Justification & framing: characteristics of current problems in human – environment interactions

- Complexity & increasing uncertainty → Unpredictability
- Evolving, rapidly, continual & iterative → Modelling
- Rapidly changing realities → Open Systems needed
- Environment – Users relationship → Adaptive capacity & management toward improved system resilience
- Importance of stakeholders’ interactions & legitimacy / recognition of multiple points of view → Relevance of concertation & mediation approaches
- Need to reconcile ecological & social dynamics / 3 (or 4) pillars of sustainable development
**Understanding Stakeholders–Environment Interactions & the diversity of points of view on Human-Environment relationships**

- New frameworks to look at adaptive co-management & resilience of socio-ecosystems / people capacity to adapt & self-organization
- Underline the importance of institutions (sets of rules) & collective learning to act
- Collaborative use of (simple) models to explore the future through participatory scenario simulation & assessment
Organized interactions among stakeholders: different weights, interest & representations

Modelling complexity in social-ecosystems through effective dialogue, sharing of viewpoints, knowledge & subjective criteria used (explicitly or implicitly) by stakeholders

Companion Modelling (ComMod)
scientific posture & post-normal science

- A bottom-up constructivist approach
- Process (interactions) more important than results
- Collaborative, evolving & iterative modelling to confront realities & theories: Field -> Model -> Field -> Simulation -> Field...
- Continuous confrontation with dynamic realities: openness, uncertainty, x points of views, model refutation & co-construction
- Two specific contexts & goals:
  - To understand a concrete issue in a complex system &
  - To facilitate collective management of common resources
- Emphasis on co-learning facilitated by evolutionary models
- To build a shared representation of the issue & mediate search for solutions thru simulated scenarios & exchanges
Towards a shared representation of the system to be managed

Objective of companion modelling:
To facilitate dialogue, co-learning & collective decision-making, to strengthen the adaptive management capacity of communities through integrative collaborative modelling & simulation

Facilitation of collective decision-making processes
Multi-Agent Systems (MAS)

Concept of Agent - Individual-based modelling –
Local interactions - Micro-simulations

→ MAS suitable to represent complex, dynamic & open systems
→ To explore hypotheses, simulate & assess scenarios
→ How to use them with people to examine NRM issues?

Co-construction & use of formal models with stakeholders in a ComMod sequence

1. Co-construction of a shared representation of the problem to be examined collectively

2. Collective visualisation of social & resource dynamics

3. Collective assessment of scenarios of change in the context or in stakeholders’ practices
   (Role-Playing Games and/or computer Agent-Based Models)
Real world - Role-Playing Games (RPGs) & computer ABM models in ComMod: various kinds of associations

- Real world NRM problem
- Diagnostic surveys Stakeholder analysis
- Conceptual models / Shared representations
- Agent-based simulation tool
- Wide choice of ABM modelling & simulation platforms
- Computer supported or not
- UML diagrams ARDI technique (Actors-Resources-Dynamics-Interactions)

Similarities of key features in RPGs & computer ABMs

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<th>Role playing games</th>
<th>Multi-Agent Systems</th>
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Combination of RPG & ABM in ComMod processes: Key flexible tools

Land use change in NE Thailand

Cattle grazing in North Vietnam

An elementary ComMod sequence

Initiation of the process

Understanding context & problem

Field

Model

Simulations

Role-playing game sessions

Interactive agent-based simulations

Conceptual modelling

Co-construction of models
Problem analysis
Collective construction of a model
Participatory simulations
Problem analysis
Collective construction of a model
Main phases of ComMod iterative process & dynamics of collective learning & decision-making

Real world

Models
Monitoring & evaluation of effects & impact

Monitoring & evaluation: diversity of knowledge exchange during a process

Types of knowledge
- Empirical/Indigenous
- Technical
- Institutional
- ComMod/Scientific
- ComMod trainee
- Academic (students)

Cattle grazing & reforestation in Nan province, North Thailand
Up & Out-scaling a ComMod process: Use of hybrid Agent-Based Models with people

New National Park & Gathering of NTFP, Nan province, N. Thailand

Up-scaling: sharing irrigation water among 14 villages in a catchment, Chiang Mai province, North Thailand

For more information from http://www.ecole-commod.sc.chula.ac.th
Diversity of effects observed: towards improved adaptive capacity

- Individual & collective learning about the system, current situation: increased self-confidence
- Increased awareness of the problem
- Understanding each other’s perceptions
- Reach a common agreement on management rules
- Change of behaviour, communication networks
- Change in decision-making leading to...
- Implementation of new practices
- Creative institutional innovation

Thank you for listening
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