Agent-Based Modelling Simulation (ABMS)
Research Opportunities for Pest Control and Marine Resource Management in Açores

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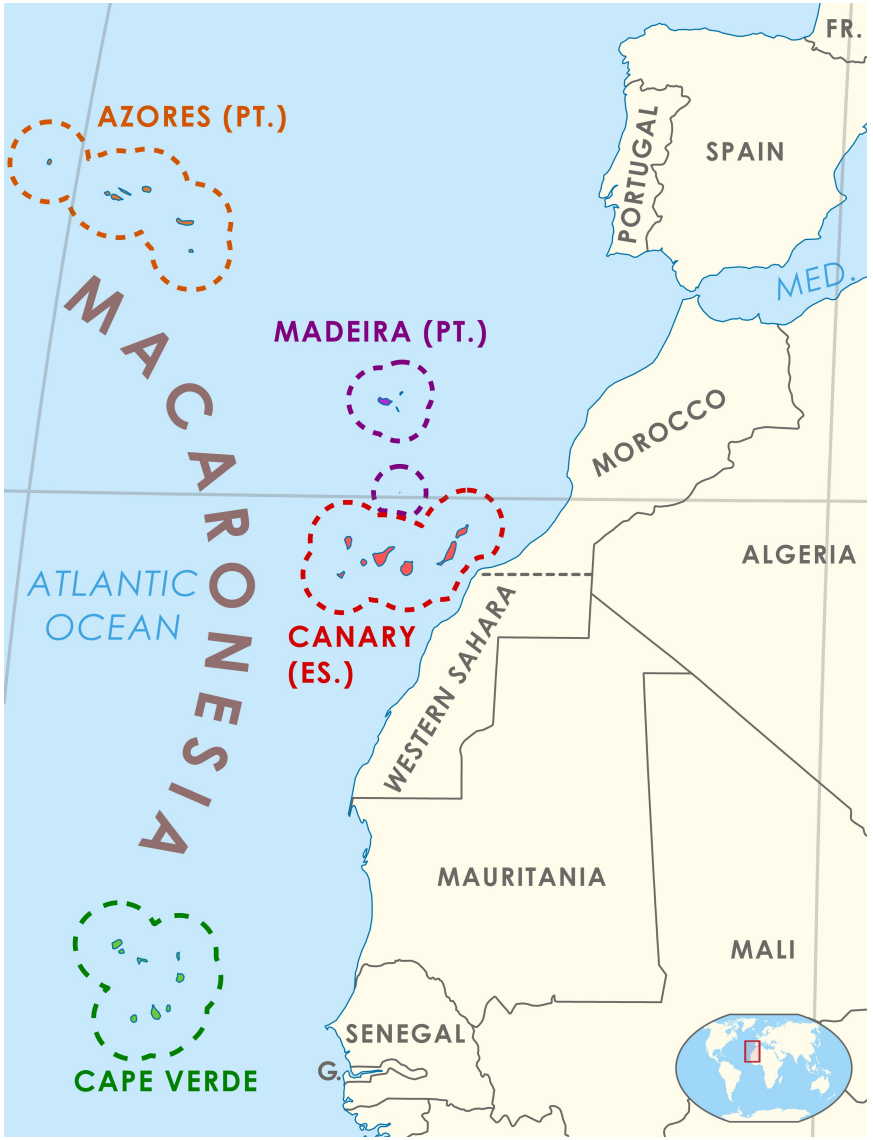
Overview

- Açores Geographic Location
- Agent-Based Modelling Simulation
- ABMS Research Opportunities in Azores
- Pest control: Termites example;
- Resources Sustainability: The Azorean Sea;
- Research Groups & Opportunities: FCT, RIS3 Açores (Regional Program);

