

## How scientific knowledge can be used to support deliberative processes in the frame of sustainable clam farming in the Lagoon of Venice



*S. Dalla Riva, P. Campostrini, CORILA*



*D. M. Canu, C. Solidoro, OGS*



*L. Rossetto, Università di Padova*



*R. Pastres, Università Ca' Foscari*



<http://cordis.europa.eu/fp6/dc>



Science and Policy Integration for COastal System

Assesment



<http://ec.europa.eu/sustainable>

Type of Instrument FPVI - Integrated Project (IP)

Sub-priority 6.3

Global Change and Ecosystems

Area V

Strategies for sustainable land management, including coastal zones, agriculture land and forests

Research topic V.1.3

Sustainable development and Integrated Coastal Zone Management

- Achieve the scientific method to understand and quantify the response of coastal zone to changing environmental and anthropogenic conditions and the resulting impacts on ecosystem services.



<http://cordis.europa.eu/fp6/dc>



## Science and Policy Integration for COastal System

### Assesment



<http://ec.europa.eu/sustainable>

### Six major objectives:

1. Create an operational Systems Approach Framework (SAF) for assessment of policy alternatives in Coastal Zone System → from existing knowledge and evolve with new knowledge
2. Create a working science-policy interface
3. Implement and test the SAF over eighteen Study Site Applications throughout the European region → SAF and its operational use is not limited to any specific policy issue, socio-economic condition, or Coastal Zone type.
4. Generate SAF Portfolio consisting of generic assessment-methodologies, decision support tools, models and new knowledge useful for ICZM
5. Improve the communication and integration among the main actors of CZ System
6. Generate new opportunities for academic and professional Training in ICZM



<http://cordis.europa.eu/fp6/dc>



**Science and Policy Integration for COastal System**

**Assesment**



<http://ec.europa.eu/sustainable>

**Project's goal** → create a self-evolving, operational framework for delivering prognostic assessments of policy options for the sustainable management of coastal zones.

**Methodological product** → **Systems Approach Framework (SAF)**

It is based on an adaptation of the System Approach that incorporates the ecological, social and economic dimensions of the Coastal Zones together with emerging concepts on system complexity



<http://cordis.europa.eu/fp6/dc>



## Science and Policy Integration for COastal System

### Assesment



<http://ec.europa.eu/sustainable>

#### SPICOSA Study Site Applications

- 1 Gulf of Riga
- 2 Gulf of Gdansk
- 3 Oder Estuary
- 4 Himmerfjarden
- 5 Limfjorden
- 6 Sonderled
- 7 Clyde Sea
- 8 Cork Harbour
- 9 Scheldt Delta
- 10 Pertuis Charentais
- 11 Guardiania Estuary
- 12 Barcelona Coast
- 13 Thau Lagoon
- 14 Taranto Mare Piccolo
- 15 Venice Lagoon
- 16 Thermaikos Gulf
- 17 Izmit Bay
- 18 Danube Delta



The project will test and improve the SAF at eighteen Study Site Applications (SSAs) all over Europe

WT	CZ System	State	Organization
7.1	Riga Gulf	EE, LV	EMI-UT, IAE-UL
7.2	Gulf of Gdansk	PL	MIG, DEEMO-UoG
7.3	Oder Estuary	DE, ES	IOW, IOeW, KMG, EUCC-Med
7.4	Himmerfjärden	SE	SU, NUE, ENVECO
7.5	Limfjorden	DK	DIFRES, NERI, SDU
7.6	Sonderled Fjord	NO	IMR, BUC, NCFS
7.7	Clyde Sea	UK	SAMS, NUE, UoP
7.8	Cork Harbour	IE	NUIC, CU, ENVISION
7.9	Scheldt Delta	NL, BE	DELFT, RIKZ, VITO, IVM
7.10	Pertuis Charentais	FR	IFREMER, CEMAGREF, UBO, SOGREA
7.11	Guardiana Estuary	PT, ES	UALG, CSIC
7.12	Barcelona Coast	ES	CSIC
7.13	Thau Lagoon	FR	IFREMER, GEYSER
7.14	Taranto Mare Piccolo	IT	IAMC-CNR
7.15	Venice Lagoon	IT	CORILA
7.16	Thermaikos Gulf,	GR	HCMR, AUTH, EROPE
7.17	Izmit Bay	TR	TUBITAK-MRC
7.18	Danube Delta	EU,RO,BG, UA, UK	IES-DG-JRC, IO-BAS, INCDDD, HMI, UoP



