

# Conceptual Approach and International Practice in Assessment and Management of Natural Risk

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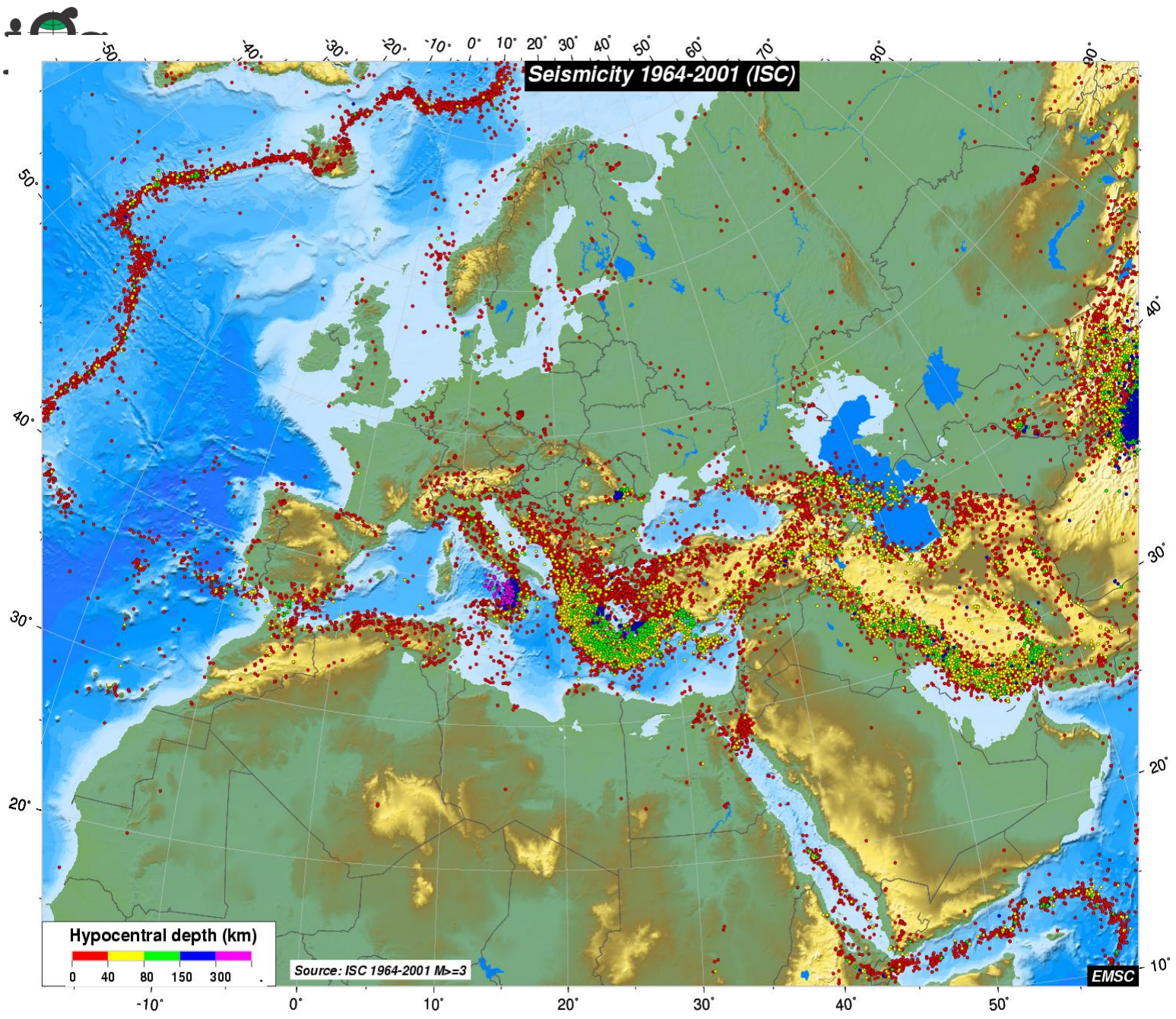
University of Tehran, Tehran  
Ecole Nationale des Ponts et Chaussées, Paris