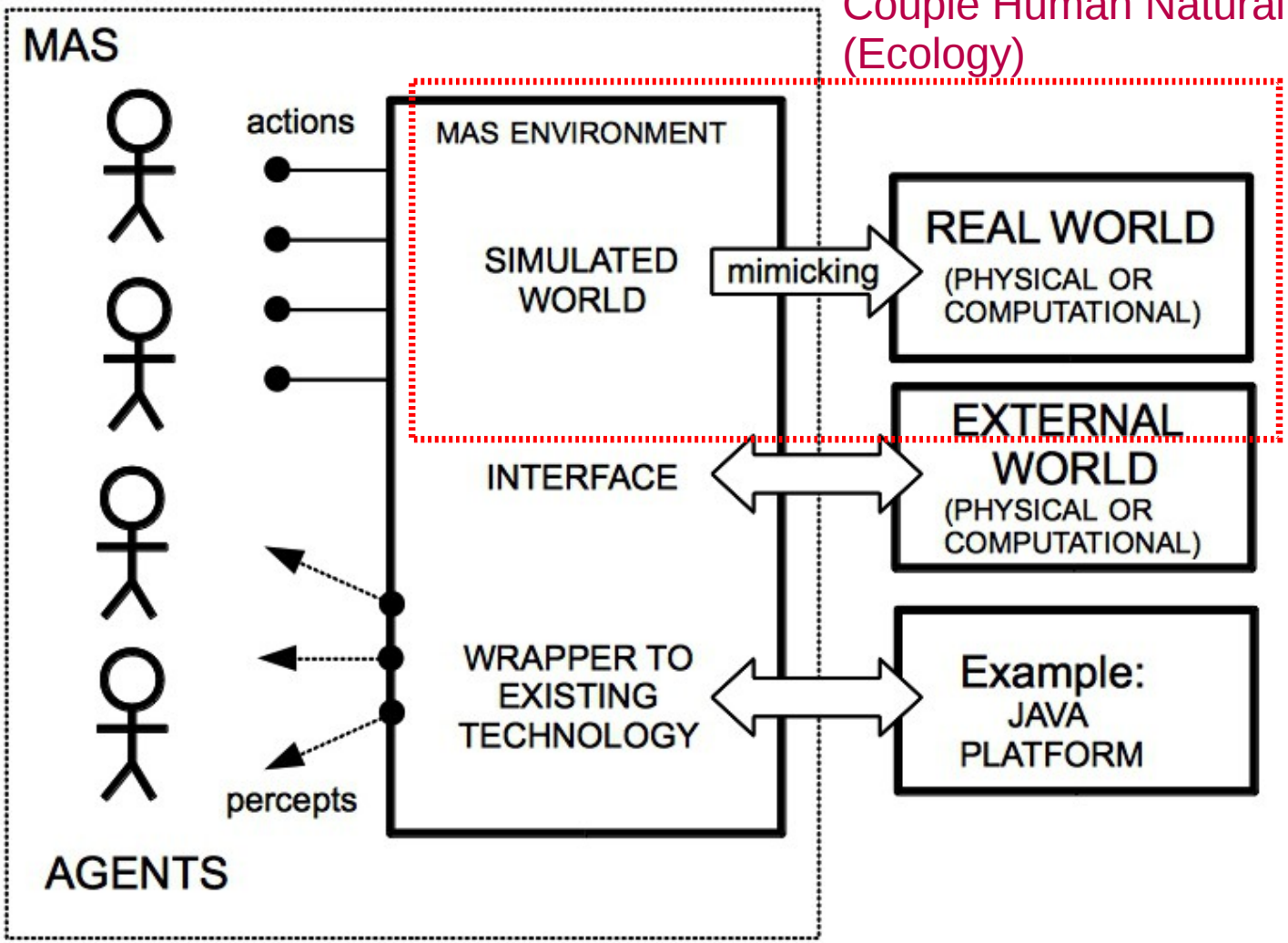
Azores Geographic Location



"Macaronesia location" by ArnoldPlaton - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons

Agent Based Modelling and Simulation

Couple Human Natural Systems (Ecology)



ABMS Research Opportunities in Azores

- Biodiversity: The conservation of the fauna and flora in the islands and sea;
- Risk assessment & mitigation: A monitoring of the volcanic activity and risk assessment & mitigation for earthquakes or land slid events;
- Pest Control: The pests (rats, termites) are serious threats to the agriculture and to the built cultural heritage (e.g. Angra do Heroísmo);
- Marine Resources Management: The overexploitation of fish resources puts in risk (local) economy, the ecosystems and the biodiversity.