<http://cordis.europa.eu/fp6/dc>



## Science and Policy Integration for COastal System

### Assesment



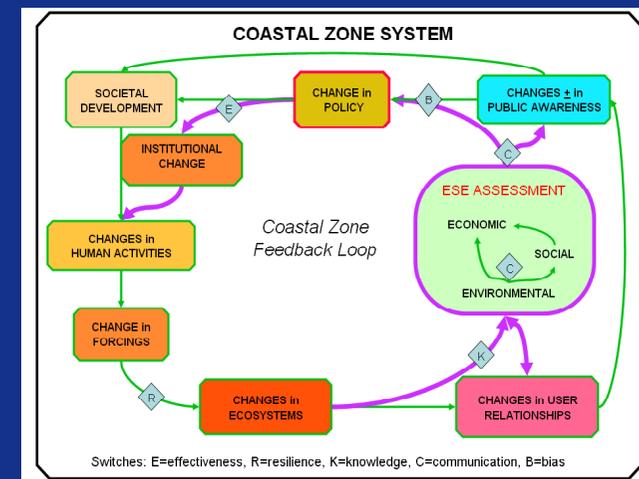
<http://ec.europa.eu/sustainable>

### Systems Approach Framework (SAF)

- ✓ to be readily updatable
- ✓ to provide an accumulative knowledge base for wider and more complex applications
- ✓ to contribute to a growing understanding of the options and actions necessary for transition to sustainable development

### SAF and Study Sites

- to create a significant SSA data set from which we can credibly distinguish those human activities that generates the greatest impacts and those type of coastal zone systems that are most vulnerable to human activity.
- to understand which policy controls can be considered as independent of the natural characteristics of a coastal zone system, which controls need to be made specific to a particular coastal zone, and to which policy changes are public perception most sensitive





<http://cordis.europa.eu/fp6/dc>



Science and Policy Integration for COastal System

Assesment



<http://ec.europa.eu/sustainable>

## STUDY SITE 7.15 Venice Lagoon



Venice Lagoon has a surface area of about 550 km<sup>2</sup>

It is the largest lagoon of the Mediterranean Sea

It has the widest tidal range of the Mediterranean Sea

Three inlets, Lido, Malamocco, and Chioggia, connect it to the Northern Adriatic Sea

The Venice Lagoon System has a variety of habitats, including dunes, tidal channels, bare mudflats, seagrass beds, and salt marshes.

It is a Ramsar site and has important ecological functions like all others wetlands. During the winter season, more than 100.000 migrating waterfowl rest in the lagoon area, seven species live here all year round.



<http://cordis.europa.eu/fp6/dc>



## Science and Policy Integration for COastal System Assesment



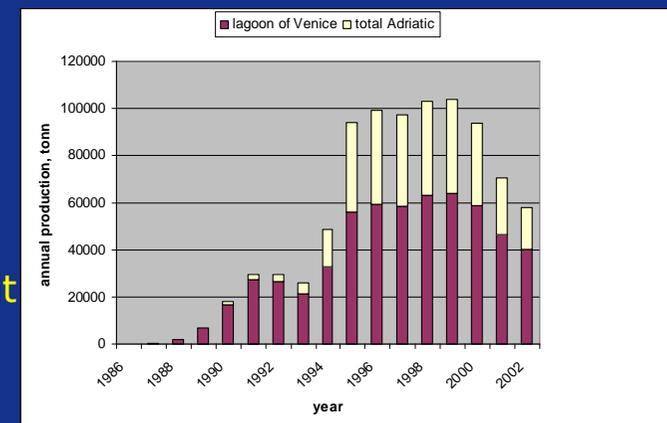
<http://ec.europa.eu/sustainable>

### STUDY SITE 7.15 Venice Lagoon

## Sustainable management of the clam *Tapes philippinarum* in the Lagoon of Venice

### History

- **1983**: *Tapes philippinarum* introduction
- **1983-1990** clam colonisation
- **From 1990**: fishermen started to fish in **open access regime/ social tensions/poor quality** (fished also in prohibited area)
- **1999**: catches decline
- **2001**: allocation of aquaculture concessions
- **2005**: extension of aquaculture concessions
- **Negative impacts**: sediment resuspension, benthic habitat
- **Economic Relevance**: 60% of national production
- **Number of fishermen**: around 1000;
- **estimated gross annual production: 180 Million Euro**







