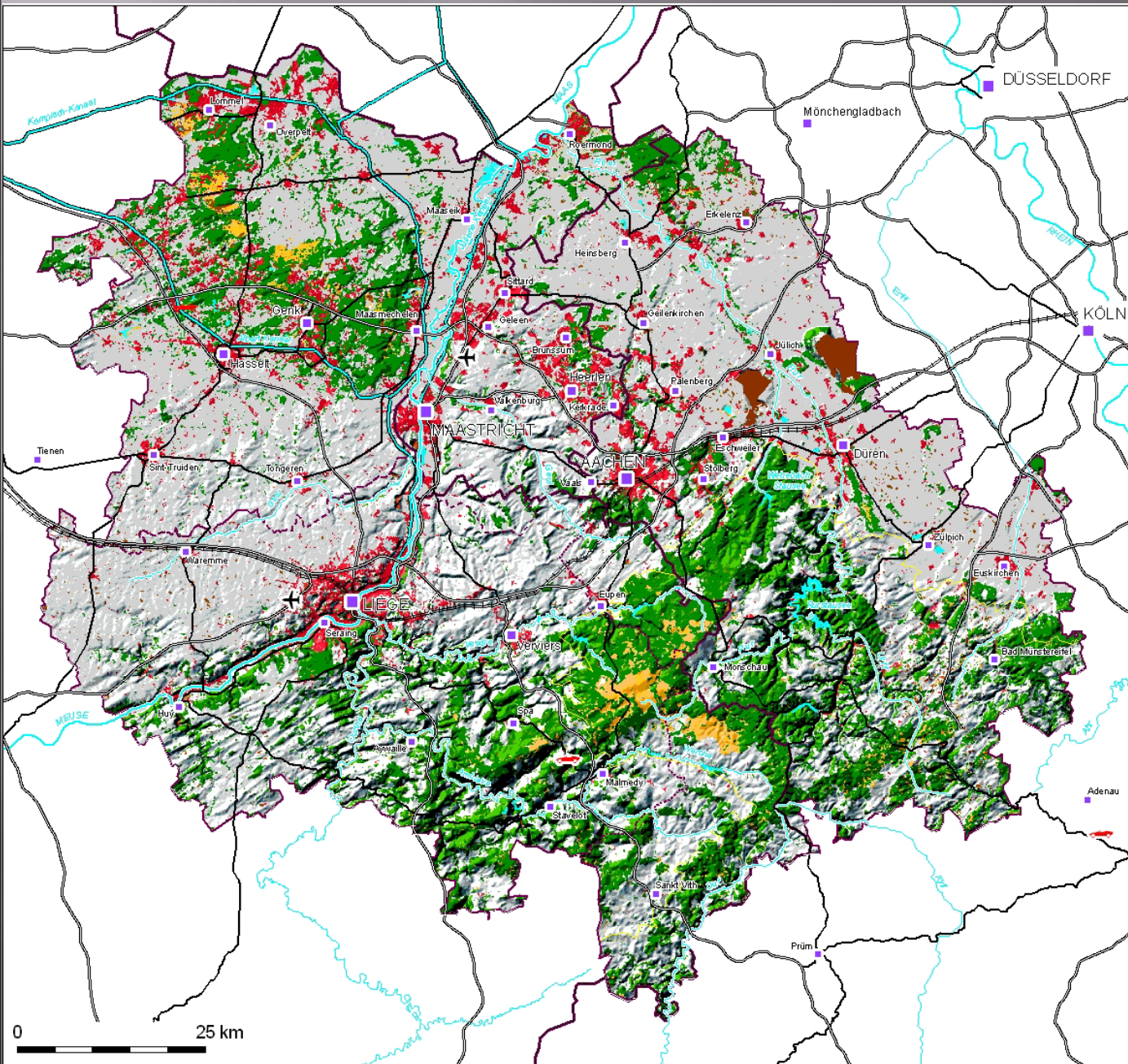
Autres couches thématiques & toponymie
© SERTIT 2010, GIST, ESRI

Cadre de travail

Les produits élaborés dans le cadre de cette action de cartographie rapide sont réalisés dans un court laps de temps, en optimisant au mieux la donnée disponible. Toutes les informations géographiques ont des limitations dues à l'échelle, la résolution, la date ainsi que l'interprétation de la donnée source. La responsabilité de l'auteur de cette carte ne peut être engagée quant à son contenu et son éventuelle utilisation.