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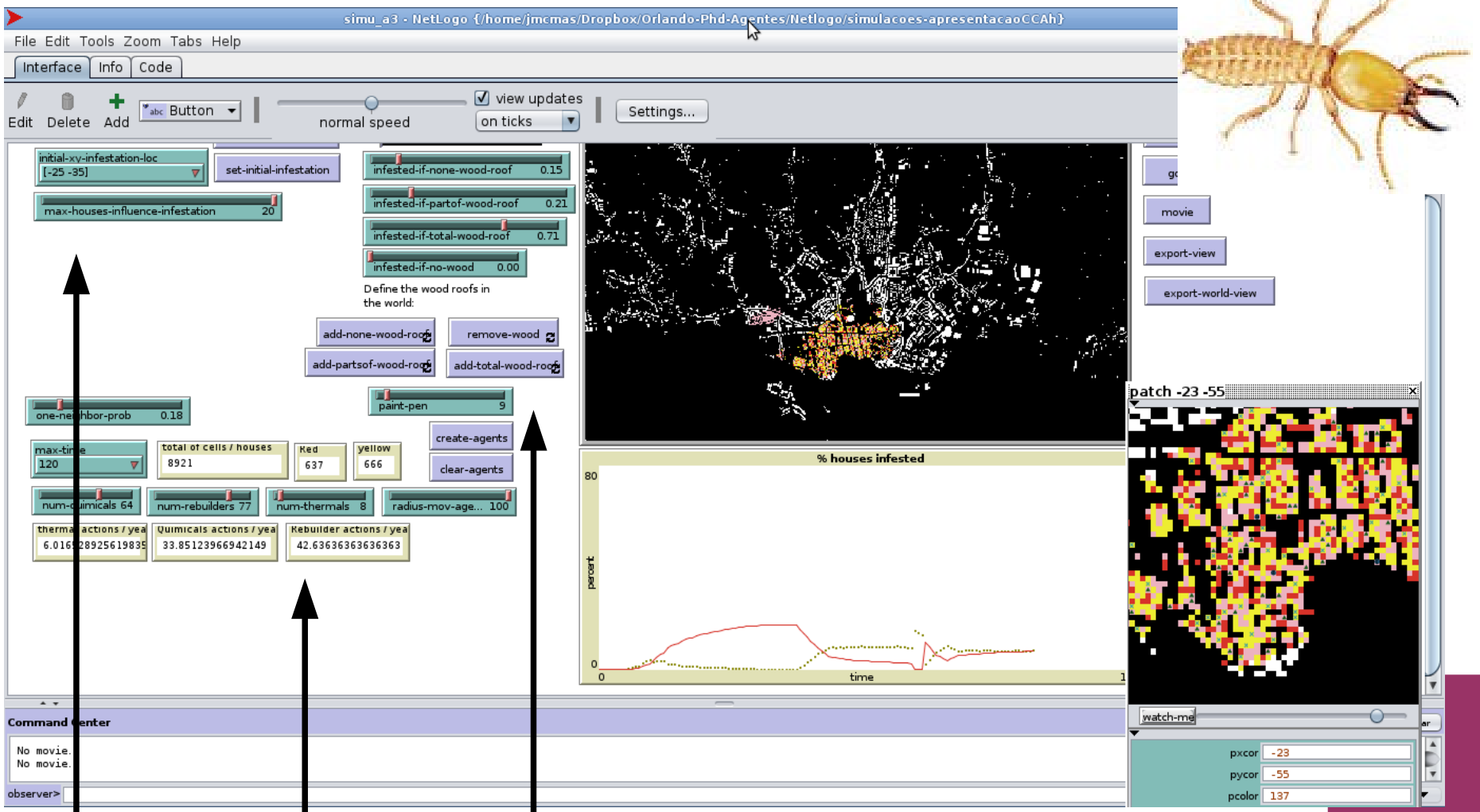
(Project) (In progress)

Pest Control: Termites example

- ECONOMIC/SOCIAL PROBLEM:
  - Termites eat Wood (drywood termite Cryptotermes brevis);
  - Damage (destruction) the building structure that needs to be replaced or treated;
  - House owners replace wood by concrete (architecture heritage at risk);
- RESEARCH CHALLENGES:
  - Simulate the Spread of the pest (biology, spread model);
  - Study the different scenarios for pest control (heat, chemicals, wood replacement);
  - Evaluate (predict) the costs (€, architecture heritage);
  - Promote the pro-active participation of the inhabitants (social target);