<http://cordis.europa.eu/fp6/dc>



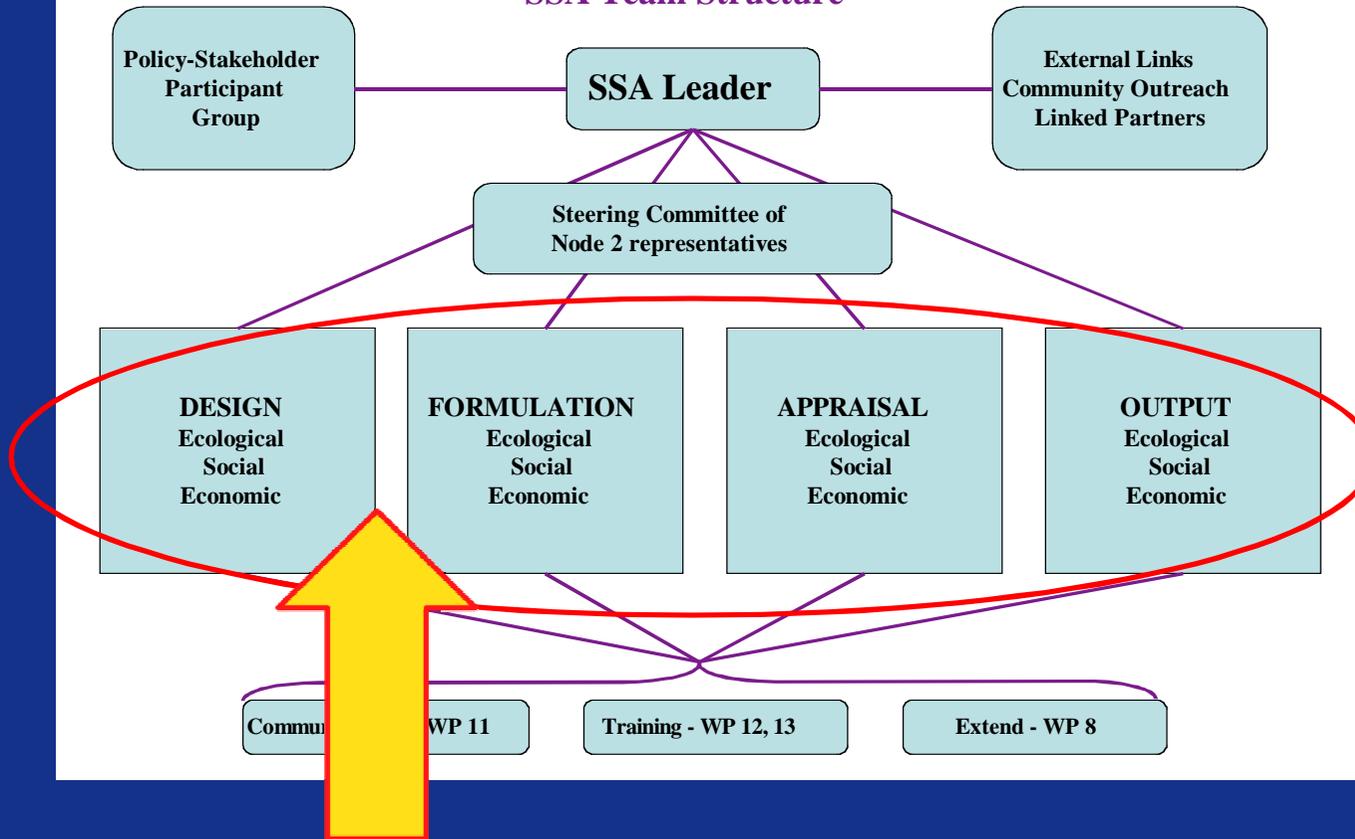
# Science and Policy Integration for COastal System