Carte produite le 22 janvier 2010 par le SERTIT
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http://sertit.u-strasbg.fr





HYDROGRAPHIE

- Rivière
- Fleuve
- Canal principal
- Plan d'eau

AFFECTATIONS

- Forêt
- Fagne et lande
- Exploitation de lignite et carrière

RÉSERVE NATURELLE

- Limite de la réserve naturelle Hautes Fagnes-Eifel

RÉSEAU URBAIN

- Agglomération
- Ville de niveau 1
- Ville de niveau 2
- Ville de niveau 3

RÉSEAU ROUTIER

- Autoroute
- Autoroute en projet
- Route principale
- TGV

LIMITES

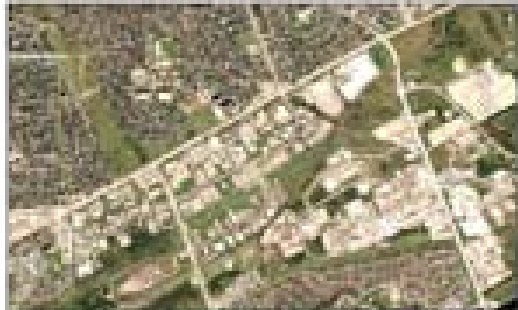
- Frontière d'état
- Limite de l'Euregio Meuse-Rhin
- Limite Flandre-Wallonie
- Limite linguistique français-allemand

ÉQUIPEMENTS PRINCIPAUX

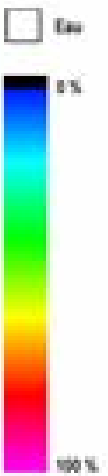
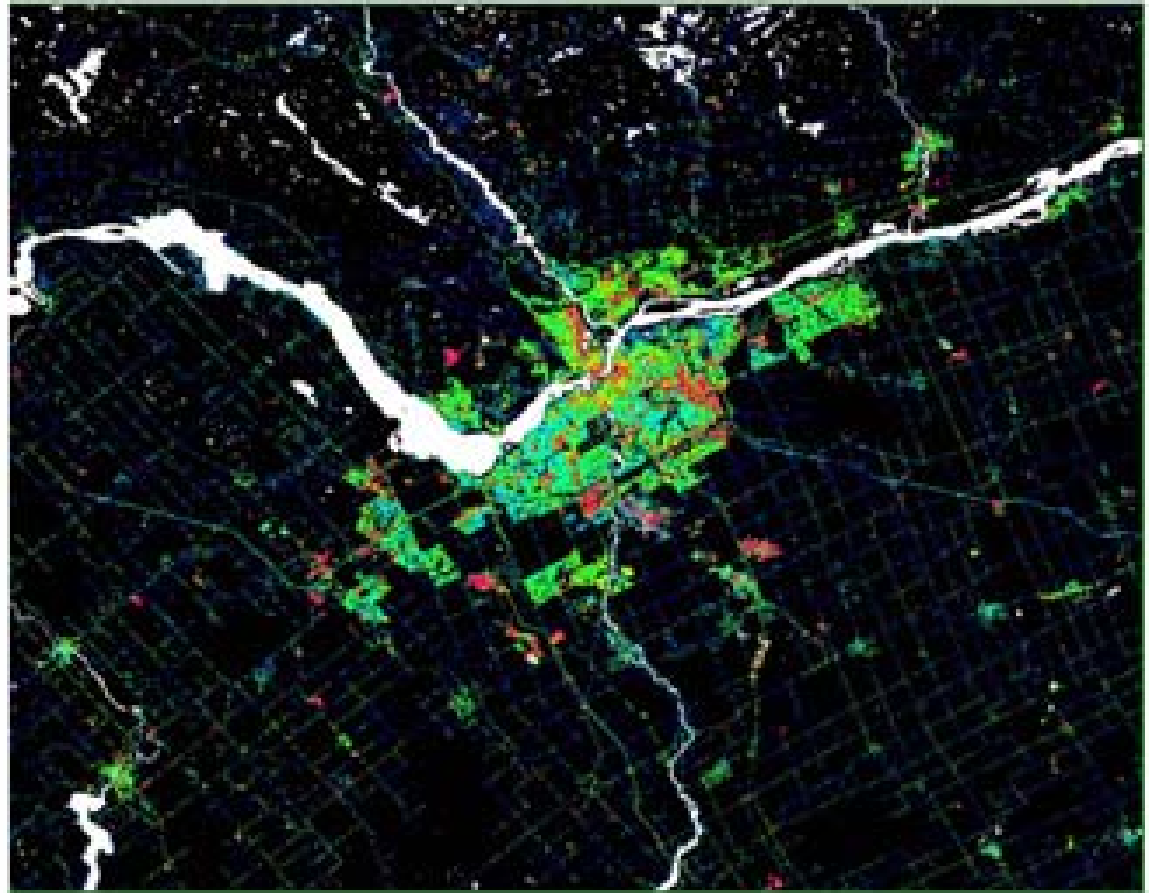
- Aéroport
- Circuit automobile

