TOWARD AN INTEGRATED SPATIAL DECISION SUPPORT SYSTEM TO IMPROVE COASTAL EROSION RISK ASSESSMENT:

MODELING AND REPRESENTATION OF RISK ZONES

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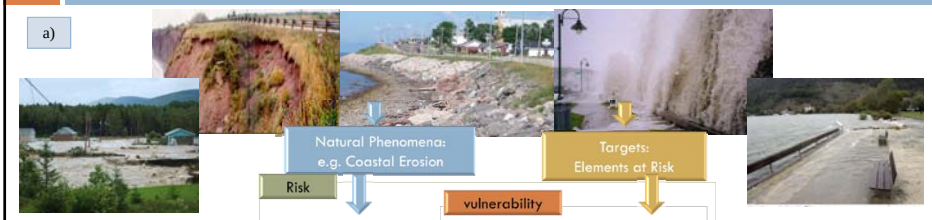
Outline

- Introduction
  - Concepts: Risk, its components and Risk Assessment
  - Issues and needs
  - Main Objective
- Proposed solutions
- Achievements
- Conclusion and Future work

Concepts

a)



Risk Concept
Varnes 1984; Blong 1996; Cutter 1996; Cutter et al 2003; Boruff et al 2005; Blaikie et al 1994; Daudé et al 2009

Coastal Risk Assessment
IPCC 2007; UNEP 2002; UNFCCC 1999; NOAA 2003; Mai and Leinbermann 2002

b)

c)

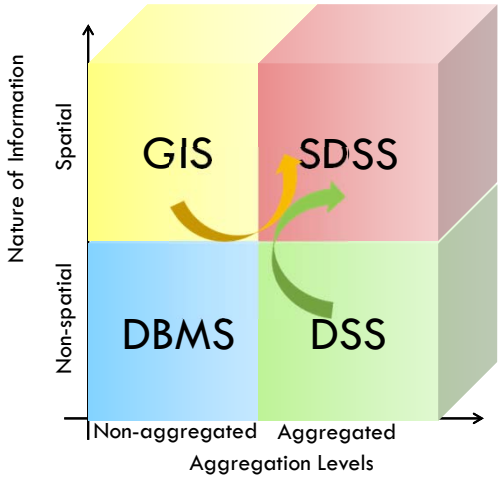
Issues and Needs

- Multiple stakeholders under authority of different organizations in local, provincial and federal governments.
  - Huge amount of data from different sources
  - Multiple criteria and interests to evaluate the risk
- Nature of the risk
  - Multidimensional: involves several elements that need to be analysed, synthesized, cross-tabulated and compared
  - Multi-Scale (micro, meso, macro) and hierarchy
  - Existence of uncertainty uncertainty propagation
  - Modeling and representation of the risk (segmenting technique and attribution of risk value to each segment)
  - Fuzzy nature of coastal Erosion

Prevents the elaboration of a coherent vision of the coastal risk for decision makers