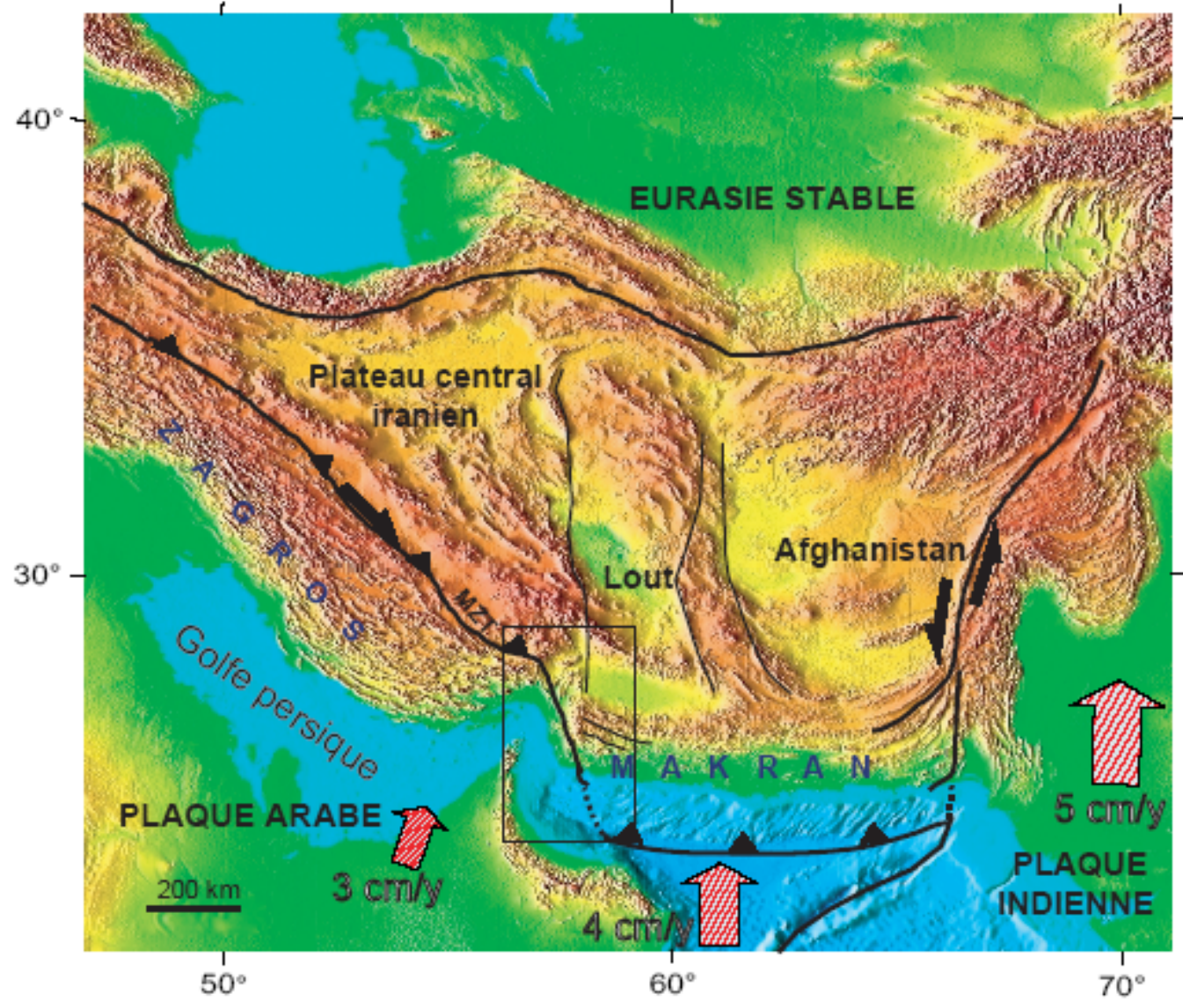
# OUTLINE

- Natural Context
- Natural Hazard and Risk Definition
- natural Hazard and Risk Evaluation
- Risk Management plan

# Natural Hazards

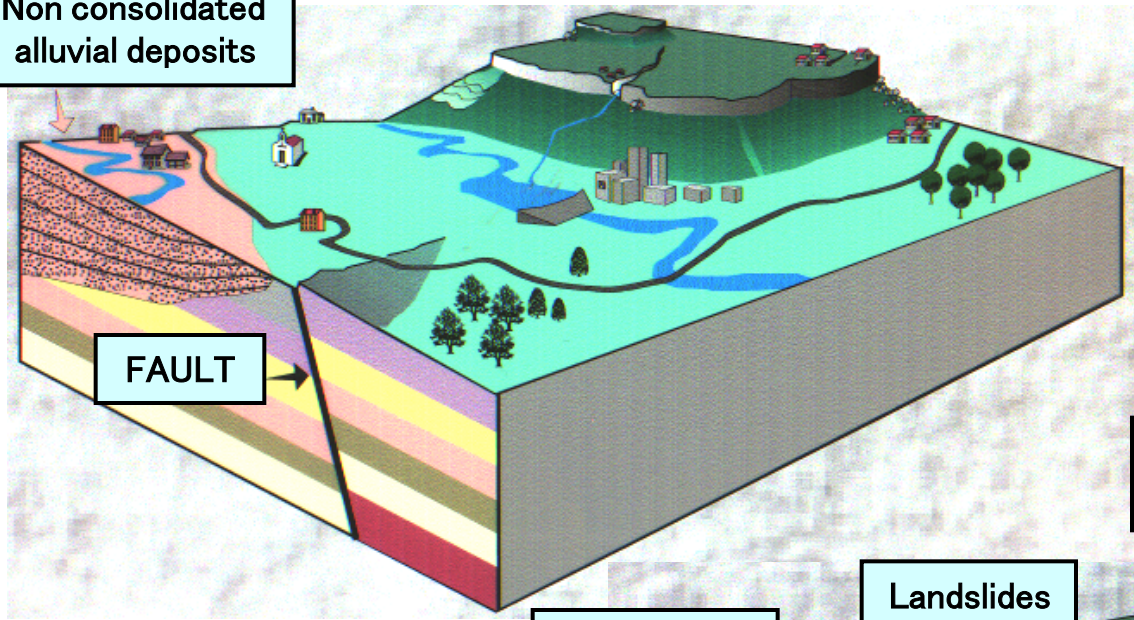
- Seismic Hazards
  - Seismic geotechnical hazards
- Flood Hazards
  - Soil erosion
- Volcanic Hazards
- Drought
  - Soil shrinkage
- Cyclone, Hurricane, Typhoon
  - Landslides
- Tsunami