## Assesment



<http://ec.europa.eu/sustainable>

### SSA Team Structure





<http://cordis.europa.eu/fp6/dc>



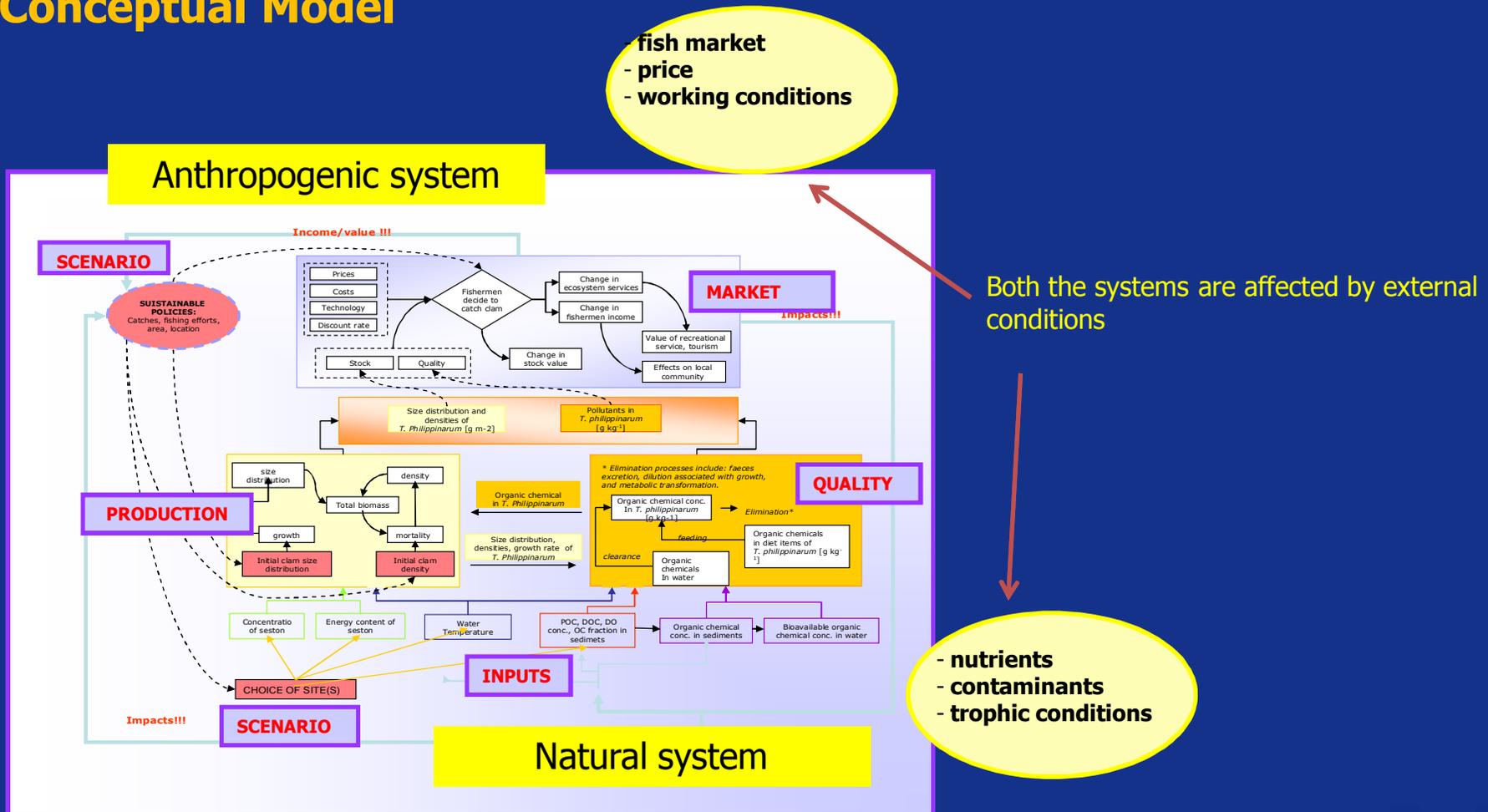
# Science and Policy Integration for COastal System

