



The analysis of Research Infrastructures relevance in response to Grand Challenges

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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

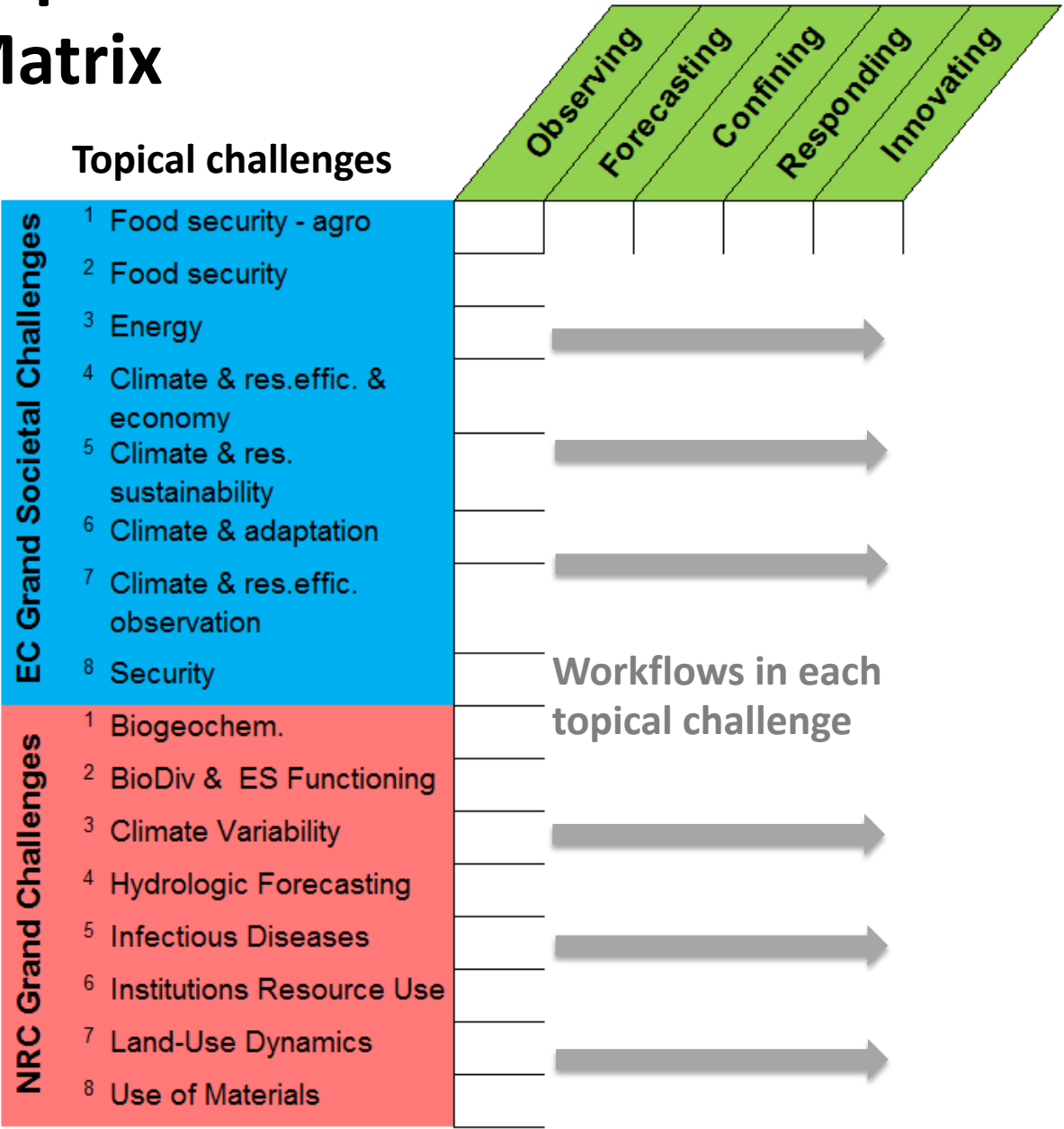
- **NRC1** Biogeochemical Cycles
- **NRC2** Biological Diversity and Ecosystem Functioning
- **NRC3** Climate Variability
- NRC4 Hydrologic Forecasting
- NRC5 Infectious Disease and the Environment
- NRC6 Institutions and Resource Use
- NRC7 Land-Use Dynamics
- NRC8 Reinventing the Use of Materials