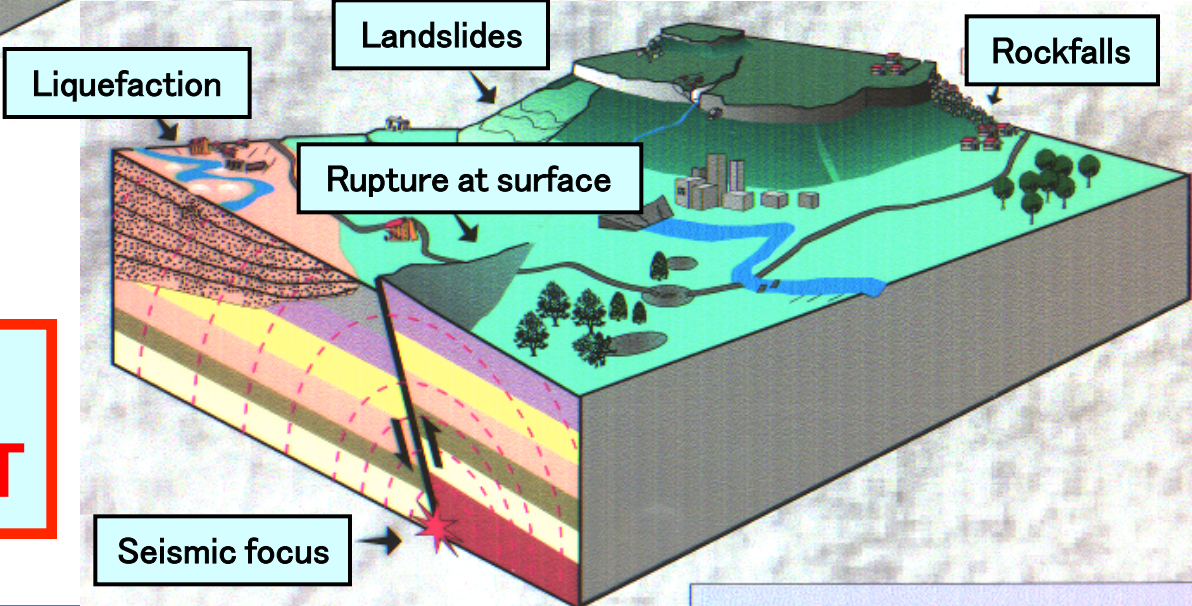


Non consolidated  
alluvial deposits

**BEFORE THE  
SEISMIC EVENT**

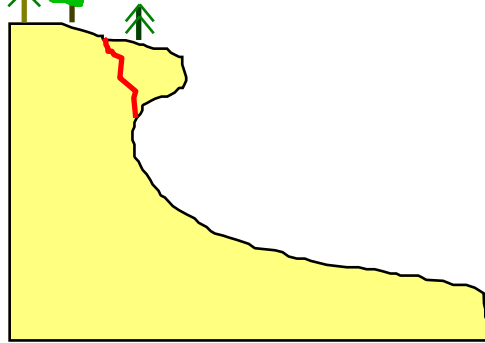


SITE EFFECTS  
Amplification



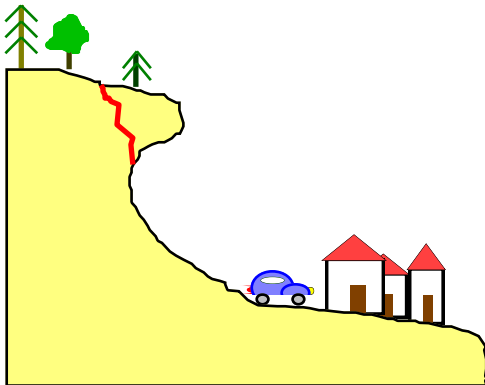
**AFTER THE  
SEISMIC EVENT**

## SCHEMATIC DEFINITION OF RISK

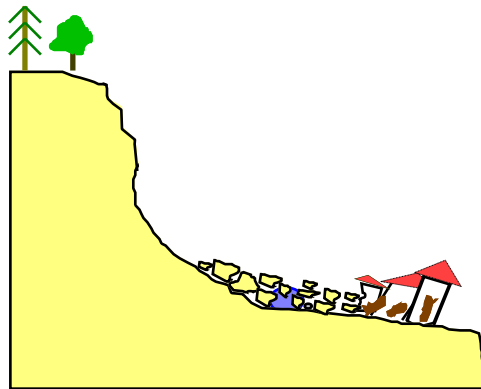


**Hazard :**  
event, intensity and return period

A threatening event, or the probability of occurrence of a potentially damaging phenomenon within a given time period and area (IDNDR, 1992)



**Vulnerability of media :** exposed elements  
(social and economic)  
**+ Value of media**



**Risk :**  
conjunction of hazard and of vulnerability and value

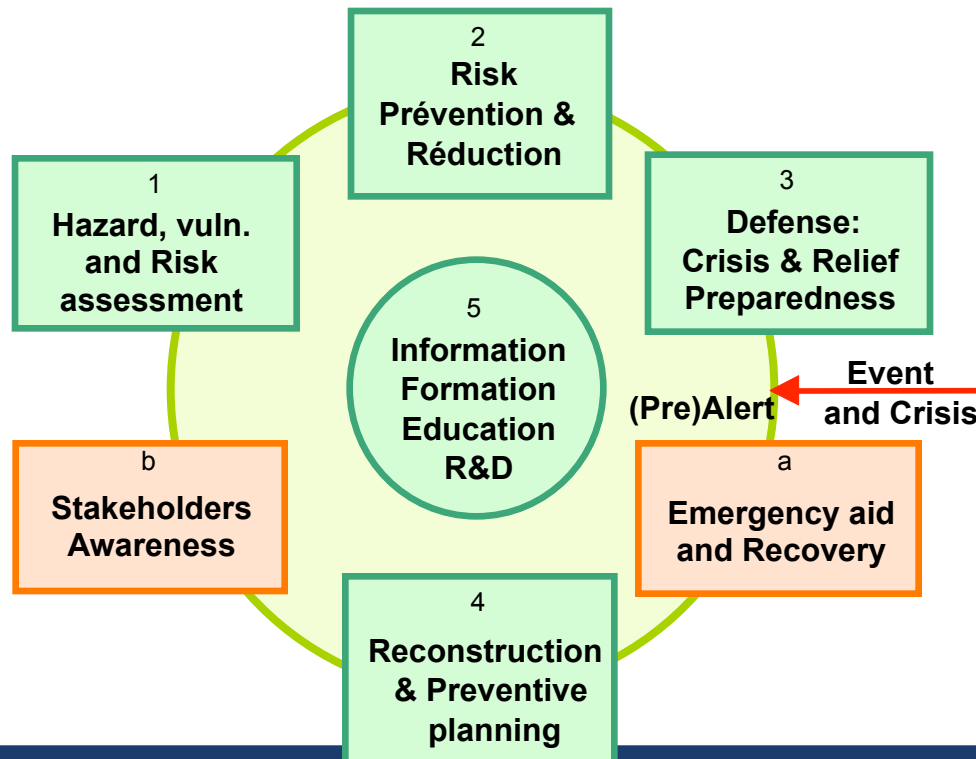
**Probability of loss :**

damages and victims (dead, injuries,...),  
dysfunction of ordinary activities of a society,  
During a reference period in a given region,

$$\text{Risque} = \text{Aléa} \times \text{Exposition} \times \text{Vulnérabilité}$$