Sources des images: MNS SRTM, 2000, NASA
Landsat-7 ETM+ © ESA, 2000, d
Aster, 2001

Cartographie: E. NYAMINANI, SURFACES, ULG



- Forêt
- Herbe
- Surface imperméable
- Eau
- Sol découvert
- Terre dure non-pavée



Genesis of (GU) 1987-2000

- Urban research : for a long time word defining a set of actions together of social sciences (JC. Deutsch)

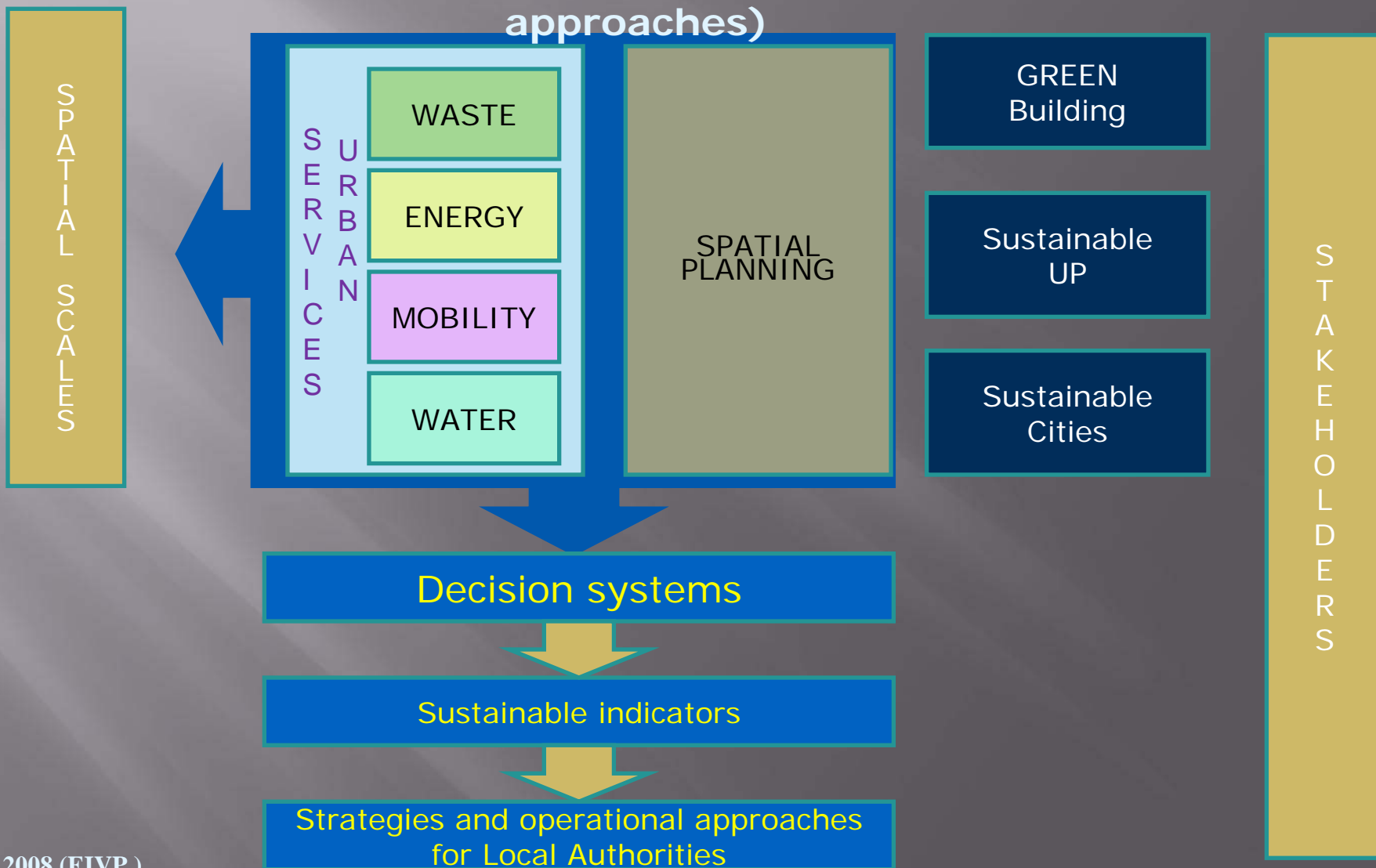
Consequences: techniques are plasters thinking so-so of wounds caused by policies ...

