

BALANS: Balancing the Impact of Human Activities in the BPNS

- Objectives:
 - Creation of an **instrument** enabling **policy advisors** and **stakeholders** to **weigh policy choices** against one another.
 - ... gain experience in correlating and balancing relevant **social, economic** and **ecological data**, through the elaboration of **indicators**, ...
 - ... weighing indicators through the **development of a conceptual model** for **sustainable management** of the North Sea;
 - ...a **consistent starting point** for a **decision support system** allowing decision makers and stakeholders to compare different policy options;

A first of a kind exercise in the BPNS, fairly unique in the Belgian scientific scene as such, not precisely excelling in integrated science nor in creative science. An exercise in scientific suicide?

- Methodology

- Not a data gathering project, rather systems thinking, algorithm generation, simulation;
- Begin with what is possible and derive from it what is needed to do better and/or more;
- Address the problem in its broad technical-societal context rather than the sectorial ‘stove-piping’ approach;
- Focus on ‘simple’ sectors: Sand and Gravel, Shrimp fishery;

- Basic methodological approach = Modelling approach, not so much an approach to integration;
- Linkage with GAUFRE?
- Linkage with TROPHOS and MAREBASSE?



'Research' versus 'Policy' models

| Research models | Policy models |
|--|---|
| time horizon, temporal and spatial resolution are <i>process</i> centred | time horizon, temporal and spatial resolution are <i>policy problem</i> centred |
| <i>accurate</i> representation of processes | <i>adequate</i> representation of processes |
| <i>modelling propels</i> data collection | <i>data constrain</i> model development |
| <i>in depth and sectorial</i> | <i>sketchy but integral</i> |
| <i>as complicated as necessary</i> | <i>as simple as possible</i> |
| scientifically <i>innovative</i> | scientifically <i>proven</i> |
| raises more <i>questions</i> than answers | build to provide ' <i>definite</i> ' answers |
| interesting and worthwhile <i>in their own right</i> | interesting and worthwhile only <i>through their output</i> |
| <i>numbers</i> validatable | <i>outcomes</i> validatable |
| response time, interactive-use <i>not critical</i> | response time, interactive-use <i>critical</i> |
| transparency and user-friendliness are <i>superfluous</i> | transparency and user-friendliness <i>essential</i> |
| the developer is the user | end-user involvement during development is critical |

- Achievements

- Conceptual models represented in a uniform, robust, generic scheme. Shrimp fishery and Sand and gravel extraction are similar. Facilitates integration, extensions, upgrading, ...;
- Mathematical models (that are rather different). Renders implementation and integration rather difficult; Evolution towards an appropriate level of abstraction;
- Systems thinking environment: Stella (great tool, messy representations, non-spatial);
- Scenario development and scenario assessment;
- Many, typical lessons are learned (collaboration, language, integration method, temporal and spatial resolution, ...)

- Relevance?



SPICOSA (EU-FP6 IP)

Science and Policy Integration for Coastal System Assessment

Sub-priority 6.3: **Global Change and Ecosystems**

Area V: **Strategies for sustainable land management, including coastal zones, agriculture land and forests**