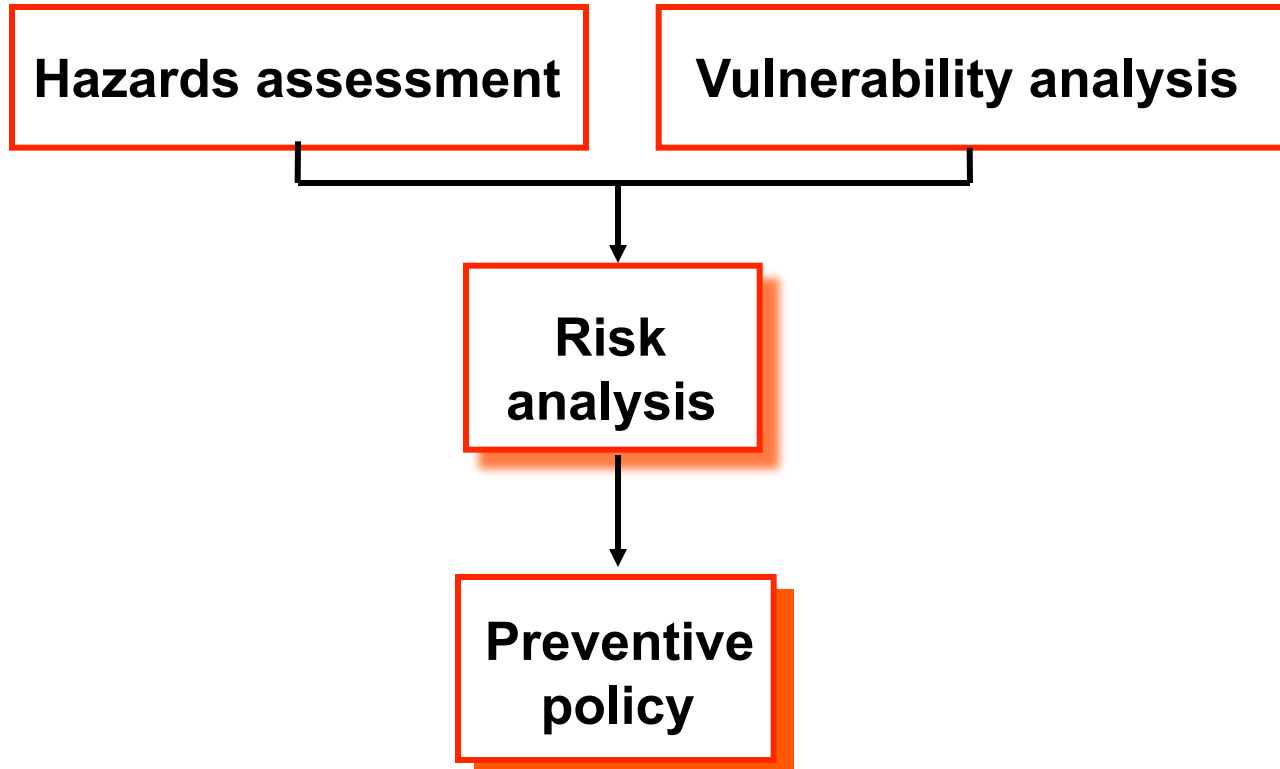
→ Risk is a probability of damage...