Issues and Needs

Potential Technologies

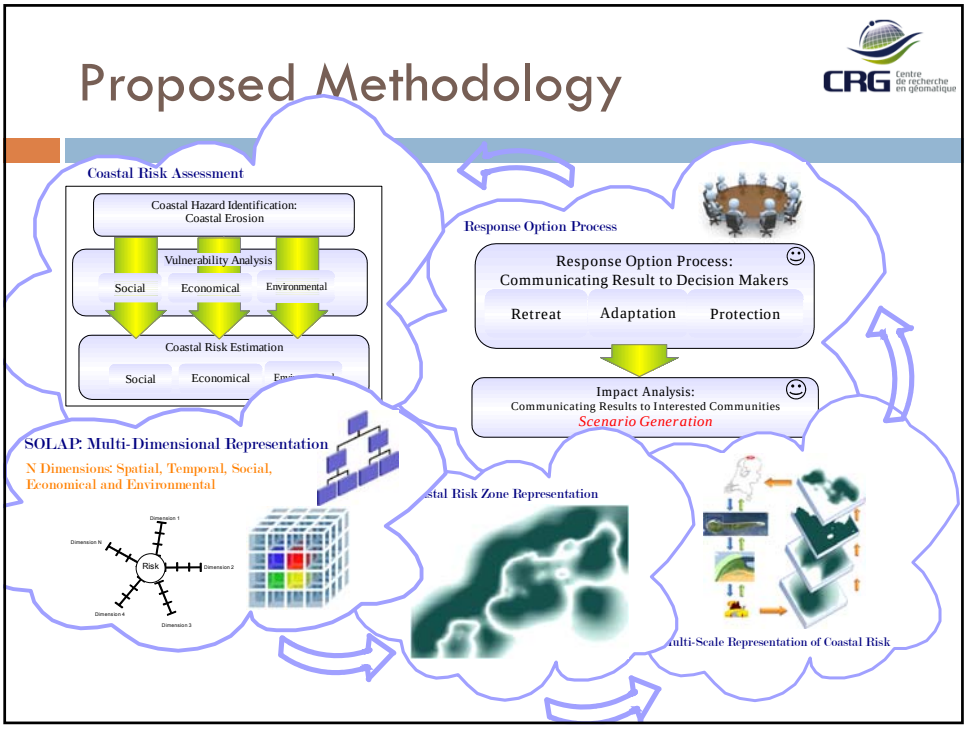


→ Geospatial Business Intelligence System (GeoBI)
- Analytical system
- Fast synthesis over time
- Trend analysis
- Perform complex querying
- Aggregated Information
- Spatial comparison
- Interactive knowledge discovery

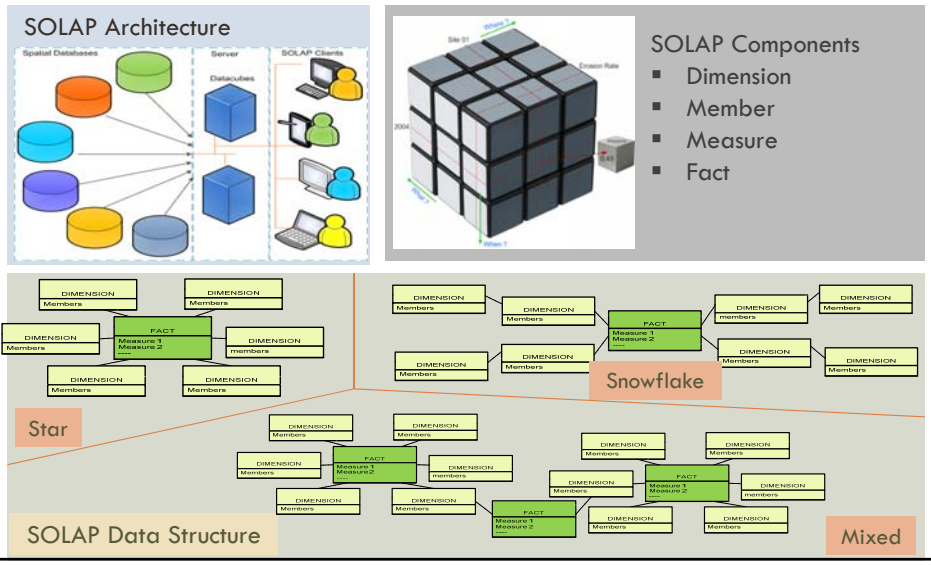
Main Objectives

Developing a **Spatial Decision Support System** to improve the assessment of coastal erosion risk using **SOLAP** approach

Proposed Methodology



Spatial On-line Analytical Processing



Solution

- Spatial Decision Support System Based on Geospatial Business Intelligence Paradigm
  - Needs analysis
  - Data inventory
  - Coastal erosion risk parameters (hazards, targets, and vulnerability index) $R(T,t) = H(T,t) \times \sum_i^N Rank(v(i)) \times \omega_i(T,t)$
  - Spatial multidimensional conceptual model (dimensions of analysis, measures to calculate, and SOLAP implementation model).