## Assesment



<http://ec.europa.eu/sustainable>

### Conceptual Model





<http://cordis.europa.eu/fp6/dc>



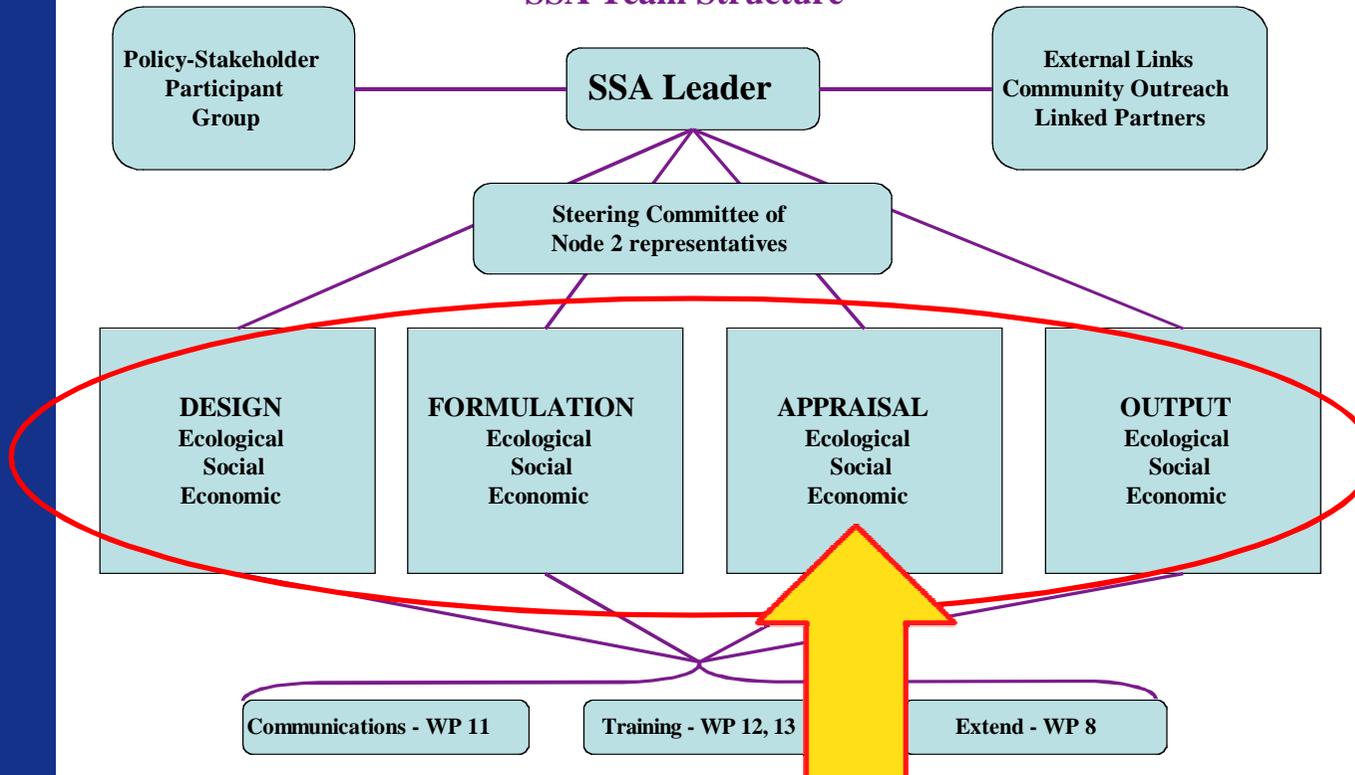
# Science and Policy Integration for COastal System

## Assesment



<http://ec.europa.eu/sustainable>

### SSA Team Structure



Simulation and evaluation of models create in the previous steps



<http://cordis.europa.eu/fp6/dc>



# Science and Policy Integration for COastal System

## Assesment



<http://ec.europa.eu/sustainable>

## Extend Implementation

The output of SPICOSA in the study site of Venice Lagoon will be an integrated model developed using Extend software, able to simulate and assess:

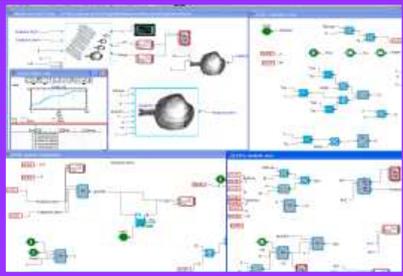
- PRODUCTION
- QUALITY
- FISH MARKET

under different scenarios

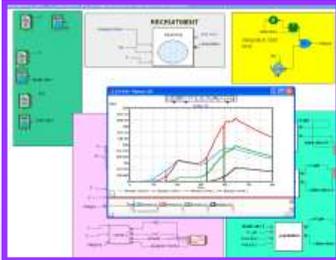
Scenarios → to simulate clam production changing:

- Clam concession areas in the lagoon
- trophic conditions under different anthropogenic inputs
- Climate changes

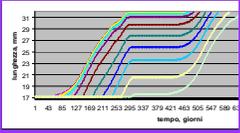
**Individual growth model**



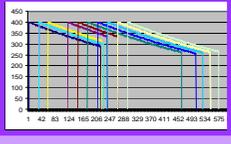
**Population dynamic model**



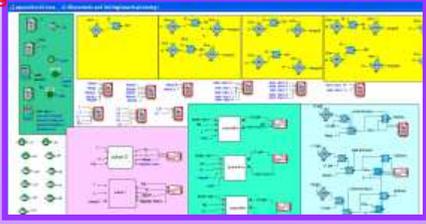
**Aquaculture: growth curves varying seeding time**



**biomass curves varying seeding time**



**Aquaculture model**





<http://cordis.europa.eu/fp6/dc>



Science and Policy Integration for COastal System

Assesment



<http://ec.europa.eu/sustainable>

## Our **integrated model**

developed in EXTEND, simulates the **PRUDUCTION, QUALITY, and MARKET** in order to evaluate the annual revenue under different scenarios

**SCENARIOS** → simulate the clam production varying the **ENVIRONMENTAL QUALITY** and the **SOCIAL DIMENSION**



- varying the location inside the lagoon
- varying the trophic conditions in response to different anthropogenic inputs
- social dimension: varying the number of people and varying their distribution inside the lagoon