- Engineering sciences (CE): predictive numeric models often little applied in the urban areas

Gap between the stakes in cities: a technico-economic management of the urban services.

Birth of the ' GU' Dupuy + Martinand +(INGUL)

Urban Engineering (New approaches)



Sustainability and GU

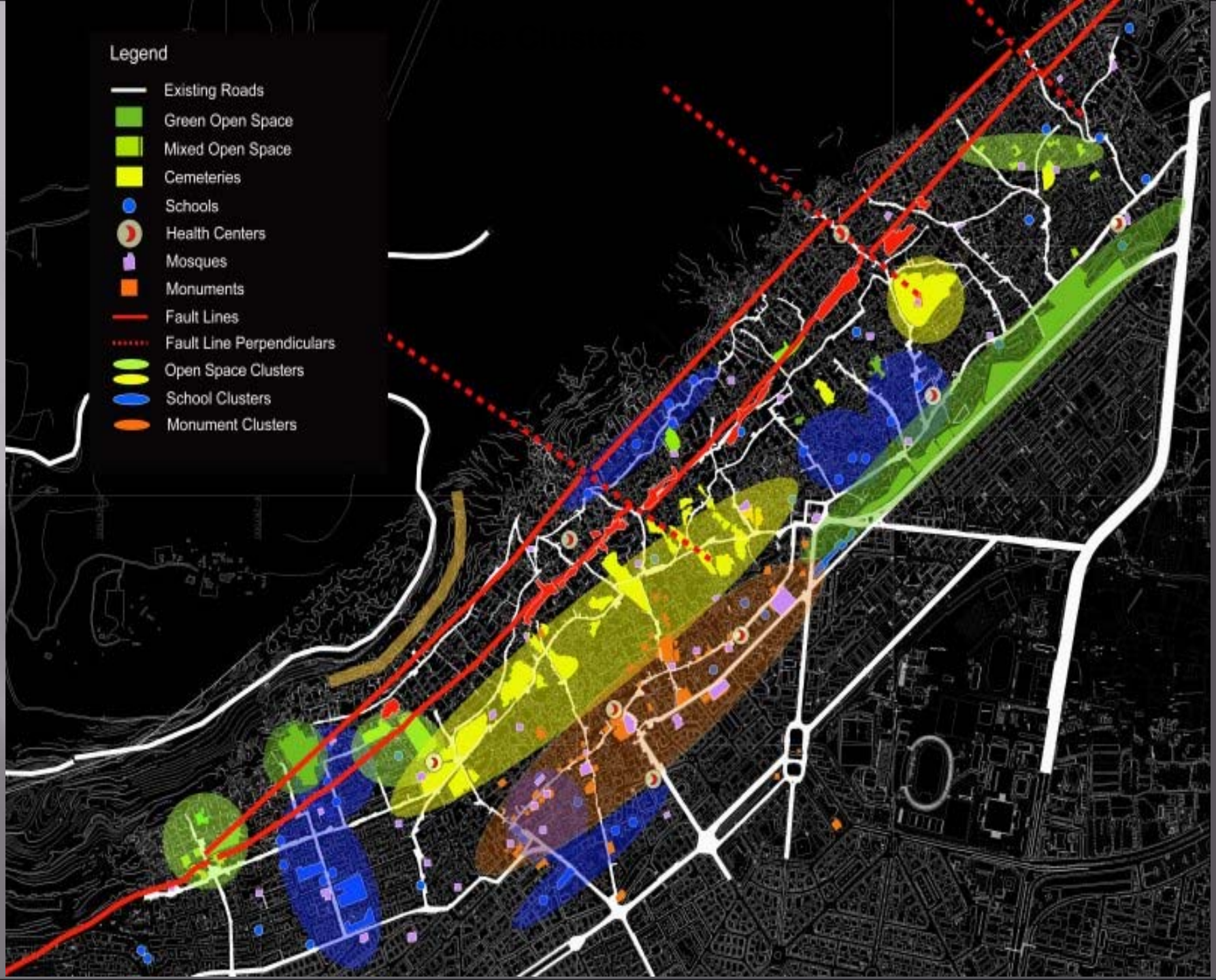
- ▣ 7 millions inhabitants
 - ▣ Networks are always important but services with different networks especially short and small grids
 - ▣ Quality of life and evolution of lifestyles
 - ▣ New concepts related to the environment : density, Green gaz, Green buildings, short circuits, smart grids and cities.....
 - ▣ Connected cities
 - ▣ Sprawled (spread) cities and shranked cities
 - ▣ technology and innovation
-
- ▣ **Problems** : Researches remain disciplinary in spite of attempts
- GU might be the solution

Examples

- ▣ Informal settlements
- ▣ Density versus water management in city
- ▣ Climate change and Urban Heating Island (UHI) Heat wave

Legend

- Existing Roads
- Green Open Space
- Mixed Open Space
- Cemeteries
- Schools
- Health Centers
- Mosques
- Monuments
- Fault Lines
- Fault Line Perpendiculars
- Open Space Clusters
- School Clusters
- Monument Clusters