Pest Control: Termite spread



Infestation Model

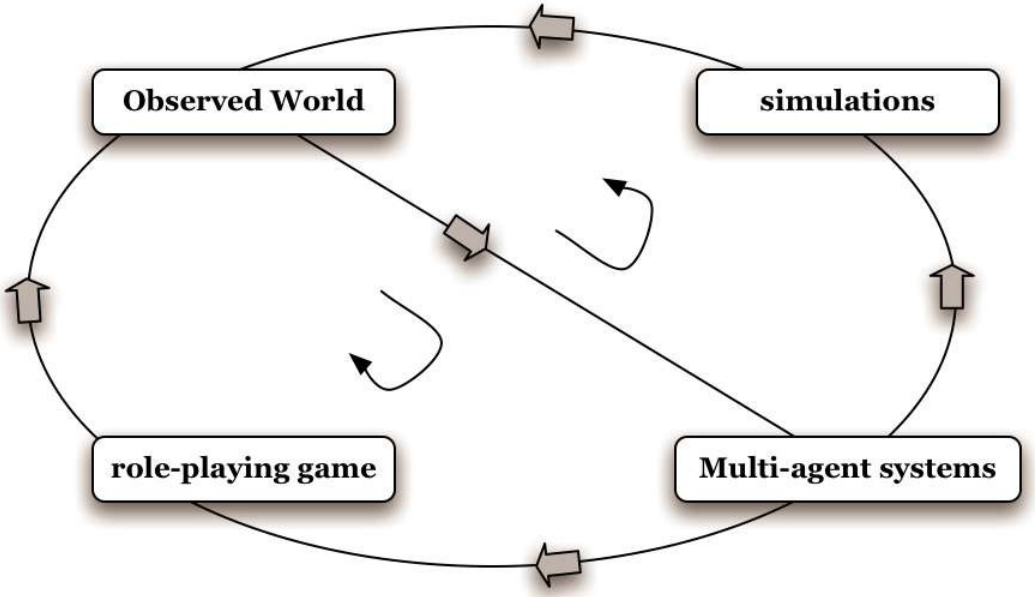
Pest-Control AGENTS

Building Structure

NETLOGO

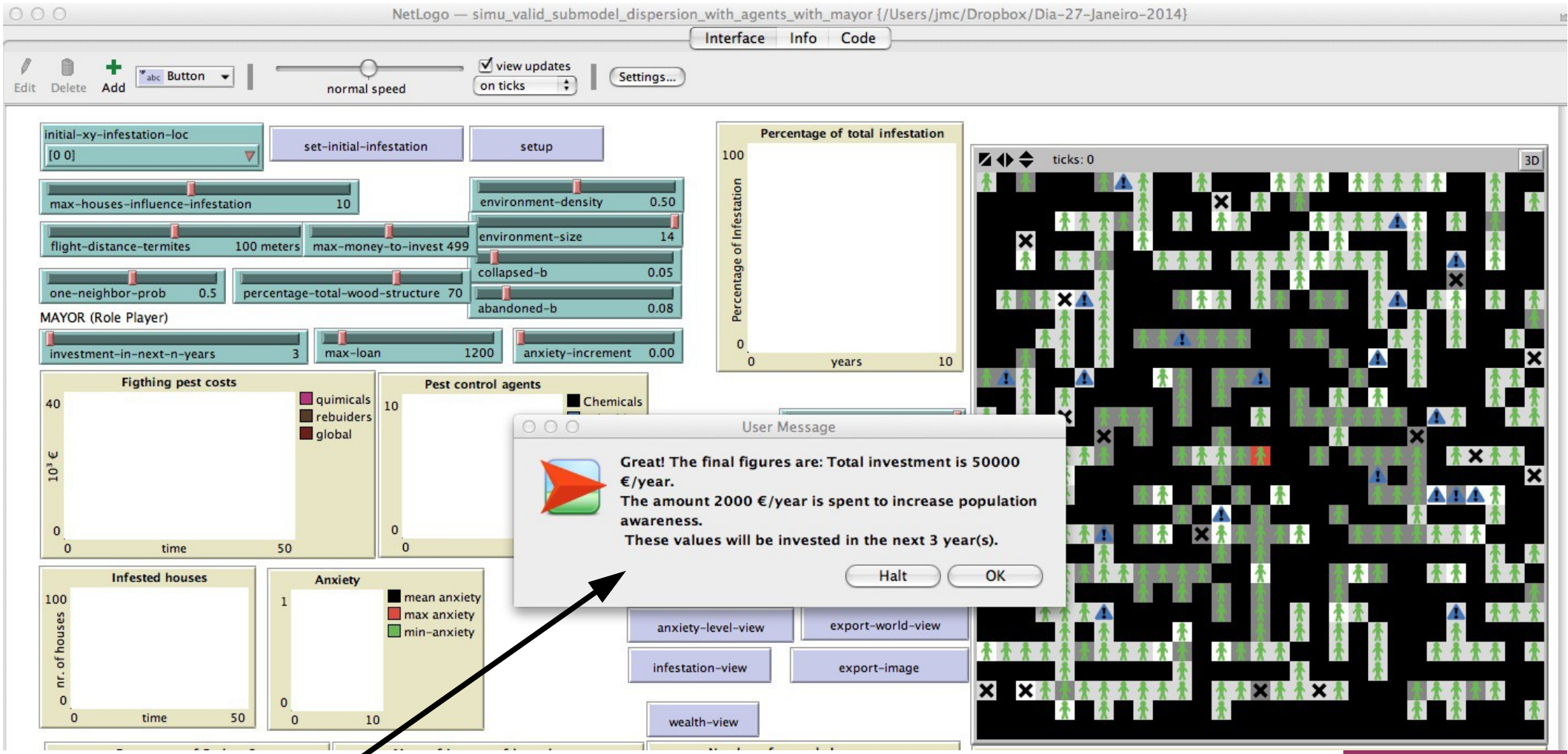
Pest Control: Participatory approach

Participatory Approach:



(Barreteau et al. 2001)