... we have the concepts and methods to reduce it



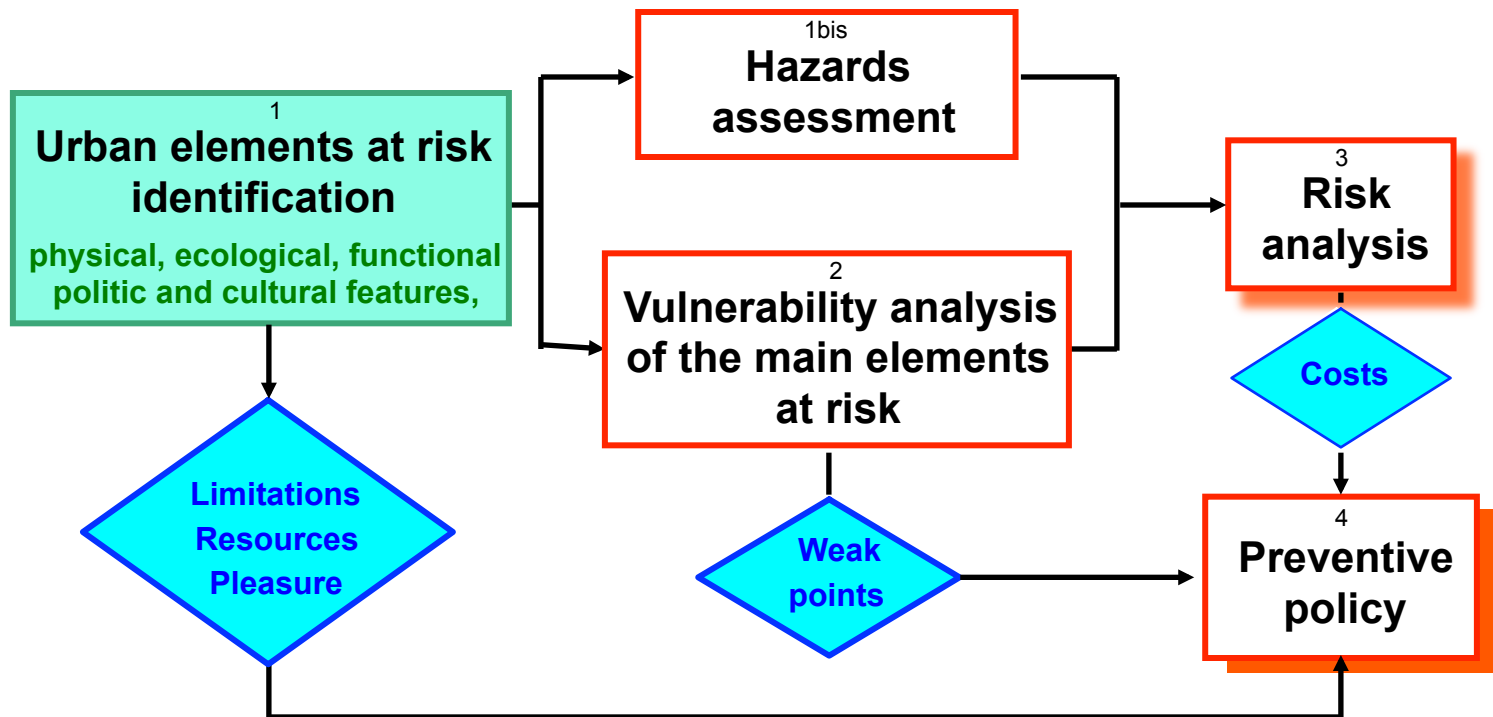


# RISK ANALYSIS AND PREVENTION



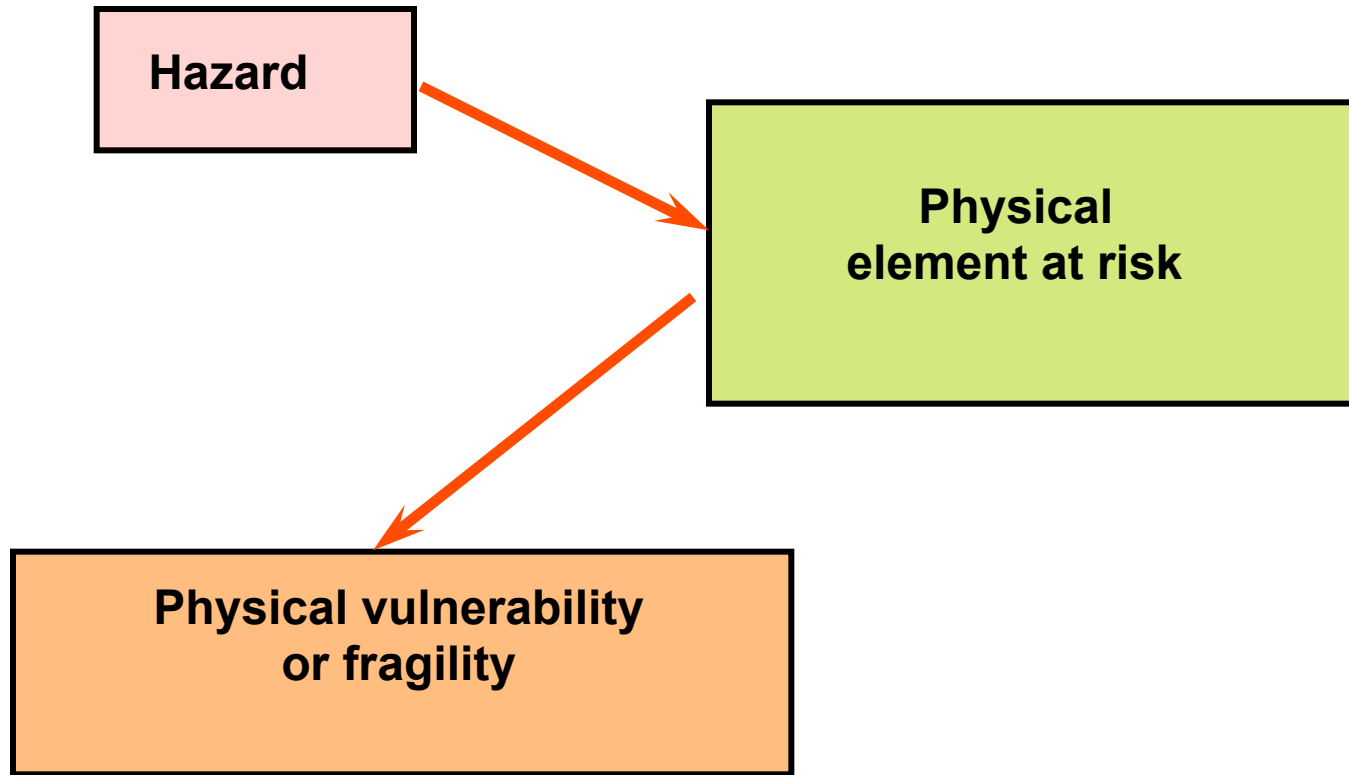
## 1. First generation model

# RISK