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

ENVRIplus

GC-Matrix



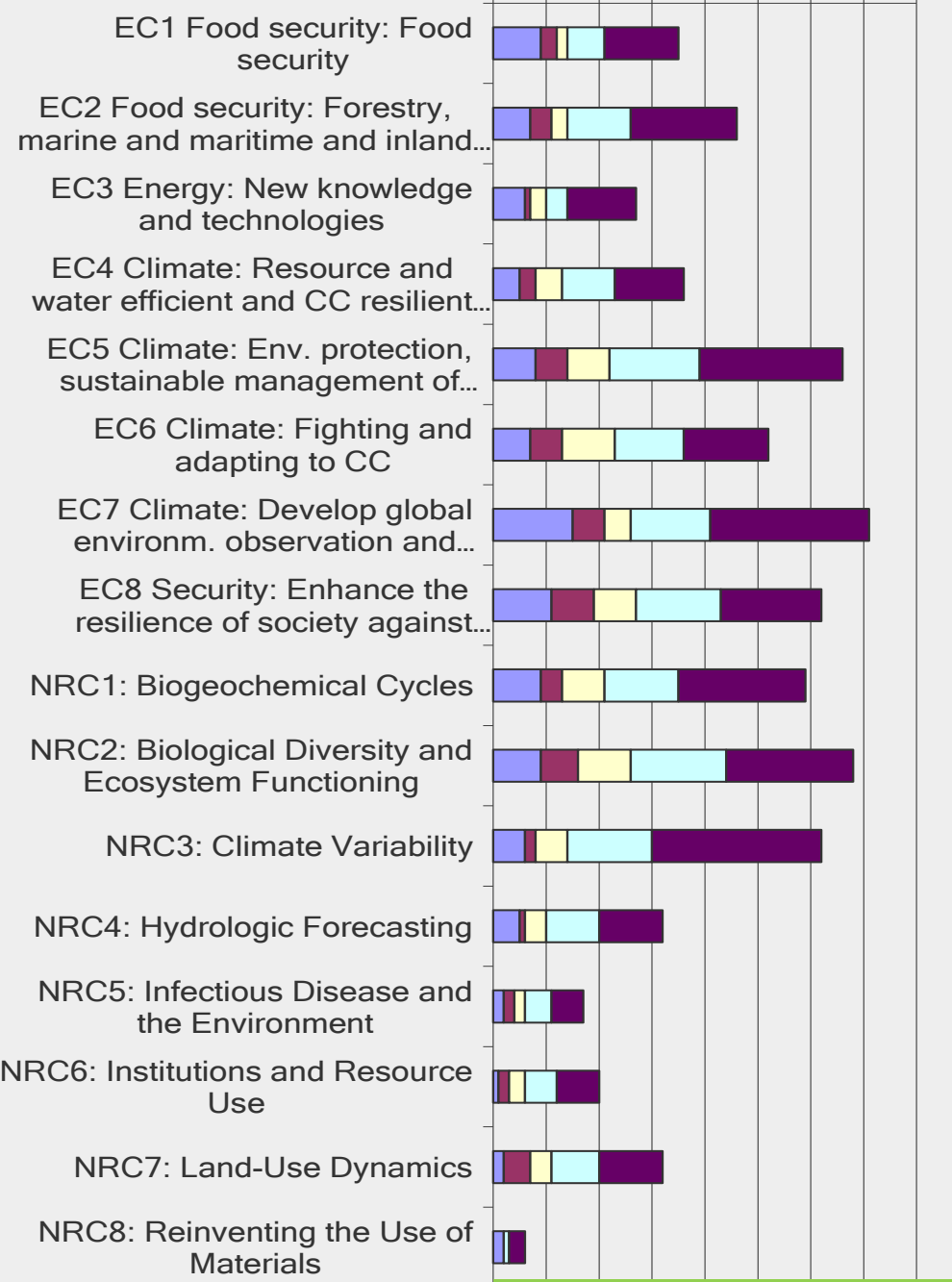
Response to EC and NRC Grand Challenges

RI	Food agro Food non-agro Energy Resilience Resource-management CC Adaptation Observation Security								Biogeo-chemistry Biodiversity Climate Hydrology Diseases Resource use Land use Material use								Mean
	EC1	EC2	EC3	EC4	EC5	EC6	EC7	EC8	NRC1	NRC2	NRC3	NRC4	NRC5	NRC6	NRC7	NRC8	
ACTRIS	3	10	23	8	13	15	100	79	3	3	87	23	5	0	5	0	24
ANAEE	94	80	0	30	60	66	6	56	100	90	24	18	0	58	54	0	46
EISCAT 3D	5	10	33	29	5	14	67	0	57	24	57	100	19	14	19	14	29
EMBRC	23	23	10	3	100	63	28	0	100	100	15	0	40	0	0	0	31
EMSO	3	27	0	0	17	13	93	77	50	30	100	0	0	17	0	3	27
EPOS	0	0	1	9	0	4	8	100	0	0	0	0	0	5	0	0	8
ESONET VI	0	16	37	0	100	0	100	68	58	58	16	0	0	0	0	16	29
Euro-Argo	0	18	6	24	65	6	100	0	35	24	94	18	0	0	0	0	24
EUROFLEETS2	29	86	43	0	79	0	100	29	79	79	29	0	0	0	0	0	34