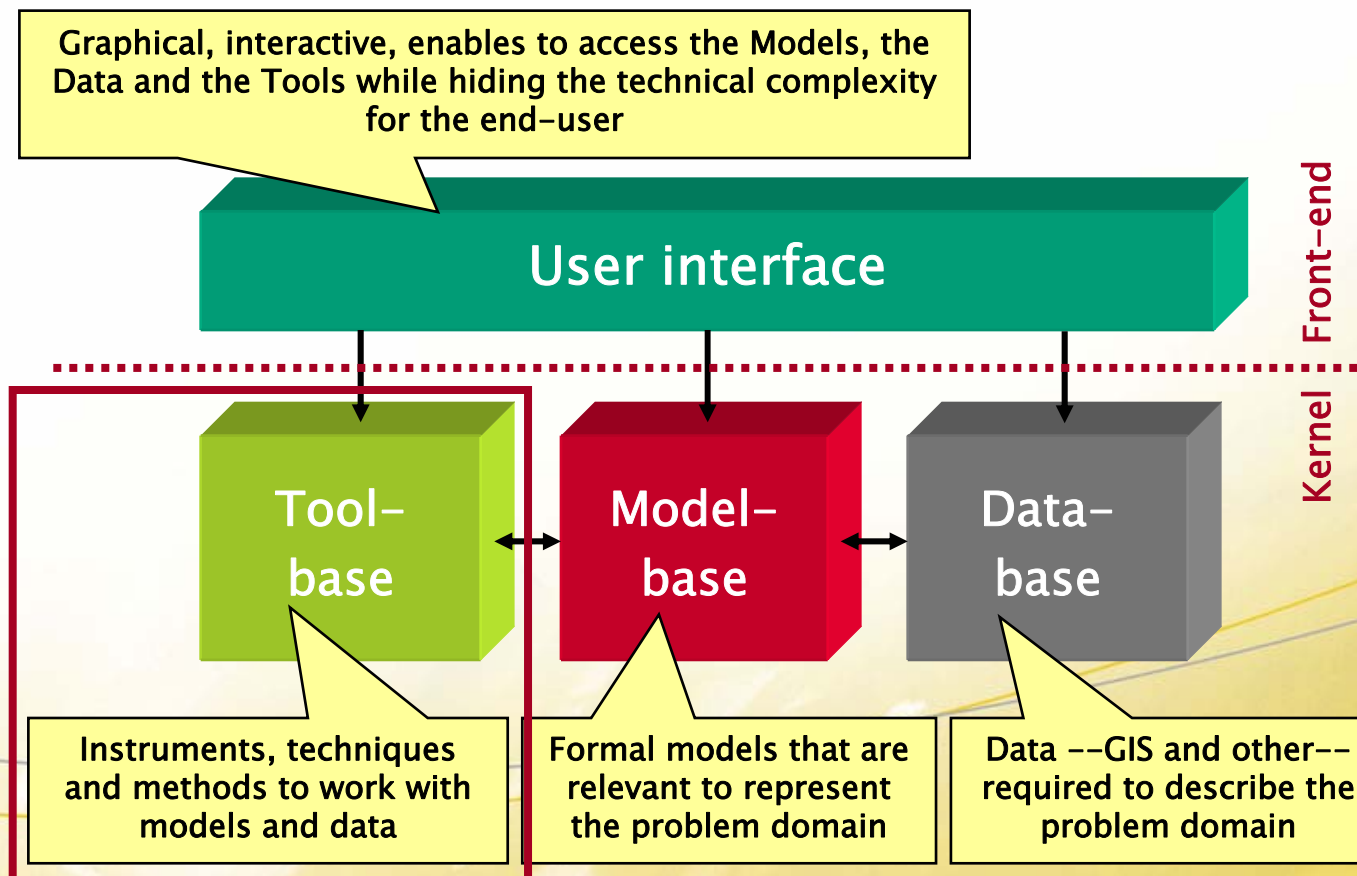
Research area V.1: **Sustainable use of land**

Research topic V.1.3: **Sustainable development and Integrated Coastal Zone Management**

*SPICOSA will develop a **Systems-Approach Framework (SAF)** that generates **Decision-Support Tools (DST)** for the integrated **Ecological, Social, Economic (ESE) assessments** needed for **policy options** in supporting **sustainability for Coastal Zone (CZ) Systems**. The SAF will be based on **best-existing knowledge** and will be validated and refined by application to a set of diverse (18) Study Site Applications (SSAs) throughout the European region. SPICOSA will be an IP consortium of **natural, economic, and social scientists** that will generate new knowledge (about prognostic methods for complex systems), **address social needs** (by promoting sustainability and improving science-policy interface), and contribute to research infrastructure change (by promoting **international and multidisciplinary integration**). Use Extend / PC Raster*



- Decision Support System development
 - A DSS is more than a model with a graphical user interface