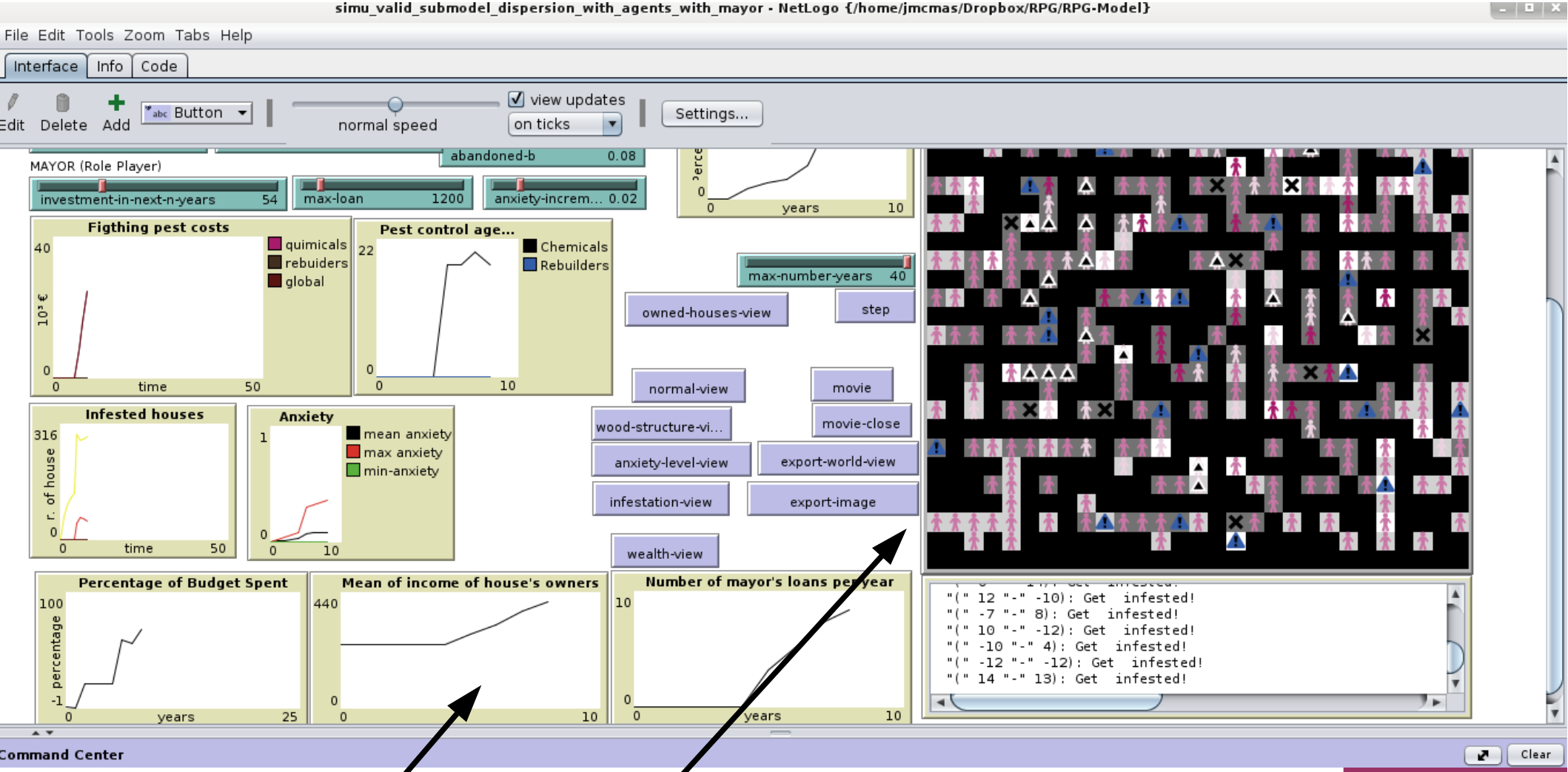
Pest Control: Participatory approach



Interaction with user (Role: Mayor)

