The analysis of Research Infrastructures relevance in response to Grand Challenges

Michael Mirtl
EnvRIs at the science-society-policy interface

Grand Challenge (GC) classifications

EC societal Grand Challenges

US NRC environmental research Grand Challenges

ICSU workflow focused Grand Challenges
8 EC societal Grand Challenges

**Food**
- EC1 Food security: agro
- EC2 Food security: non-agro habitats incl. water

**Energy**
- EC3 Energy: New knowledge and technologies

**Climate**
- EC4 Climate: Resource and water efficient and CC resilient economy and society
- EC5 Climate: Env. protection, sustainable management of nat. resources, water, biodiv & ecosystems
- EC6 Climate: Fighting and adapting to CC
- EC7 Climate: Develop global environm. observation and information systems

**Security**
- EC8 Security: Enhance the resilience of society against natural & man-made disasters
8 US NRC environm. research Grand Challenges

- **NRC1** Biogeochemical Cycles
- **NRC2** Biological Diversity and Ecosystem Functioning
- **NRC3** Climate Variability
- **NRC4** Hydrologic Forecasting
- **NRC5** Infectious Disease and the Environment
- **NRC6** Institutions and Resource Use
- **NRC7** Land-Use Dynamics
- **NRC8** Reinventing the Use of Materials
5 ICSU workflow focused Grand Challenges

• **Observing**: Develop, enhance, and integrate observation systems to manage global and regional environmental change.

• **Forecasting**: Improve the usefulness of forecasts of future environmental conditions and their consequences for people.

• **Confining**: Determine how to anticipate, avoid and manage disruptive global change.

• **Responding**: Determine institutional, economic, and behavioural changes to enable effective steps toward global sustainability.

• **Innovating**: Encourage innovation (and mechanisms for evaluation) in technological, policy, and social responses to achieve global sustainability.
Topical challenges

EC Grand Societal Challenges
1. Food security - agro
2. Food security
3. Energy
4. Climate & res.effic. & economy
5. Climate & res. sustainability
6. Climate & adaptation
7. Climate & res.effic. observation
8. Security

NRC Grand Challenges
1. Biogeochem.
2. BioDiv & ES Functioning
3. Climate Variability
4. Hydrologic Forecasting
5. Infectious Diseases
6. Institutions Resource Use
7. Land-Use Dynamics
8. Use of Materials

Workflows in each topical challenge
## Response to EC and NRC Grand Challenges

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### Overall response to EC and NRC Grand Challenges & share of ICSU workflow steps

#### With respect to focal GCs:

**Observing**
- EC1: Food security: Food security
- EC2: Food security: Forestry, marine and maritime and inland
- EC3: Energy: New knowledge and technologies
- EC4: Climate: Resource and water efficient and CC resilient...
- EC5: Climate: Env. protection, sustainable management of...
- EC6: Climate: Fighting and adapting to CC
- EC7: Climate: Develop global environm. observation and...
- EC8: Security: Enhance the resilience of society against...
- NRC1: Biogeochemical Cycles
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- NRC5: Infectious Disease and the Environment
- NRC6: Institutions and Resource Use
- NRC7: Land-Use Dynamics
- NRC8: Reinventing the Use of Materials

**Forecasting**

**Responding**

**Innovating**
ENVRI domains relevance for ...

EC Grand Challenges

Solid earth

NRC Grand Challenges
ENVRI domains relevance for ... 
EC Grand Challenges

Atmosphere

NRC Grand Challenges
ENVRI domains relevance for ...
Example: Visibility of special niche of ACTRIS, eLTER & ICOS in response to EC Societal GCs

- **EC5**: Env. protection, sustainable management of natural resources
- **EC6**: Climate adaptation
- **EC7**: Develop global environmental observation and information
Environmental RIs in a collaborative societal process

Exemplary frameworks for environmental policies, e.g.:

- Strategy on adaptation to Climate Change
- Biodiversity Strategy
- **Habitats** Directive
- Water Framework Directive
- **Soils** thematic strategy
- NEC directive

Data/info requirements (GC, SDG)

1. Raw data
2. Continuous refinement
3. Information from other RIs & accessory scientific projects
4. High level data products, science enablement
5. Tailor-made information, assessments
6. EU policy implementation
Summary and recommendations

• Clearly visible role of each RI
• Comparison of pairs and clusters of RIs
• Possibility to detail on request
• Easy to extend to other (emerging) classifications

Recommendations
• Cost-efficiency through acknowledgement of env. RIs niches (avoiding overselling pressure)
• Focus on the env. RIs overall service portfolio
  • strategic alignment/complementarities
  • technical collaboration, co-location
THANKS TO ALL CONTRIBUTORS
Spare slides for possible questions
Grand challenges

**Grand Challenges** are important problems posed by various institutions/professions to

- encourage solutions
- energize a wide range of target groups
- develop a sense of the possibilities, an appreciation of the risks, and an urgent commitment to accelerate progress

**Grand challenges** are more than ordinary research questions or priorities, they

- are global in scale, difficult to accomplish, yet offer hope of being ultimately tractable
- demand extensive contributions (science, technology, non-technical disciplines)
Spotting special RI focus by comparing „Mean relevance“ VS. „Relevance in a specific workflow part“
GC Ontology in the RM - „Science View Point“

- Research Infrastructure
  - Blank node Objective
    - has objective relevance
- Blank node Objective Workflow
  - has objective workflow relevance
- EC GC objective EC5
  - has objective
- ICSU workflow observing
  - has objective
- float 100%
- has relevance %
- relevance 5: 76-100:
  - has relevance class
- GC Classification (EC, NRC, ICSU...)

 sınıflandırma: (EC, NRC, ICSU...)
GC on-line survey

What one needs to know about the survey:

- ENVRRI+ is supposed to check, how it’s RIs relate to “Grand Challenge”
- A range of diverse GC definitions and classifications already exists.
- Our basic decision was, NOT to invent a new Grand Challenge classification.
- But to use existing classifications in order to explain “RI relevance for GC”.
- After a pre-screening we checked 4 GC classifications in detail (example)
- Three of them were relevant: EC, NAS/NRC, ICSU
- Two of them describe two different user viewpoints
  - EC: the societal point of view (EC Grand Challenges: selection)
  - NAS/NRC: the scientific point of view (NRC Grand Challenges)
- One of them describes a high level workflow
  - observe - forecast - confine - respond - innovate (see explanations)
- For each Grand Challenge classification (EC, NAS/NRC) the workflow was split into different parts of the work flow.
- RIs respond to selected GCs, but also to explicit parts of the work flow.
- The resulting cross-matrix (see graph below) was used as basis for this presentation.