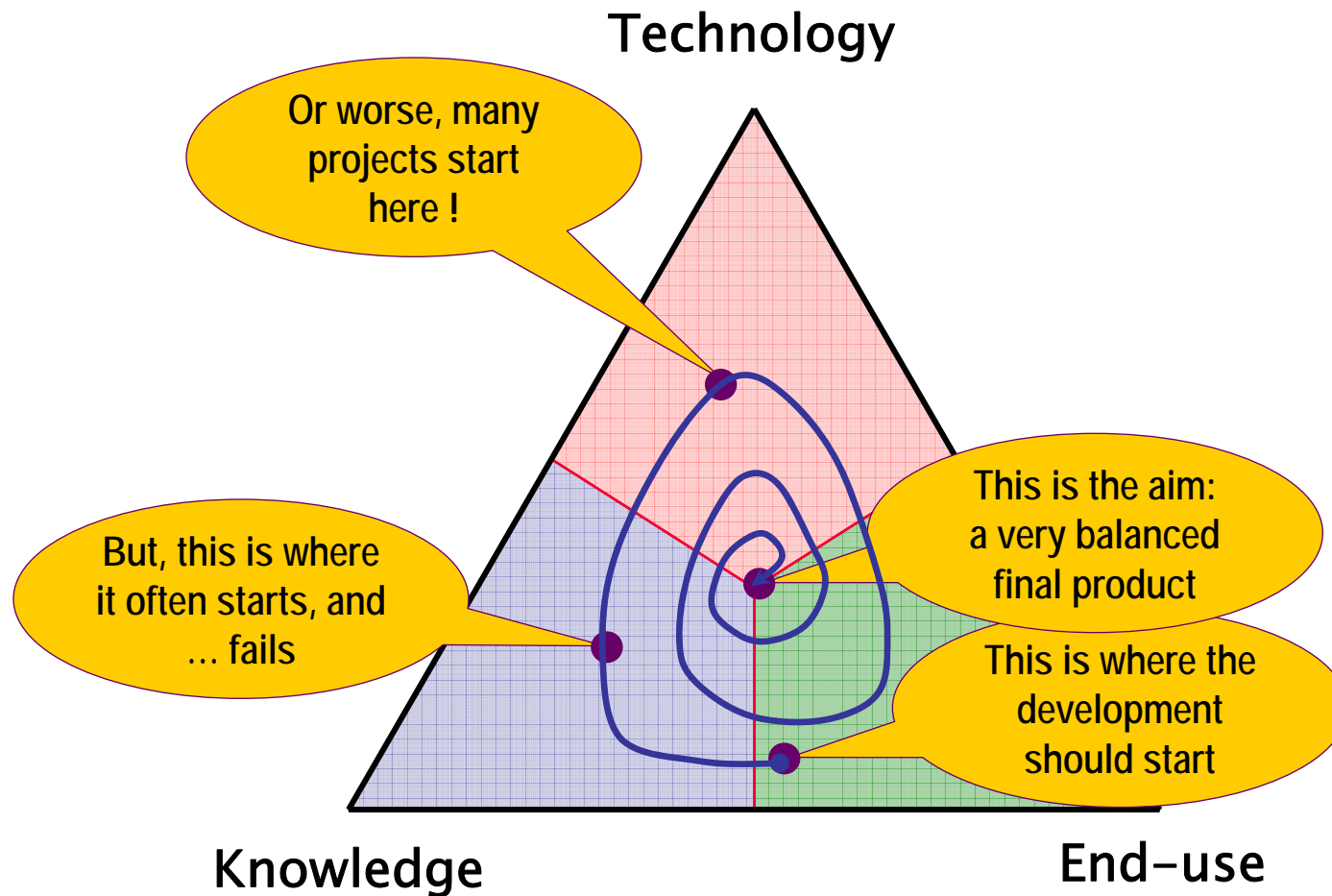


- Decision Support System development
 - Who are the end-users? What is the problem?



