

# Communicating risk through DSS design: vulnerability, resilience and the design of DSS's cognitive pathways

Jean-Paul Vanderlinden, Cultures Environments Arctic Representations Climate Research Center (CEARC), Observatoire de Versailles Saint-Quentin-en-Yvelines.

Cf. Kane, I.O., Vanderlinden, J.-P., Baztan, J., Touili, N., Claus, S., “Communicating risk through a DSS: a coastal risk centred empirical analysis ,” Coastal Engineering, en révision pour publication avril 2014.

Presentation made at the European Workshop:  
Knowledge, beliefs, representations in understanding climate issues,  
Meudon, November 29 2013

# Outline

1. Introduction: Coastal areas under a changing climate – some of the issues at hand – hypotheses under scrutiny.
2. Context: The THESEUS project.
3. Hypotheses
4. Material and methods
5. Results and discussion
6. Designing a cognitive pathway
7. Conclusion

# 1

## Introduction

Coastal areas under a changing climate – some of the issues at hand.

# Coastal system under climate change

**CEARC**  
Cultures•Environnements  
Arctique•Représentations•Climat



Multidimensional imagined/projected impacts

- (1) Sea level rise
- (2) Increased intensity of extreme events
- (3) Increased frequency of extremes

Leading to

- (1) Flood risk
- (2) Erosion risks
- (3) Shifts in activity (fisheries, aquaculture, transportation, tourism, geostrategical activity...)
- (4) Increased uncertainty

High concentration and high diversity of human activities

- (1) Heuristic diversity
- (2) Issue diversity in material terms
- (3) Issue diversity in normative terms

# 2

## Context

### The THESEUS project and its DSS

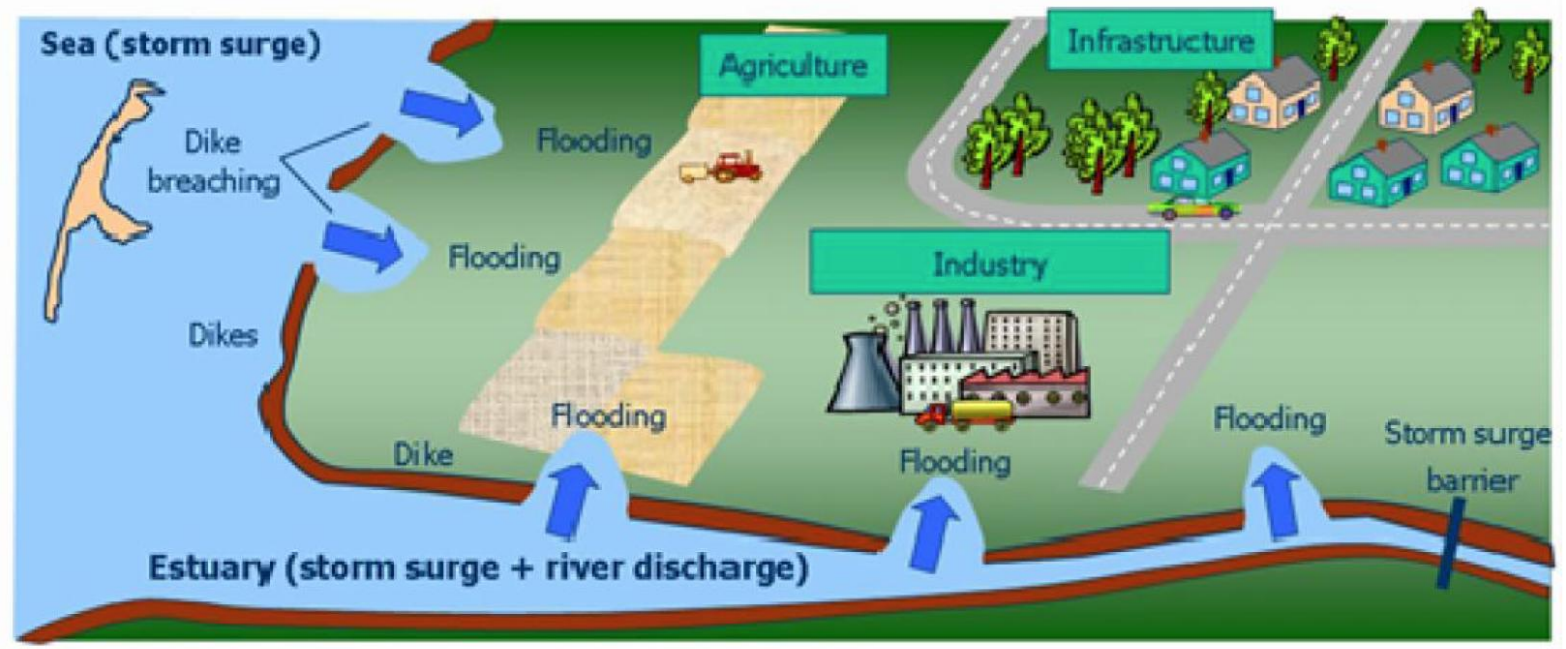
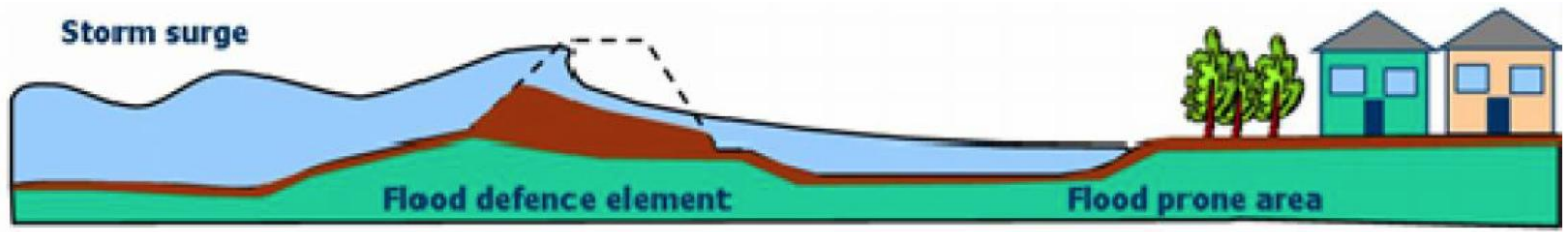
# The THESEUS project