ANALYSIS AND PREVENTION



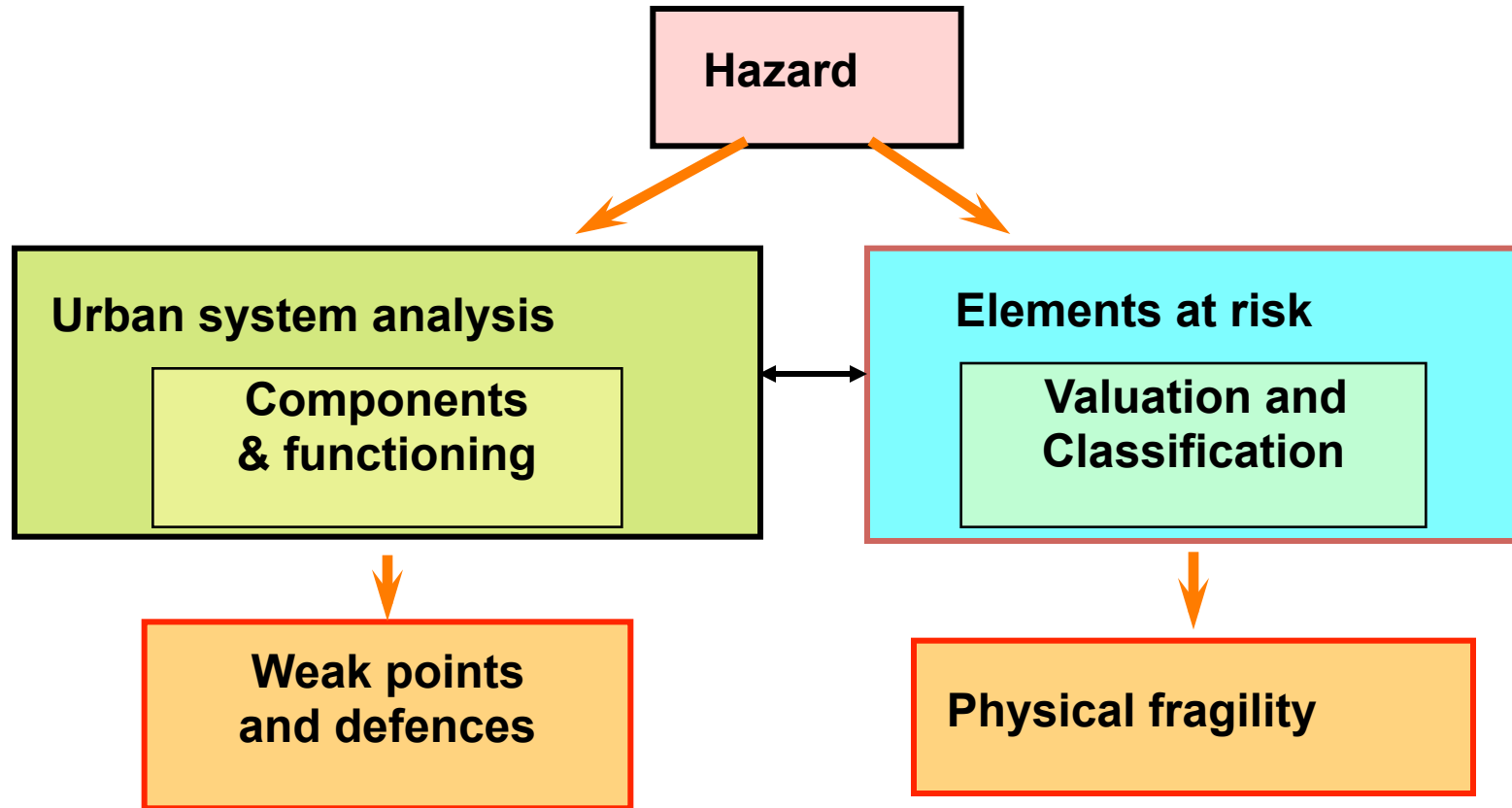
## 2. Second generation model

# VULNERABILITY ANALYSIS



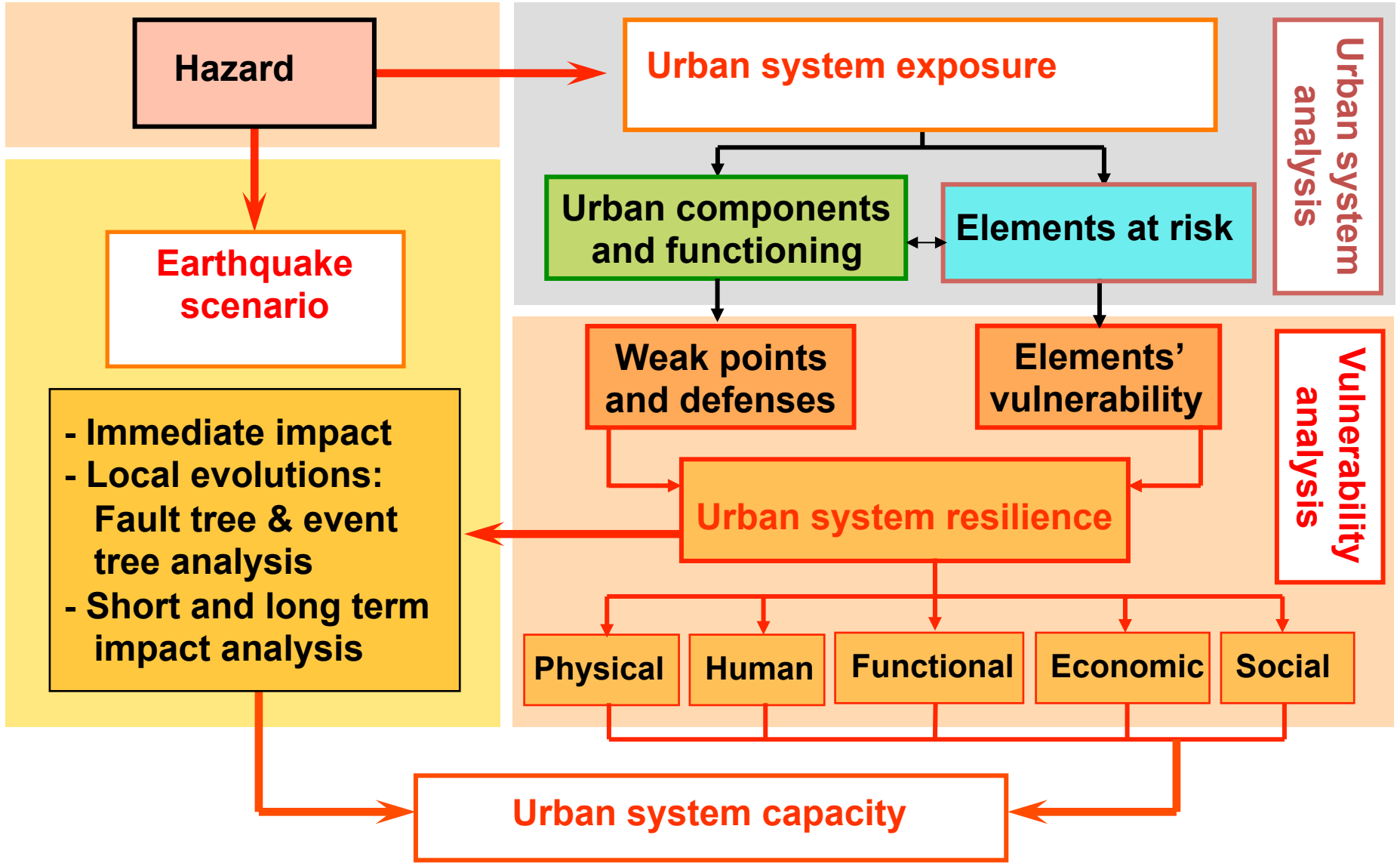
## a) Isolated element - Physical vulnerability

