ON THE ECONOMIC APPROACH TO NATURAL HAZARDS MANAGEMENT: WHAT ECONOMICS CAN ADD TO COMMON TECHNICAL KNOWLEDGE ON HAZARD-RISK BINOMIAL IN ENGINEERING DISCIPLINES

P. DIAZ SIMAL and S. TORRES ORTEGA
ETS der Ingenieros de Caminos
Universidad de Cantabria

Who we are?

* Economics vs. Engineering , what a strange couple , or not?
* Are we in fashion?
* Modeling previous or understanding the future?
* Mr. Roberts quote:
  * Core subjects — IDENTITY
  * Threads — INTERDISCIPLINARY
  * Further reading — FUTURE?

The problem

* Increasing risk awareness
* Need to create a conceptual framework
* Different contributions from diferent areas
  * Geography
  * Economics
  * Environmental sciences
* Need to clarify concepts to share knowledge.

Natural risk management as emergent topic

Diverse approaches technical/economics		Areas of Concern
• Increasing degree of awareness • Increasing concern • Shortage of resources • Diversity of sources	• Diversity of variables • Diversity of time horizons	Sustainability Climate Change

Some Theoretical reflections

1. Framework: basic elements included in the analysis.
    1. Flows
    2. Controls
    3. Stocks
    4. Attributes
2. Theories
    1. Identify and set priorities among relevant elements
    2. Solve specific questions
    3. Fix proposals for assumptions
3. Specific models introduced to represent each case study

Two different frameworks

	DPSIR		PSR
FLOWS **STOCKS**	1.- Drivers: different drivers towards Specific needs 2.- Pressures: demands raised to the environment 3.- States: pollution externalities and levels of services reached 4.- Impacts: loss of quality 5.- Responses: recombination of the system		1.- Shock will exist 2.- Different pathways 3.-Final consequences on each receptor.
CONTROLS	1.- General system of feedbacks 2.- Reassignment of resources and functions		1.-Physical process 2.-Probabilistic impact - response
ATTRIBUTES	1.- Heterogeneity 2.-Decomposability 3.- Predictability 4.- Extent in space and time 5.- Resilience-vulnerability 6.-Productivity	Resilience Vulnerability: 1.- Homeostasis 2.- Omnivory 3.- High Flux 4.- Flatness 5.- Buffering 6.- Redundancy	1.- Hazard – Exposure 2.- Susceptibility 3.- Vulnerability 4.- Resilience 5.- Adaptive capacity

Six theoretical approaches

	Evolutionary economics Holling (1973)	Institutional economics	Entitlement theories Sen (1976)	Ecological economics	Risk Management	Natural hazard and Catastrophes analysis
Basics assumptions	4 steps Evolutionary paths The adaptive process that rules human and natural evolution as subject of the analysis	Social Framework, Governance Agents perception concern and awareness	The economic and social conditions make the difference	The role of nature as provider of services as part of the available capital	Risk management decisions (adaptation mitigation, assumed damage…)	1.- Risk hazard probability quantification 2.-Expected damage

Theories for vulnerability analysis

	Evolutionary economics	Institutional economics	Entitlement theories	Ecological economics	Risk Management	Natural hazard and Catastrophes analysis
Sources of vulnerability	1. Evolutionary paths 2.- Long Term States	1.- Weakness of the decision framework 2.- Perception of the problems and risk 3.- Quality of the governance structure	1.- Poverty 2.- Ability to choose	1. Anthropic pressures. 2.-Carrying Capacity	1.- Risk management decisions (adaptation mitigation, assumed damage…)	1.- Risk hazard probability quantification. 2.-Expected damage
Scale and temporal path of the analysis	1.- Long Term scale 2.- Social micro-scale (Incentives)	1.- High scale resolution to identify vulnerable areas. 2.- Low scale indicators to include aggregate characteristics of a society 3.- Long term temporal scale.		1.- High scale resolution to identify ecosystem units	1.-Long term periods for capturing trends in natural events. 2.-High space resolution to capture spatial differences.	
Available information	Qualitative information on evolutionary and adaptive capacity.	1.- Aggregate economic data, 2.- Distributive equity, 3.- Governance and transparence, 4.- Quality of social and human capital		1.- Biodiversity 2.-Resilience 3.- Evolutionary 4.- Primary production	1.- Physical data on the present functions 2.- Previsions on path evolution of climate parameters	
Capacity to produce a synthetic indicator.	Projected trends	1.- GDP 2.- Wealth Distribution. 3.- Governance indicators 4.- HDI	1.- Sen´s Poverty Index	1.- National Accounts environmentally adjusted 2.- Happiness indexes	Expected damage ($)	Level of risk (probability)

PEDRO DIAZ SIMAL & SAUL TORRES ORTEGA

As a final reflection

* Different theoretical approaches
* Different conceptual framework
* Ambiguity and conceptual missunderstanding
* Concepts still in process.