Provide an integrated methodology for planning sustainable defence strategies for the management of coastal erosion and flooding in the light of a changing climate.

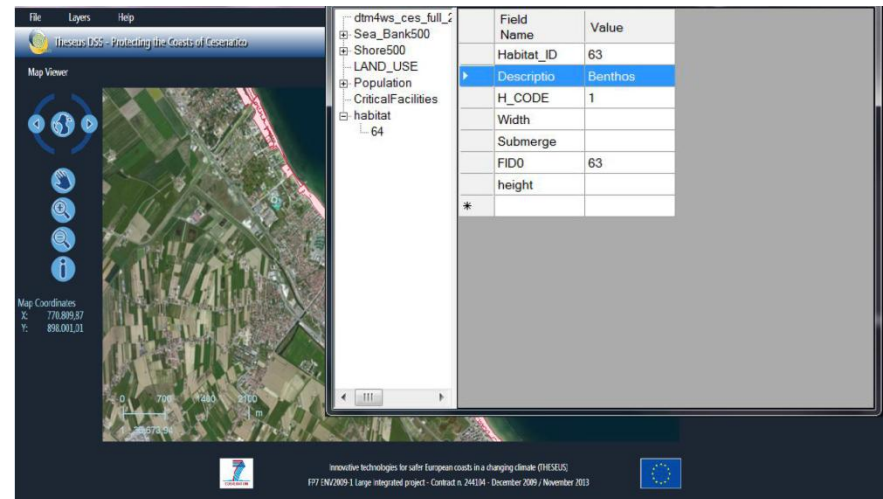
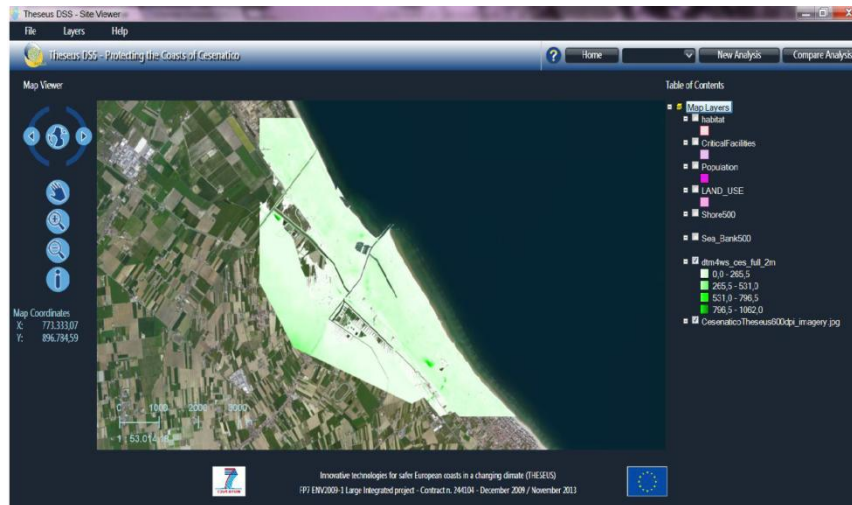
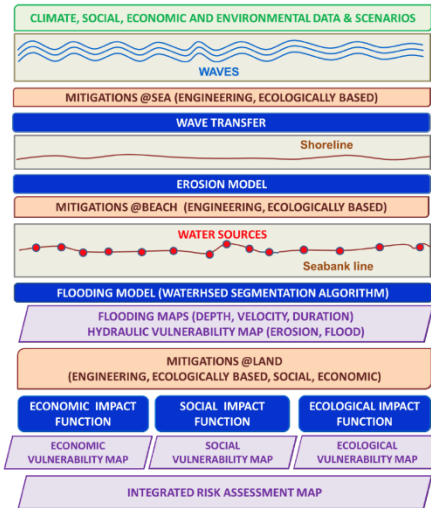
Organized along 2 integrative work packages, 3 “disciplinary” work packages and 2 management work packages