Solution(continued)

Elaborate an Adapted Vulnerability Index

Category	Index parameter	Ranking of each parameter with respect to coastal erosion				
		Rank 1*	Rank 2*	Rank 3*	Rank 4*	Rank 5*
Physical indicators	Geology & geomorphology (type of coast)	Cliff, fjords beaches	Talus, stable beach(with vegetation)	Talus, and instable beach (without	Beach	Delta, marsh, dune
	Coc				4-10m	0-3m
	Slo				29-35 %	> 36 %
	Tide				2.1- 4	> 4
	Tide				4.1-6	> 6
	Wa				6- 6.9	> 6.9
	Hyc			-	----	Presence
	Dist				301-400m	< 300m
	Dist obje				11-20m	0-10m
	We			-	----	Presence of faults, fractures or subsidence
Socioeconomic indicators	Lan			zone (rural	Urbane zone (residential)	Mixed urbane zones
	Prot cons			royed or air	----	Non
	Peo education)					
	Tourism	Principal Component analysis of Census data				
	Structure (house, manufacture, built environment) and Infrastructure (road, railway, port, bridge, power transfer)	Principal Component analysis of Census data				

Key indicators:

- People
- Infrastructures
- Building and built environment
- Topography
- Geology and geomorphology
- Hydrology network
- And so on

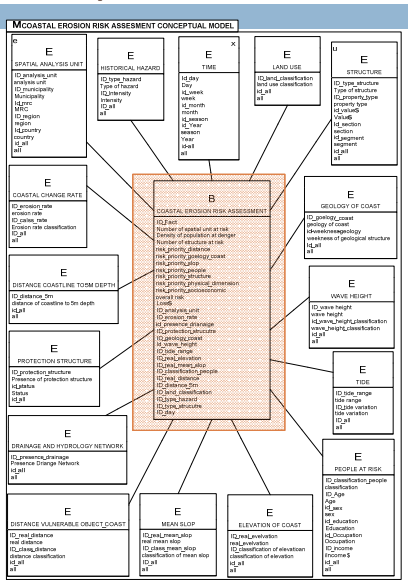
(Gornitz et al. 1991; Thieler and Hammer-Klos 1999; Shaw et al. 1998; Xhardé 2007, Boruff et al. 2005)

Achievement:

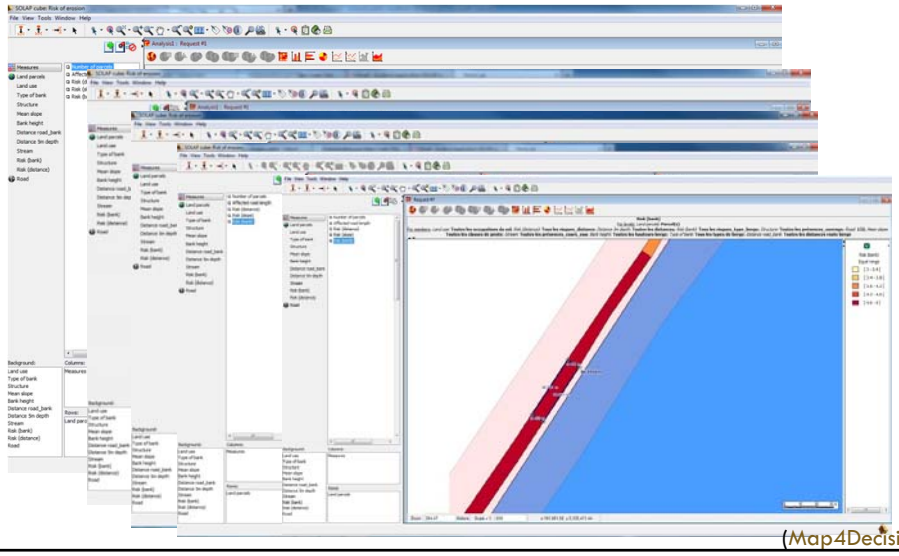
Spatial Multidimensional Conceptual Model

- Dimensions
  - Spatial
  - Temporal
  - Thematic
- Measures
  - Risk Equation

$$R(T,t) = H(T,t) \times \sum_{i}^{N} Rank(v(i)) \times \omega_i(T,t)$$



SOLAP Interface



(Map4Decision)

Conclusion

- **Geospatial Business Intelligence paradigm (GeoBI)** is a **Fast** and **Efficient SDSS** tool for coastal erosion risk assessment
- **Future work: implementation** of the idea **is on the way**

Comments or Advices are welcome!

Please write to

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