<http://cordis.europa.eu/fp6/dc>



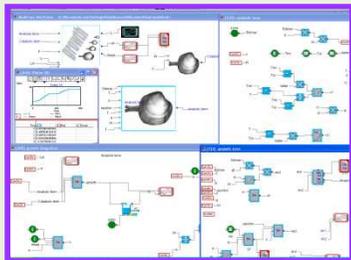
# Science and Policy Integration for COastal System

## Assesment

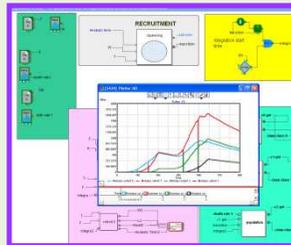


<http://ec.europa.eu/sustainable>

### Individual growth model



### Population dynamic model

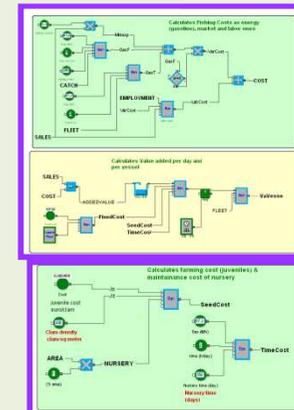
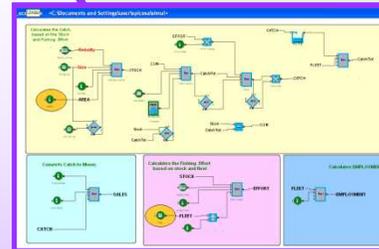


### INTEGRATION, First Results:

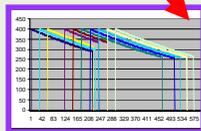
evolution of Catch, Sales, Cost and Added Value.

Varying the schedule of seeding, from january to december

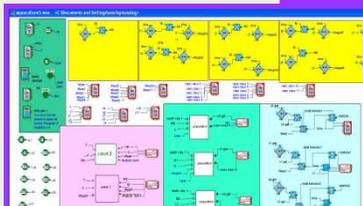
### Economic model



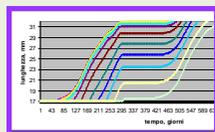
Aquaculture: biomass curves varying seeding time



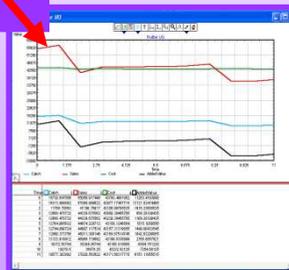
### Aquaculture model



Aquaculture: growth curves varying seeding time

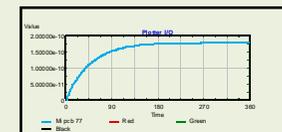


Profitable choice!!!



### Quality model

Forcings:  $3.38 \cdot 10^{-12}$  g/l pcb 77 in water  
 $2.70 \cdot 10^{-8}$  g/l; pcb 77 in sediment