Conceptual integration through the Source Pathway Receptor Consequences (SPRC) model :

1. SPRC to organize the risk assessment,
2. SPRC used to identify the role within a vulnerability reduction approach of various mitigation options
3. SPRC used to define the underlying structure of the THESEUS DSS.



# The THESEUS DSS





# 3

## Hypotheses

### 3 exploratory hypotheses

- (1) Representations of coastal risks are diverging, more precisely the representation of “coastal risks under climate change” of local stakeholders and scientists working on the development of THESEUS’s DSS are different;
- (2) These divergences are rooted in different material and moral value systems;
- (3) These divergences are rooted in paradigmatic tensions visible through the relative importance given of intervening within causal chains (deterministic paradigm; vulnerability reduction approach) and the relative importance given to intervening on the system’s boundary conditions (non-deterministic approach; resilience enhancement approach).

# 4

## Material and methods

3 corpuses, iterative grounded theory

# Use of three corpus

Stakeholder interview corpus (32 interviews)

- Gironde estuary, France, Santander bay, Spain, Cesanaticco, Italy.

The scientific reports corpus (5 reports 1386 pages)

- Series of deliverable contributing to the scientific structure and foundation of the DSS

The interview with scientists corpus

- 2 ecologists, 2 economists, 2 ecologists, 1 sociologists, 1 data manager, 1 climate scientist, 1 interdisciplinary risk expert.

# Data analysis

## Iterative grounded theory

- Moving iteratively between a corpus based theorization and a chosen conceptual framework.
  - How do people theorize the questions at hand, how does this theorization relate to a chosen conceptual framework.

## Conceptual framework chosen

- Renn's (2008) integrative framework for risk perception
  - Perceptions/representations/attitudes the product of reaching a balance between relevance claim, evidence claim, normative claim.

Thematic coding (predefined and emerging) and establishing relationship between themes.

# 5

## Results and discussion

Each corpus in a nutshell

Back to the hypotheses

# The three corpus in a nutshell

## Stakeholder interviews

- Relevance
  - “it is about ensuring a balance between protection and restoration of waterways, it is about biological productivity, it is about protecting of goods, infrastructures, **all depends on the will of the population and of the elected officials.**” (43\_cb\_gir)
- Evidence
  - “people use dykes according to their very narrow interests. Duck hunters often dig holes in dykes” (179\_df\_gir) “**these actions are totally unbelievable**, they are associated with local habits totally disconnected from a culture of risk” (183\_df\_gi)
  - “When **you rise the level of the quay**, it will potentially increase the risk of **flooding of adjacent lands**” (91\_en\_gir)
  - “I would rather not talk about land use plans, as **they make no sense at all.**” (54\_im\_gi)
- Norms – **dominates the corpus**
  - “how to improve globally taking into account **solidarity** between territories, the solidarity within the community” (438\_df\_gir)

# The three corpus in a nutshell, results

## Scientific report

- Relevance
  - analysis of the economic costs associated with flooding and erosion
  - approached in ecological terms – with non-economic valuation of biodiversity and ecosystem services
  - potential life losses
- Evidence
  - Source Pathway Receptor Consequence
  - probability density function
  - simplification of reality is sometimes acknowledged and justified by the need for pragmatism
- Norms
  - values associated with science (robustness of results and being inscribed in the Khunian normal science paradigm)
  - Pragmatism and the need for science to lead to operational reduction of coastal risks



# The three corpus in a nutshell, results

## Scientists interviews

- Relevance
  - Cf the report corpus
- Evidence
  - “We try to do **by vulnerability because it is difficult to know exactly when the complexity of others system will be affected**. I mean if you come in complex system like economic, the interactions between economic and environmental, then **it is difficult to know exactly when resilience will be affected**, it is **very difficult to predict the relevant thresholds**, but yet, **I can identify vulnerable relationship within this system.**” (123\_ql\_th)
- Norms
  - “In English we say why do you use this concept or how do you justify it? I **use it because it is useful**, sorry but that is the answer” (11\_fq\_th)

## 3 exploratory hypotheses

- (1) Representations of coastal risks are diverging, more precisely the representation of coastal risks of local stakeholders and scientists working on the development of THESEUS's DSS are different;
- (2) These divergences are rooted in different material and moral value systems;
- (3) These divergences are rooted in paradigmatic tensions visible through the relative importance given of intervening within causal chains (deterministic paradigm; vulnerability reduction approach) and the relative importance given to intervening on the system's boundary conditions (non-deterministic approach; resilience enhancement approach).