# VULNERABILITY ANALYSIS



## b) Urban system - Global vulnerability analysis

# SEISMIC RISK ANALYSIS



## **0. Preliminary Audit** on the feasibility of a preventive project at local level

### **A. Natural Risk assessment**

- Natural hazard assessment (regional and local levels)
- Urban System Exposure (USE) and main stakes assessment
- Vulnerability Analyses and disaster Scenario. Natural Risk Report

### **B. Local Capacity Building for disaster prevention**

- Local active appropriation process
- Capacity building of a collective expertise
- Local organisation for the risk management

### **C. Risk Management Plan (RMP) and Action Plan**

- Crisis management preparedness
- Preventive planning at local, regional and national levels
- Construction policy (strengthening, new codes and control)
- Sector related measures
- Synthesis : RMP decision and dissemination
- Feasibility analysis : Action Plan
- Short term projects design

### **D. Implementation** management and control of the preventive programme.

### **E. Accompanying measures** : information, education and training

# URBAN SYSTEM EXPOSURE (USE) ASSESSMENT

The USE assessment can be divided into five steps:

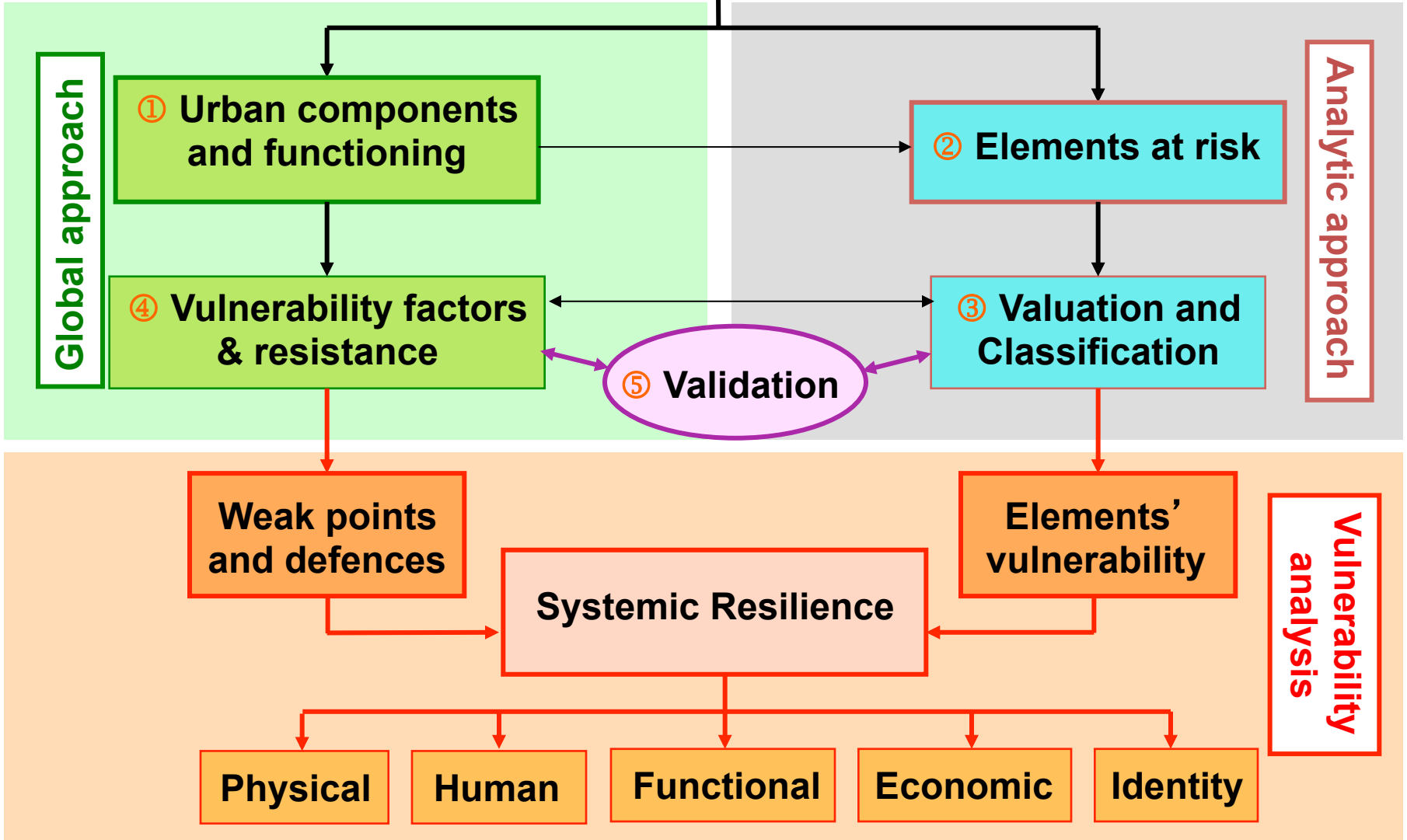
- 1. Global approach of the Urban System.**
- 2. Analytical approach of the elements at risk.**
- 3. Elements at risk valuation and classification through a global value analysis (main issues).**
- 4. Vulnerability factors analysis and identification of the weak points and defences of the urban system.**
- 5. Validation phase with the local actors.**