Paris 1910



Saint Lazare



Rue Leblanc



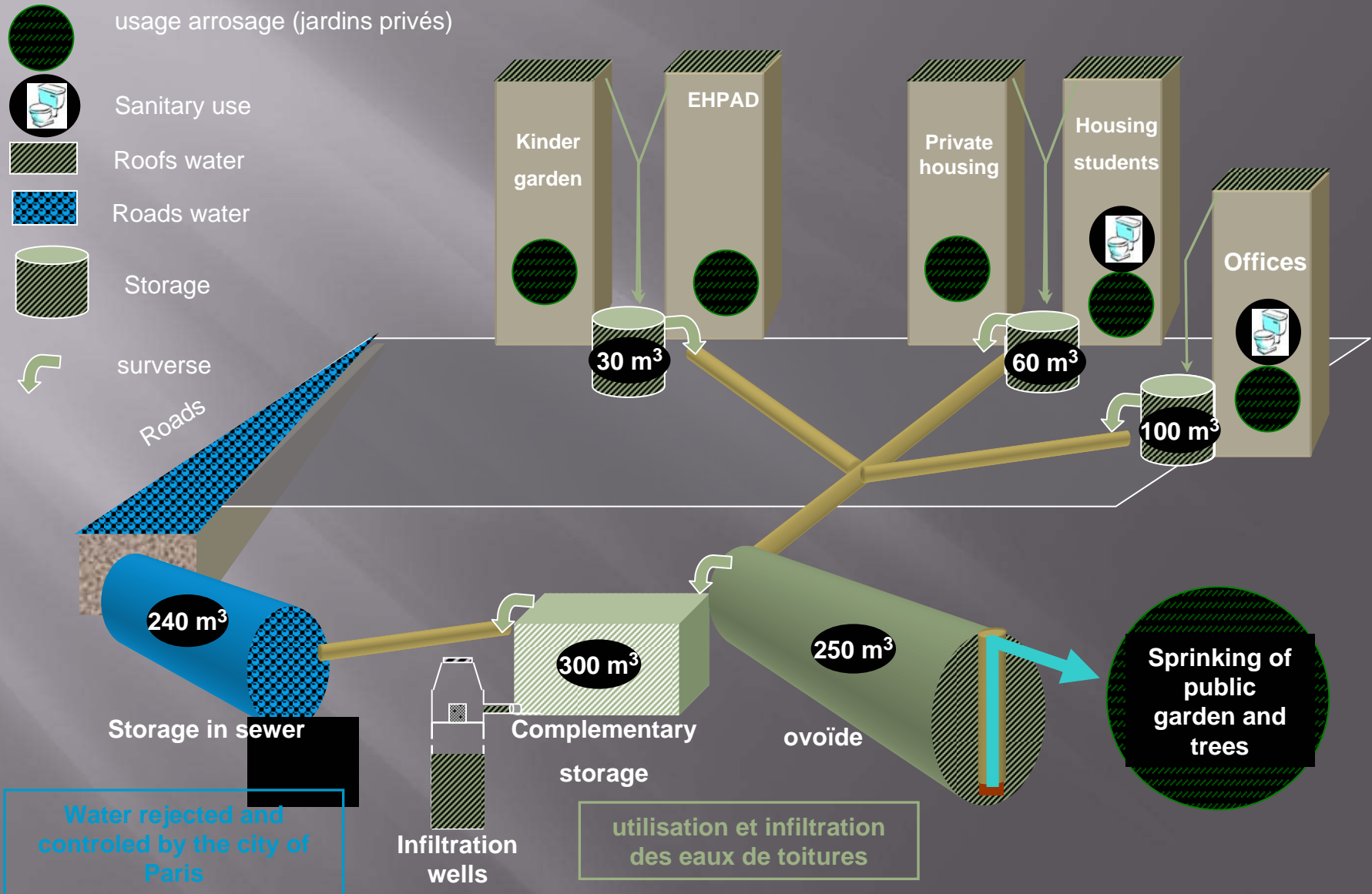
PICARD report

- ❑ 1910 : In Paris, the maximal flow is considered in approximately 2400 m³/sec; the measures which were made were able to be made only for the diminution.
- ❑ In [Mantes-la-Jolie](#), the maximal flow was measured by gauging; it is 3 300 m³/sec
- ❑ 4 billions of m³ passed through Paris.
- ❑ Flow averages in the entry of Paris 328 m³/sec ([Alforville](#)) brought out in approximately 438 m³/sec to [Poissy](#).
- ❑ The diminution lasts approximately 35 days.
- ❑ The diverse damages esteemed for the [department of the Seine](#) amount to 7 and a half billion francs.

Solutions

- ▣ Absorbent wells and Turfing (infiltration)
- ▣ Reservoirs and reforestation (4000 to 50000 reservoirs from 20 to 25 000 m³ of capacity)
- ▣ Diversions in the upstream towards the approval of Paris
- ▣ The most popular solution under various form
Ship canal (*Grand Paris before the hour*)

Master plan of raining water management



Raining water management

- 2 °C

HABITER LE FLEUVE



Resilience, technology and Urban Engineering

- ▣ Indicators
- ▣ Sustainability
- ▣ Scales
- ▣ Systemic approaches
- ▣ Context (soil, informal...)
- ▣ Systemic approaches
- ▣ Modeling and project management
- ▣ Data protocol and management