Stylized city model

Pest Control: Participatory approach



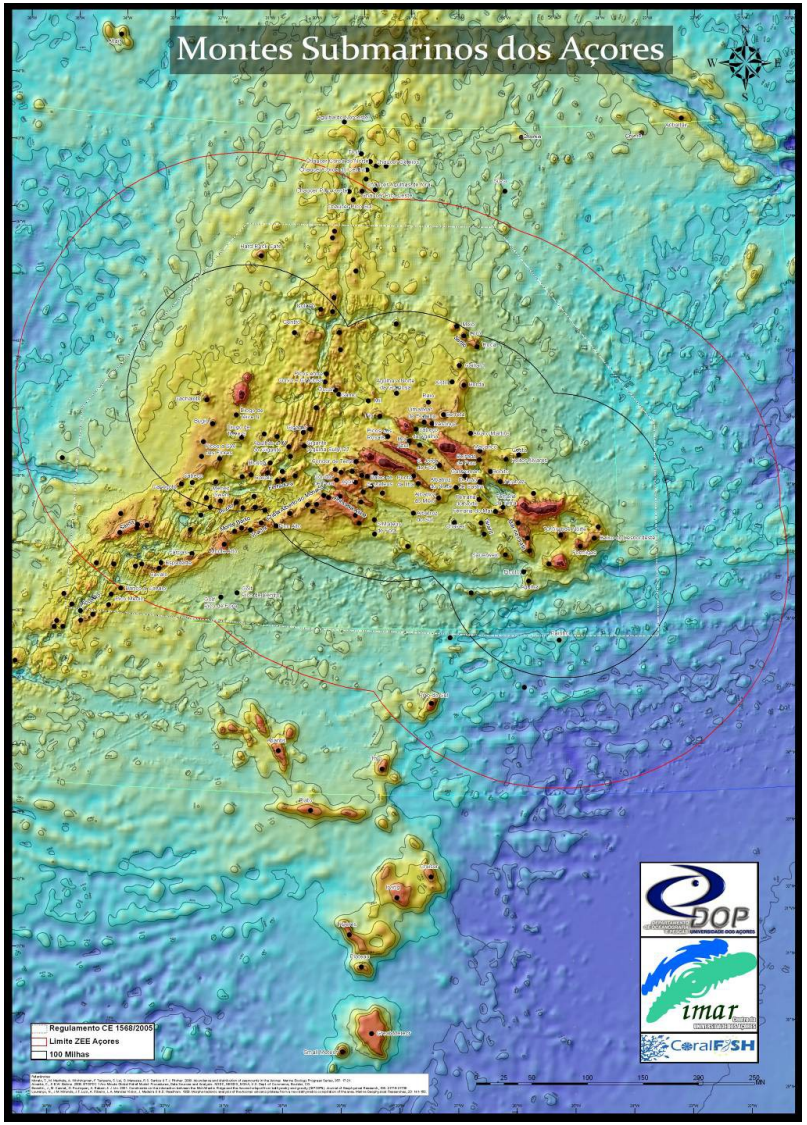
Economic sub-model

Social sub-model (anxiety)

Pest Control: Participatory approach

- Different roles in a Game:
  - Mayor;
  - Inhabitant;
  - Local authority (Government department);
- Players' decision-making (when? Why? How?):
  - Investment (middle term, long term);
  - Inhabitants behaviours (e.g. close the window during infestation period);
  - Demands for economic support (loans, public investment);
  - Protection laws (e.g. control certificate against termite infestation)