## Key elements

Representations and paradigmatic tensions

What is of interest

The way the world functions

Making stakes explicit

All stakes

Broadly associated with the hazard

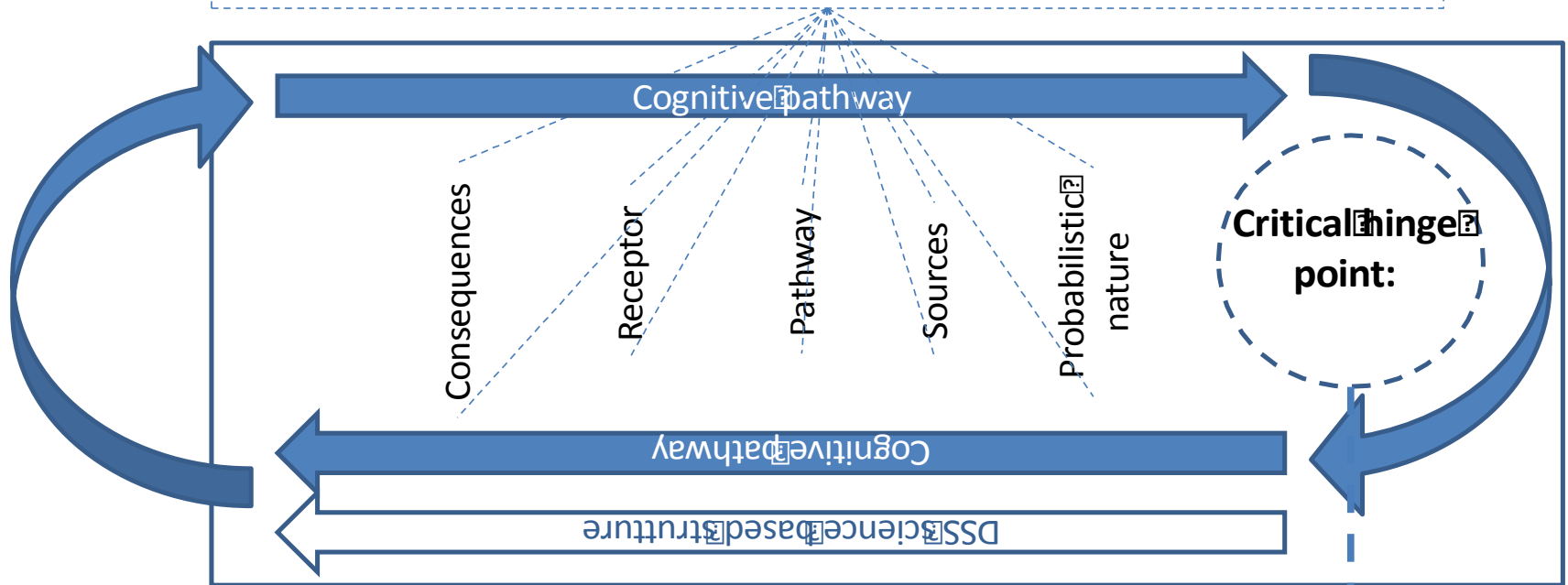
Broadly associated with **imagined** mitigation options

# 6

## Using the DSS as a safe deliberative space

Within each step the following questions should receive attention, the answers to these should be documented as part of the DSS

- (1) what are the important phenomena that should receive our attention,
- (2) what are the causal linkages that are expressed,
- (3) what is good, tolerable, and/or acceptable.



**What has changed for DSS designer/builder?**  
**What has changed for end user?**  
**What does this tell us about integrating DSS and the public in terms of information flow.**

Iteration  
 questionnaire/inter  
 view/focus groups

there should be no proceeding forward without a clear consensus on the probabilistic nature of the risk and on the scientific basis for establishing this probabilistic nature

# 7

## Conclusion

# Come concluding elements

Risk communication as a dialogic learning experience involving jointly stakeholders and scientists

Moral and material values, as well as paradigmatic differences between parties in presence, are different and compatible – they should be explicitly documented.

DSS as the opportunity for sustaining mutual learning.

More research ;-)

- testing in other settings, with DSS structured along different conceptual models.
- real time experiments into the implementation of a communication scheme such as the one proposed
- combining the proposal made with other techniques such as visualisation, joint scenario development, model co-construction.



# Merci!

"The support of the European Commission through FP7.2009-1, Contract 244104 - THESEUS ("Innovative technologies for safer European coasts in a changing climate"), is gratefully acknowledged"

