

## **Towards a 'science of global systems'**

Brussels, December 15<sup>th</sup> -16<sup>th</sup>

Organised by GSD<sup>1</sup> in collaboration with INFSO/F2 and RTD/I2

### Objective of the meeting:

GSD–Global System Dynamics and Policies is a FET OPEN funded coordination action. The aim of GSD is to explore how modelling and ICT in general can impact on the link between science and decision making in policy and industry. Based on a series of workshops bringing together scientists and decisions makers in industry and policy, it identified a series of research challenges and methodological challenges that will need to be addressed.

The meeting will explore whether a coherent research agenda could be built around such a 'science of global systems' and how EC could help foster such a research agenda.

### Rationale: Why is there a need for a 'science of global systems'?

Challenges resulting from global systems at risk -for instance global financial systems or the global social and economic consequences of climate change - necessitate a 'science of global systems' to understand the deep and unexpected connections between economic, social, and ecological systems and the functioning of systemic structures and processes that help make global systems sustainable. This implies a need for new tools for modelling of global systems grounded in new concepts from computer science, complex systems research, and Internet science and from the social and behavioural sciences. New forms of (ICT-enabled) interactions should allow active participation of stakeholders in the modelling process.

### Positioning: Why FET? Why ICT? Need to link to RTD activities

In the context of FET, research that furthers societal use of ICT is given increasingly more prominence. Research in various policy-relevant models - ranging from models of the innovation cycle to models of climate impact to new models for economy triggered by the financial crisis- is currently very fragmented with a corresponding decrease in impact. This is why bringing together expertise of scientists funded in DG INFSO (large scale modelling, Grid computing, Internet science, applied mathematics, complex systems) and DG RTD (sustainability, policy models, economic modelling) will help link efforts and will lead to new global research communities better able to inform policy decisions. This raises fundamental challenges in research and will necessitate new conceptual foundations of modelling, use of ICT in societal interaction, novel concepts to integrate models across systems, and new alliances including perhaps alliances of science with the world of design.

## **Three tightly integrated pillars define a 'science of global systems'**

- (1) Data and Models: The data challenge and limits of modelling. A deluge of heterogeneous data transforms scientific analysis, model construction and validation, and the process of decision making.
- (2) Models to encourage action: (ICT-enabled) link between scientific discourse, technological/ industrial/societal action; the need to condense data into alternative options for action in policy, industry, and society - sustainable action based on incomplete knowledge as a paradigm. Can we develop a 'mathematics of social entities' to capture underlying social structures and processes?
- (3) A systemic perspective through a focus on system-wide processes and patterns: Understanding systemic patterns and processes. Understand better the issues of scale in global system dynamics. Explore the systemic entanglement between different policies and industrial agendas<sup>2</sup>.

<sup>1</sup> GSD -Global System Dynamics and Policies (<http://www.globalsystemdynamics.eu/>)- is a network funded by the FET OPEN unit of EC.

<sup>2</sup> Many of these issues are already alluded to in complex systems research agenda.

## **Possible areas where a 'science of global systems' will have impact**

-Understanding global systems at risk and integrated risk governance: Understand system risk and system resilience and identify patterns of system behaviour that would favour resilient/robust behaviour to help make integrated risk governance more efficient.

-New models of economy that take into account interconnectedness of players, role of institutions, behavioural aspects, role of extreme events (crashes) ....

-Integrated Urban planning: global and local approaches to urban planning

-Social impact of climate change: How society shapes environment - How environment shapes society  
The role of policy (regulatory and societal action) and industry (manufacturing, design) in an integrated approach to challenges from global change.

## **Questions to ask during the meeting**

What would be a credible and operational path to translate scientific results into societal action? What are practical steps to foster such a link? How does the need for a link between models/data and action translate into novel research challenges? What are the fundamental questions that such a problem-driven research agenda would raise?

What are the research challenges in data and models? What are the conceptual challenges that integrating models across systems and with the process of decisions making will raise?

How could a dedicated effort in Europe be developed? What are the targeted communities?

What role can ICT play? (Large scale computing and data, Grid, Internet) Can we find ways (including Internet social networks) to engage policy and science in a constant dialogue? What is the role of data in decision processes?

## **Agenda:**

### **15<sup>th</sup> December**

-11.00-13.00: Introduction EC: Zoran Stancic(tbc), EC  
Introductory Remarks by Julian Hunt and Carlo Jaeger  
Remarks on EC perspective: Nicole deWandre, Ales Fiala/Ralph Dum...  
Presentation of participants

-14.00-17.30: Discussion of a research agenda uniting the three pillars in 'science of global systems'.  
Discussion of research challenges associated with the model/data – policy link.

### **16<sup>th</sup> December**

-9.30-12.30: First Conclusions on scope, objectives, research challenges of 'science of global systems':  
funding and policy involvement

-12.30-13.00: meeting close (Mario Campolargo(tbc)/Ralph Dum)

## **List of Participants:**

Julian Hunt, House of Lords, University of Cambridge, UCL, UK

Carlo Jaeger, Potsdam Institute of climate change, president of European Climate Forum

Sander van der Leuw, University of Arizona at Phoenix, US

Michel Morvan, Veolia, France

Steven Bishop, UCL, UK

Bert de Vries, Utrecht University, NL

Geoffrey West, president Santa Fe Institute (will attend parts of the meeting)