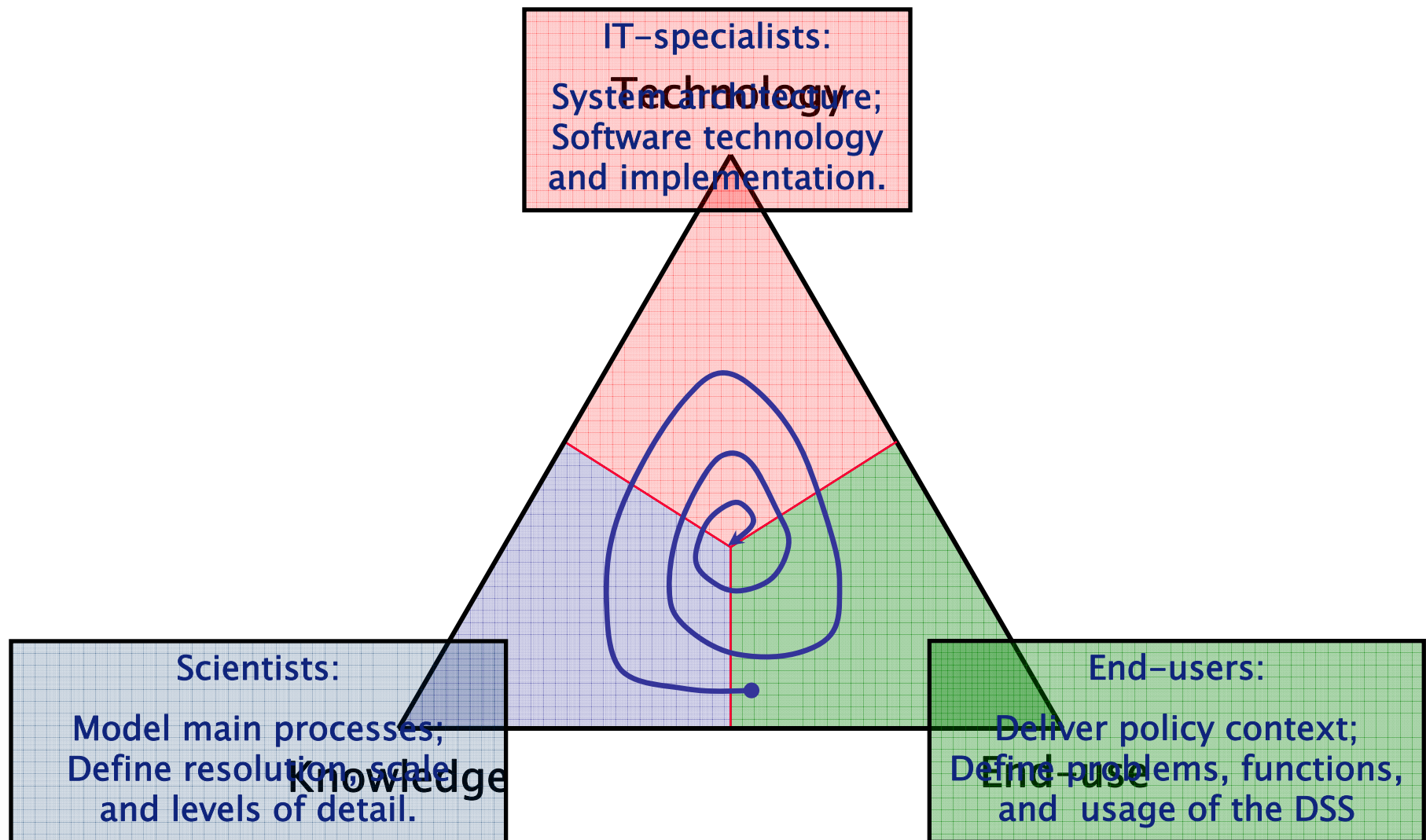
Developing Decision Support Systems

End-use, Knowledge, Technology, ... , Evolutionary development



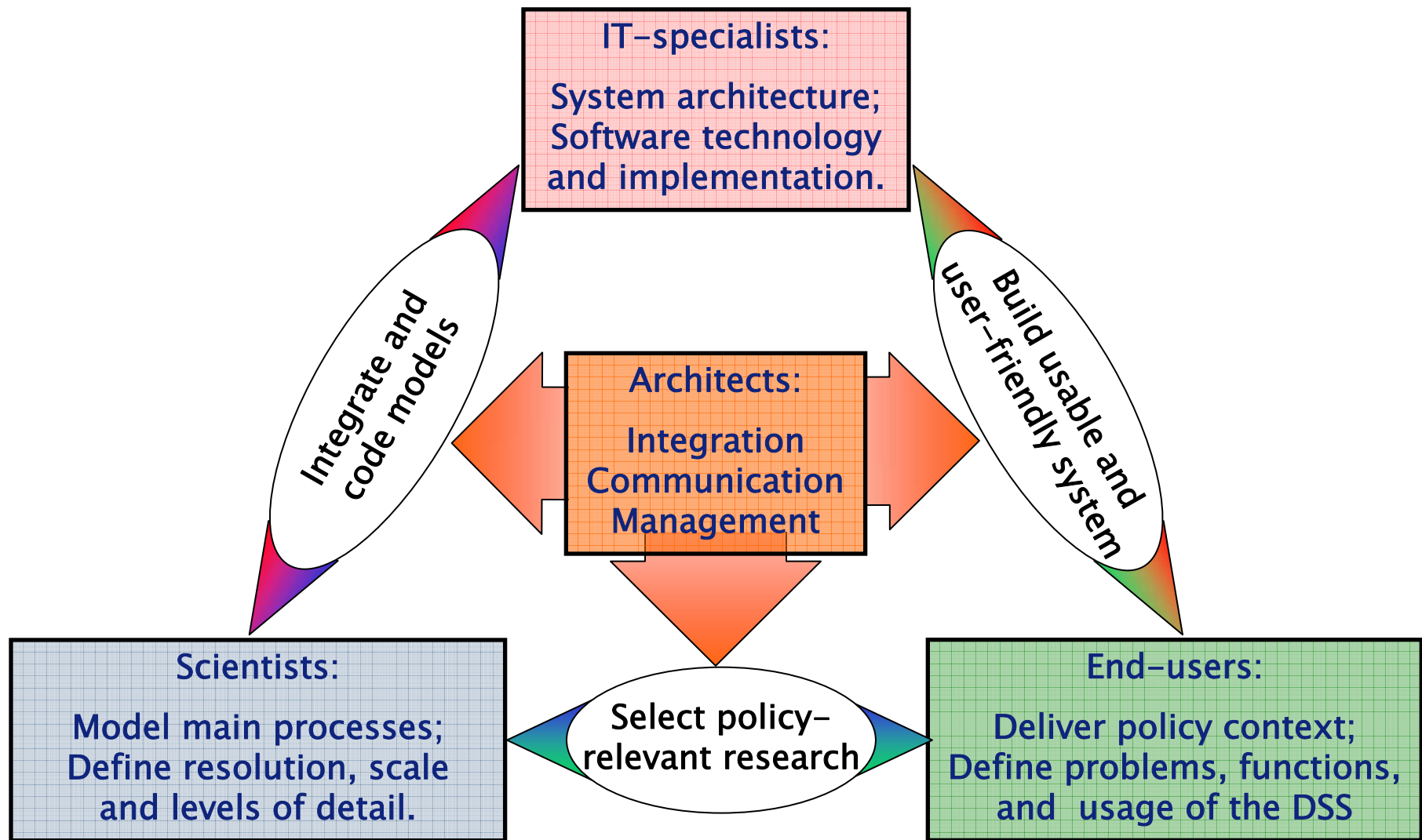
Developing Decision Support Systems

End-use, Knowledge, Technology, ... , Evolutionary development



Developing Decision Support Systems

End-use, Knowledge, Technology, ... , Evolutionary development



BALANS is in need of a science of integration:

1. problem orientation versus process orientation: which processes need incorporation for tackling particular problems and when;
2. representing processes at appropriate levels of detail and spatial and temporal resolution, and procedures for linking them through the scales;
3. fast and powerful tools for calibration, validation and sensitivity analysis;
4. better analytical and visualisation tools for dealing with uncertainty and error propagation in coupled models.