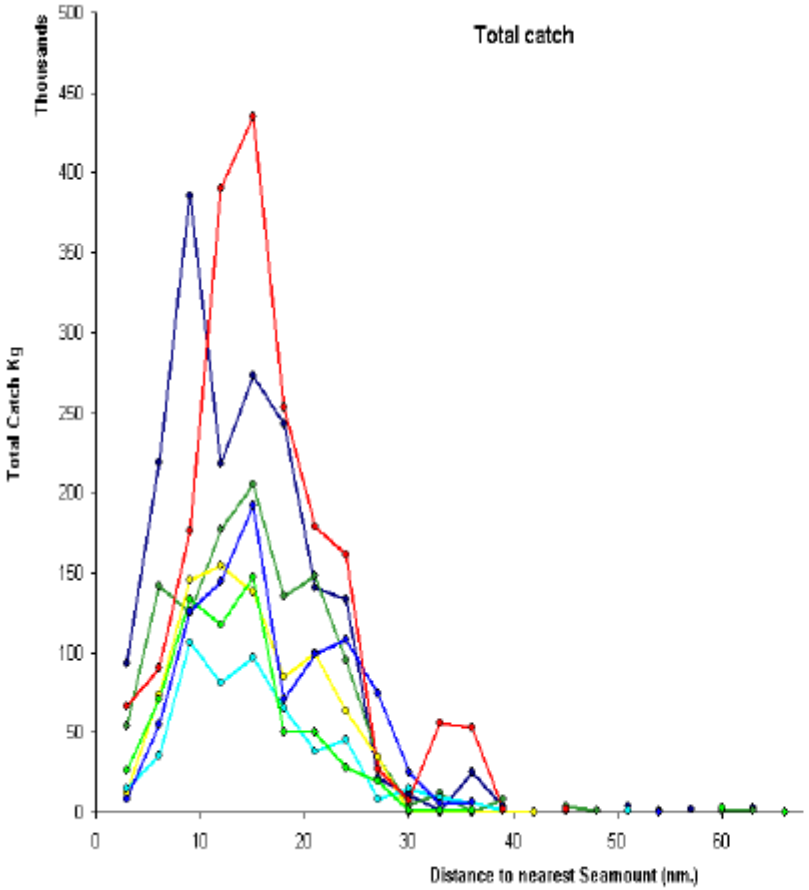
Marine Resource Management

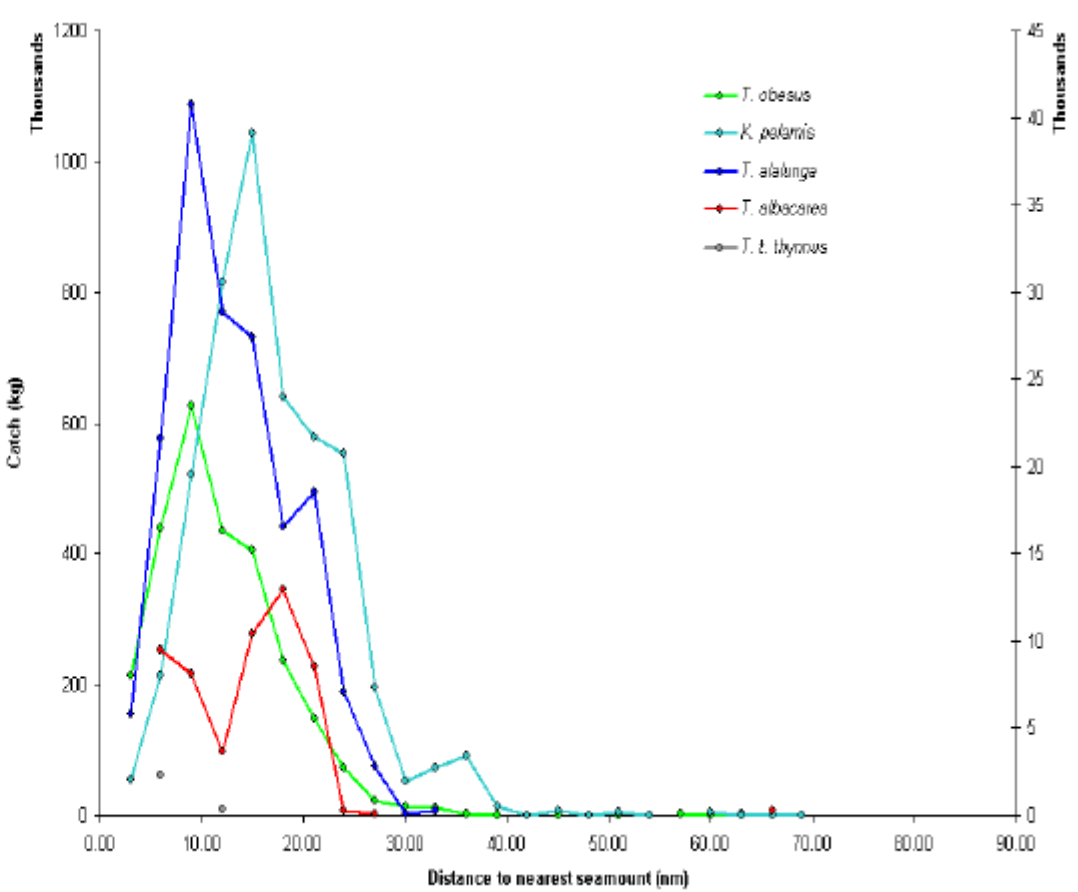


In Serrão Santos, "Maritime spatial planning: An opportunity for sustainability in fisheries and aquaculture Brussels - 30 May 2013