<http://cordis.europa.eu/fp6/dc>



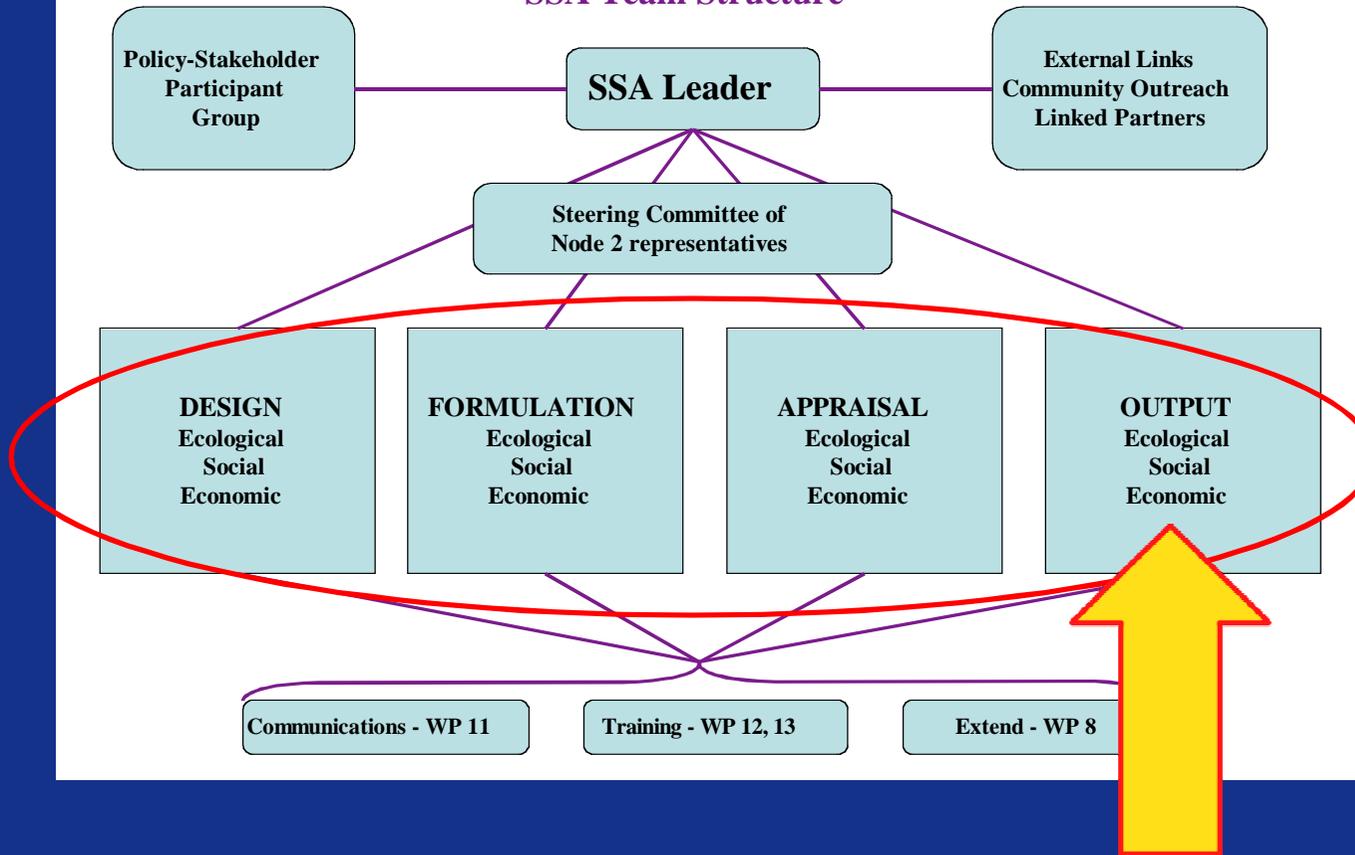
# Science and Policy Integration for COastal System

## Assesment



<http://ec.europa.eu/sustainable>

### SSA Team Structure





<http://cordis.europa.eu/fp6/dc>



## Science and Policy Integration for COastal System

### Assesment



<http://ec.europa.eu/sustainable>

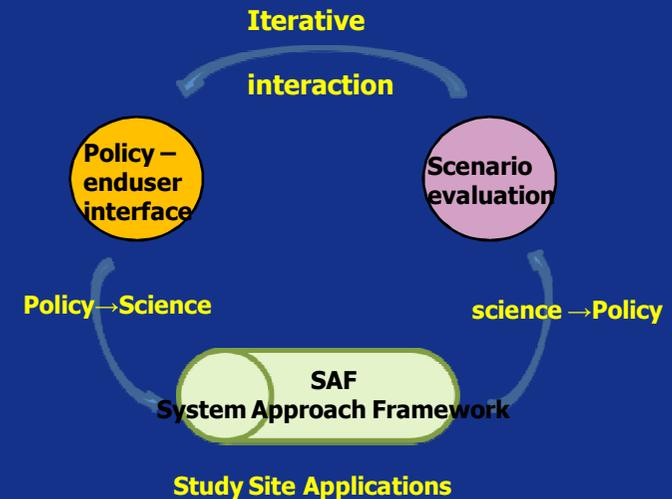
Appraisal Integrated Coastal Zone Management options is seen as a dynamic and iterative process → stakeholders' views and positioning can evolve over time

### Meetings with stakeholders: Provincia, GRAL, Fishermen corporation

Information on SPICOSA project, the methodology to be applied (SAF) and discuss together the problems to be addressed and start up a collaboration for the mutual exchange for the whole duration of the project and beyond.