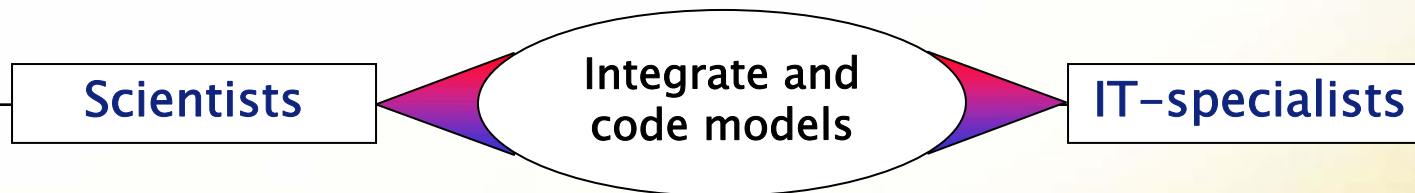
Scientists

Select policy-relevant research

End-users

BALANS is in need of a science of integration:

5. fast ways for upgrading a DSS to keep it up to date with the changing policy context within which it is used and without giving in on its scientific rigour;
6. software architectures and technologies, enabling to assemble integrated models from elementary building blocks, that are generic, yet, sufficiently simple to be applied by a large group of users.



BALANS is in need of a science of integration:

7. better interfaces and institutional support for interdisciplinary collaboration between modellers, domain specialists, computer scientists and end-users.
8. user involvement during the development process and the incorporation of user needs and requirements;
9. mastering high levels of complexity without complication: improving the ergonomics, user friendliness, transparency, interactivity, responsiveness of the systems developed.



6 key-factors for success

- **Functionality.** What are the intended functions of the system (analysis, knowledge management, communication, etc.)? What is the usefulness of the system? What are the possibilities for its application and what is its added value?
- **Applicability.** How difficult is it to obtain and update the necessary data, knowledge and models? Is their availability, quality and quantity sufficient to offer support beyond the obvious? Is this worth the cost of development, maintenance, training and use?
- **Credibility.** Is there consensus on the models and the underlying assumptions? Can the system be calibrated? Validated? Can its output be trusted? Can it convince the parties involved?



6 key-factors for success

- **Language.** Does the system provide output that relates to the information needed by the end-users? Can information available to end-users be used as an input for the system? Is the jargon in the system that of the end-users?
- **Institution.** Where and how can the system be introduced in the organisation? Can it be given an institutional role in the procedures and working methods of the organisation? Who is going to work with it, and what are actual and practical changes required in the organisation to enable this?
- **Culture.** Are the end-users willing to adopt the system? Which tasks will they carry out with the system? Are they willing and able to adjust their decision-making process to it?



References

Slide 3:

- Engelen G., 2003. Development of a Decision Support System for the integrated assessment of policies related to desertification and land degradation in the Mediterranean. In: *Climate Change in the Mediterranean. Socio-economic perspectives of Impacts, vulnerability and Adaptation*. Edited by: C. Giupponi and M. Shechter, Edward Elgar Cheltenham, UK, p.159-195.
- Oxley T., B. McIntosh, M. Mulligan, N. Winder and G. Engelen, 2004. Integrated modelling and decision support tools: a Mediterranean example, *Environmental Modelling and Software*, **19**, p.999-1010.

Slide 6-7:

- Engelen G., 2004; Models in Policy Formulation and Assessment: The WadBOS Decision Support System. In: *Environmental Modelling: Finding Simplicity in Complexity*, edited by: John Wainwright and Mark Mulligan, p.257-271, John Wiley & Sons Ltd, Chichester, England.
- Engelen G., Uljee I., and K. Van de Ven, 2002; WadBOS: Integrating knowledge to support Policy-making in the Dutch Wadden sea. In: *Planning Support Systems in Practice*, Edited by: Stan Geertman and John Stillwell, Springer Verlag, pp.513-537.

Slides 8-13:

- Engelen G., 2002. Developing a successful Decision Support System: A process involving collaboration. *Veranstaltungen 4*, Bundesanstalt für Gewässerkunde, Koblenz, Germany, p.23-30.

Slides 14-15:

- van Delden H., P. Luja and G. Engelen, 2007. Integration of multi-scale spatial models of socio-economic and physical processes for river basin management, *Environmental Modelling and Software*, **22**, p.223-238.