Marine Resource Management

Extractive activity: Fishing



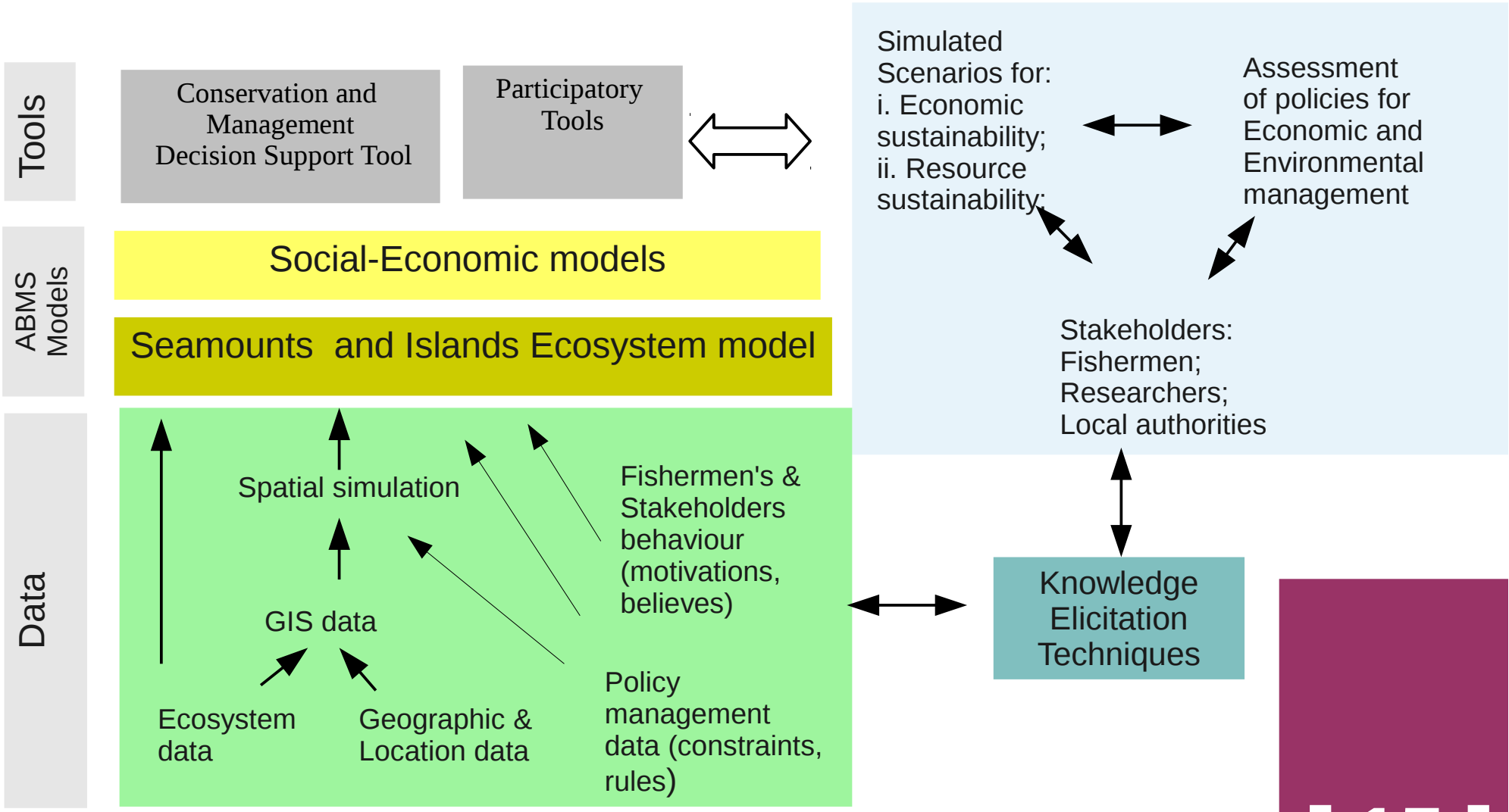


In Serrão Santos, “Maritime spatial planning: An opportunity for sustainability in fisheries and aquaculture”, Brussels - 30 May 2013.

Marine Resource Management

- ECOLOGICAL/ECONOMIC/SOCIAL PROBLEM:
  - Overexploitation of seamounts (fish stocks reduced, species & ecosystem endangered);
  - Local economy dependent from local species vs. Conservative measures demands to close fishing grounds;
- RESEARCH CHALLENGE:
  - Integrate data from fish landings, fishing effort, fish ecology and biology, sea surface temperature, biodiversity and other environmental variables
  - Tools for Resource Management:
    - Scenarios for different management options (e.g. closing fishing ground areas during a period of time)
    - Participatory management (stakeholders, fishermen, researchers, local authorities);

Modelling & Simulation of Resource Management and Sustentability of Seamounts in Azorean Sea - **MoSSea**



Research Groups & Opportunities

- **Pest Control – Participatory Approach;**

  Project to be submitted to Regional Call – Direção Regional da Ciencia e Tecnologia April/May 2015;

  Research Group:

  - LabMAg & Azorean Biodiversity Group (http://www.gba.uac.pt/)

- **Modelling & Simulation of Resource Management and Sustentability of Seamounts in Azorean Sea**

  Project to be submited to **FCT** (and **RIS3 Açores**);

  Research Group (in construction):

  - LabMAg & IMAR/DOP (http://www.dop.uac.pt/investigacao)

  & Economy & Oceanography

Obrigado!

- Publications

  Orlando et al. (2013). Towards an Agent Based Modeling: The Prediction and Prevention of the Spread of the Drywood Termite Cryptotermes brevis, EPIA, pp. 480-491. (**TERMITES Spread modelling**)

  Menezes, G. and Giacomello, E. (2013) Spatial and temporal variability of demersal fishes at Condor seamount (Northeast Atlantic). Deep-Sea Research II, 98, pp. 101-113. (**CONDOR data**)

  Ressurreição, A. Giacomello (2013). Quantifying the direct use value of Condor seamount. Deep-Sea Research II, 98, pp. 209-217.(**Socio-economic Conflit--> Participatory approach!**)

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