The purpose of communicating and presenting the scenarios is to make stakeholders aware of the different alternatives for the future





<http://cordis.europa.eu/fp6/dc>



Science and Policy Integration for COastal System

Assesment



<http://ec.europa.eu/sustainable>

## Deliberation Support Tool

Include a wide range of information-packaging and communication tools that may apply to conduit scientific knowledge towards end-users in the decision making processes

In SPICOSA:

- SAF
- tools dedicated to helping public debate → to increase public support and stakeholders' commitment towards sustainability

Position of stakeholders and decision makers in the SAF process → they specify the type of decision they need at the beginning and receive an interactive Information Portfolio at the end of the process





<http://cordis.europa.eu/fp6/dc>



## Science and Policy Integration for COastal System

### Assesment



<http://ec.europa.eu/sustainable>

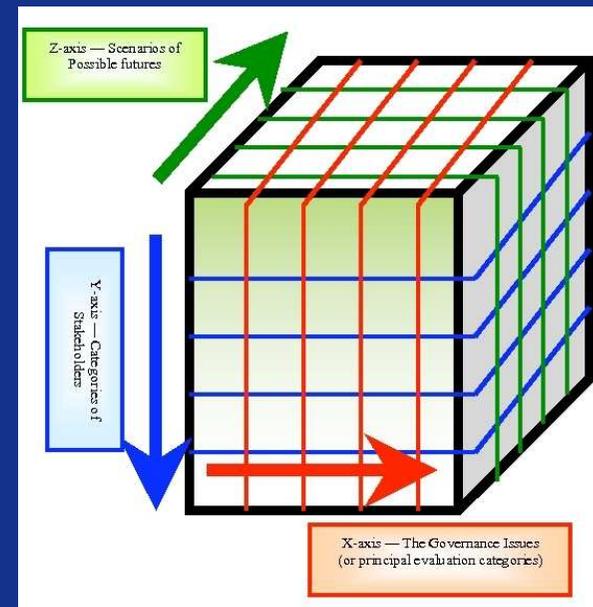
## KerCost Deliberation Tool

➔ an interactive multimedia deliberation support tool allying science and stakeholder dialogue processes for integrated management and governance of coastal zones at multiple scales

1. SCENARIOS
2. ACTORS → who is involved in the decision-making process
3. ISSUES



It provides an interactive framework allowing users, as members of a stakeholder class, to signal their judgements (satisfactory, poor, intolerable, etc.) of each scenario of policy or management action, for the spectrum of governance considerations being addressed





<http://cordis.europa.eu/fp6/dc>



## Science and Policy Integration for COastal System

### Assesment

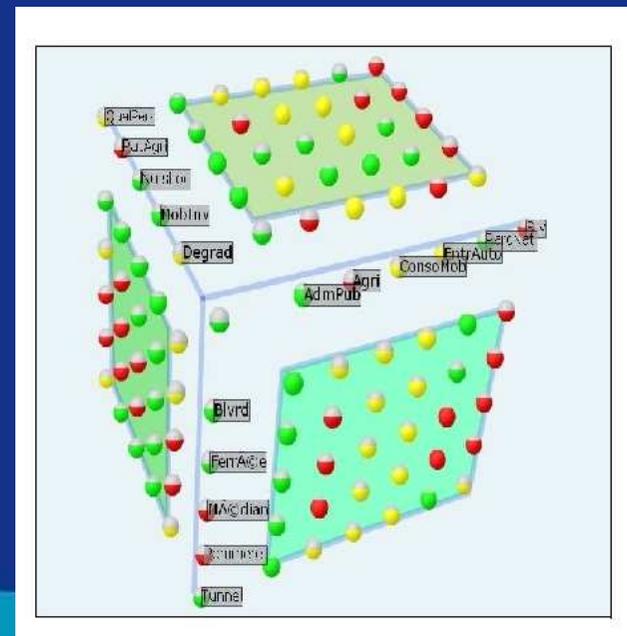


<http://ec.europa.eu/sustainable>

The option along the 3 axis must be chosen on previous analysis and discussion, or through a decision-making process among the actors involved in the assessment done in real time

Every stakeholder category must provide a judgement to each scenarios concerning each issue.

KERDST	Indicators in the assessment process	
Decision-making tool	<u>NO INDICATORS</u> Cell with or without comment	<u>INDICATORS</u> The judgement in each cell is taken by a set of indicators
	Each cell symbolized a single judgement	The color of the cell change in accordance with the meaning and the weight of the indicator





<http://cordis.europa.eu/fp6/dc>



## Science and Policy Integration for COastal System

### Assesment



<http://ec.europa.eu/sustainable>



At the end of the OUTPUT step:

Study Sites will share informations and data with:

WP8 Modelling Support

WP9 SAF Information Management

WP10 Alternatives Strategies

WP11 Communication and dissemination

Support & Services



Study Sites → implementation of a clam *Tapes philippinarum* aquaculture management integrated model in the Venice Lagoon system

SPICOSA Project → generate SAF Portfolio consisting of generic assessment methodologies, decision support tools, models, and new knowledge useful for ICZM, in manner that is user-friendly and updateable