# URBAN COMPONENTS

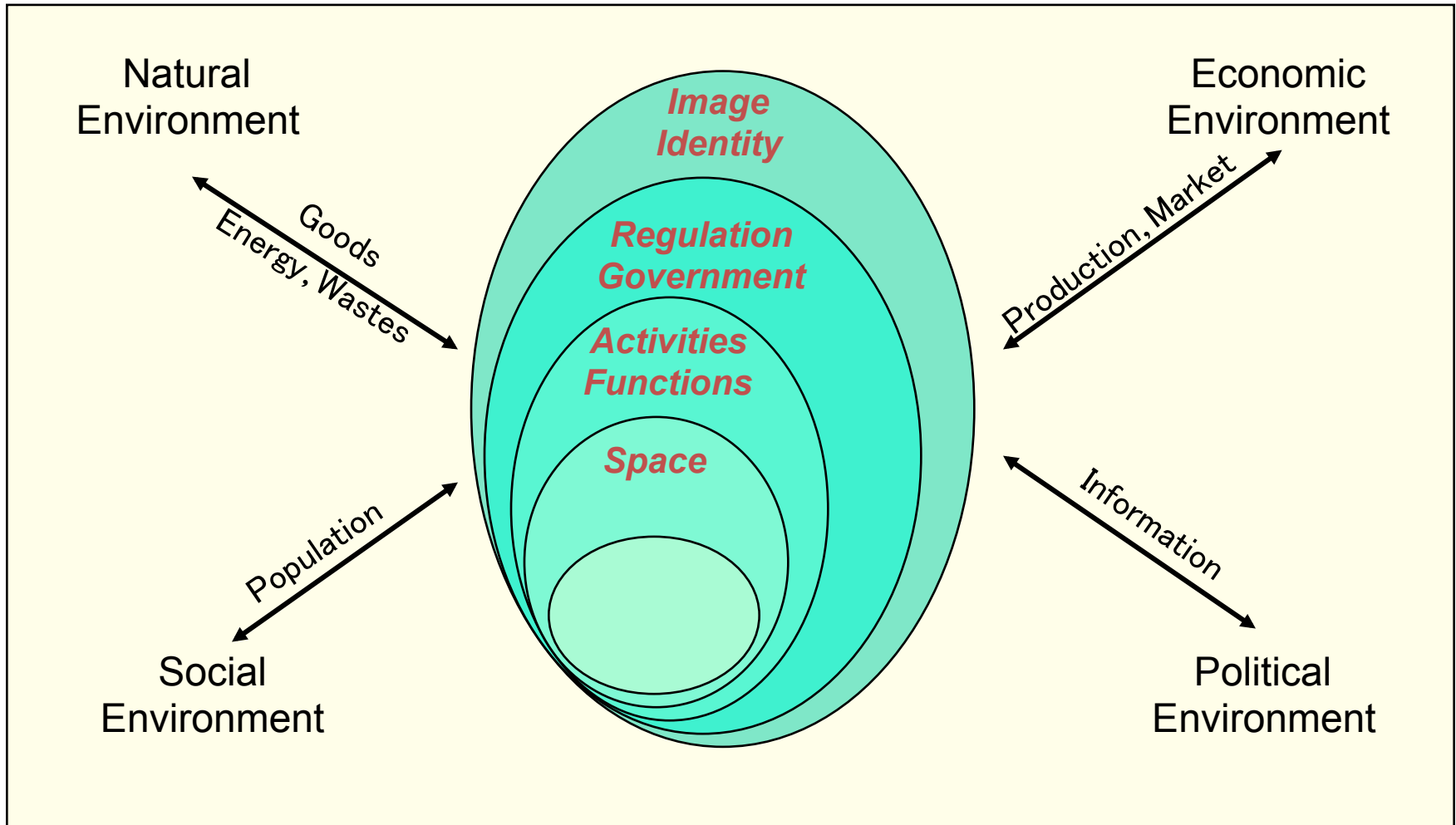
- 1. *Population*** : inhabitants (age, social level, etc.), workers, tourists, people passing, demographic distribution, demographic growth, etc.
- 2. *Urban space*** : natural environment (air, water, soil, sub-soil, biotope), the "built medium" (buildings, infrastructures, lifelines, etc.) and the geographic environment (spatial organisation, land-use, urban fabric and natural features).
- 3. *Urban Services*** : housing, supply, sanitation, transportation, communication, social and emergency's functions.
- 4. *Urban Activities*** : economic, administrative, cultural.
- 5. *Urban government and actors*** : institutional, economical, social actors and decision making process, policy planning.
- 6. *Identity and culture*** : social cohesion, local culture and history, symbolic images and representations, etc.
- 7. *Urban development and external radiance*** : city expansion and evolution, territorial position, image, etc.



# URBAN SYSTEM EXPOSURE ASSESSMENT



# URBAN SYSTEM REPRESENTATION



## THIRD PHASE

### C. Risk Management Plan (RMP) and Action Plan

- Crisis management preparedness
- Preventive planning at local, regional and national levels
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- Synthesis : RMP decision and dissemination
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# FOURTH PHASE

## D. Implementation

### management and control of the preventive programme

- Projects design and negotiation
- Crisis management preparedness strengthening
- Sector related risk reduction projects
- Preventive planning and construction

# FIFTH PHASE

## E. Accompanying measures

- **Awareness and Education : Public, decision makers and economic leaders**
- **Preparedness and Training of professionals and the population**

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