EUROGOOS	16	32	32	21	32	21	100	21	53	26	84	32	3	0	0	0	29
FIXO3	36	84	16	8	56	36	100	84	84	84	84	36	12	36	0	20	49
IAGOS	21	21	9	23	50	59	100	54	30	30	71	30	25	25	25	21	37
ICOS	38	33	25	36	47	87	100	9	76	55	45	16	7	2	13	0	37
INTERACT	0	0	23	0	100	51	56	51	92	92	38	31	0	49	28	3	38
IS-ENES2	19	19	6	19	19	69	6	0	69	19	100	38	6	0	0	0	24
JERICO	17	60	13	86	86	86	100	69	86	86	86	86	63	24	60	0	63
LifeWatch	6	6	0	19	100	26	39	32	0	90	3	0	32	10	6	0	23
LTER	23	54	11	44	100	35	65	39	59	87	70	23	3	14	57	4	43
SEADATANET	9	27	27	0	73	0	100	9	73	73	73	0	0	0	0	0	29
SIOS	80	80	48	30	100	40	40	80	30	100	80	80	30	30	38	10	56
Mean	21	34	18	19	60	35	70	43	57	57	58	27	12	14	15	5	34



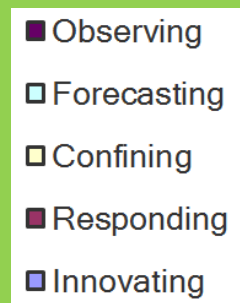
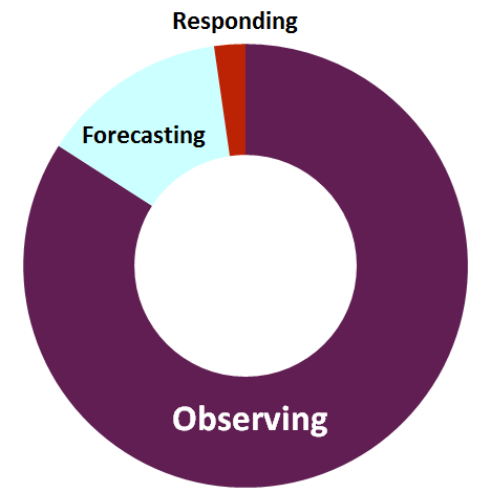
Yes/no:

0 10 20 30 40 50 60 70 80

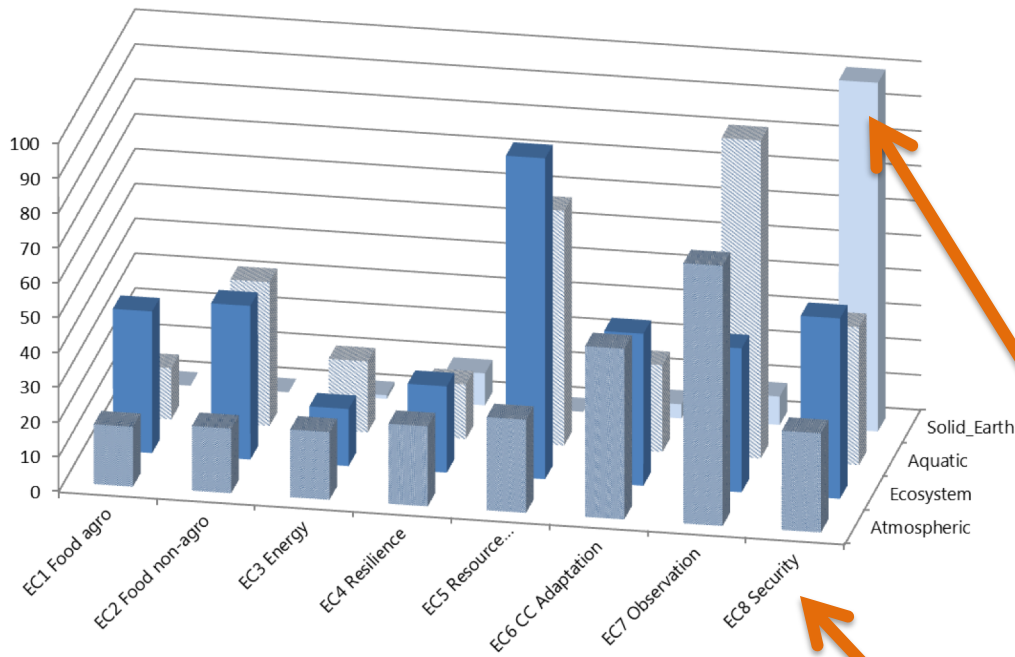


Overall response to EC and NRC Grand Challenges & share of ICSU workflow steps

With respect to focal GCs:



Standardized relative Importance [%] of RI_domains

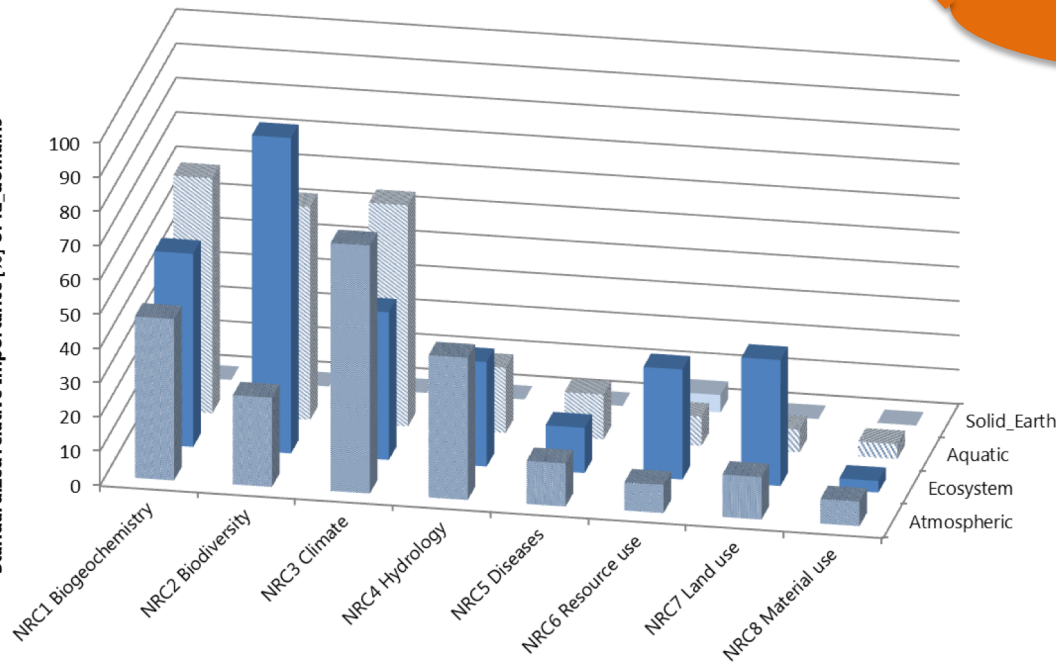


ENVRI domains relevance for ...

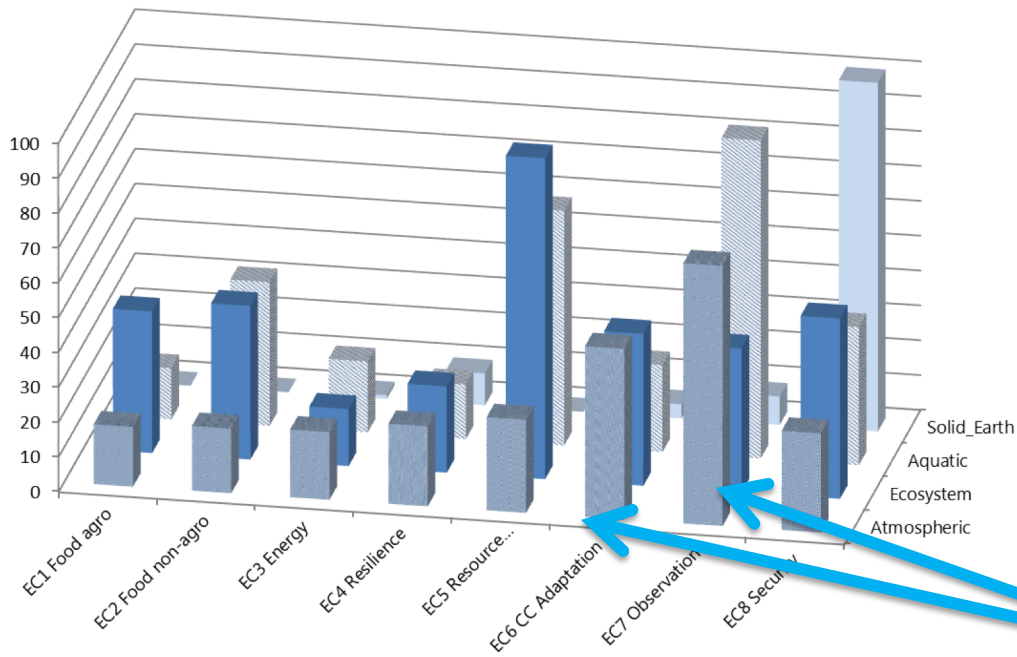
EC Grand Challenges

Solid earth

Standardized relative Importance [%] of RI_domains



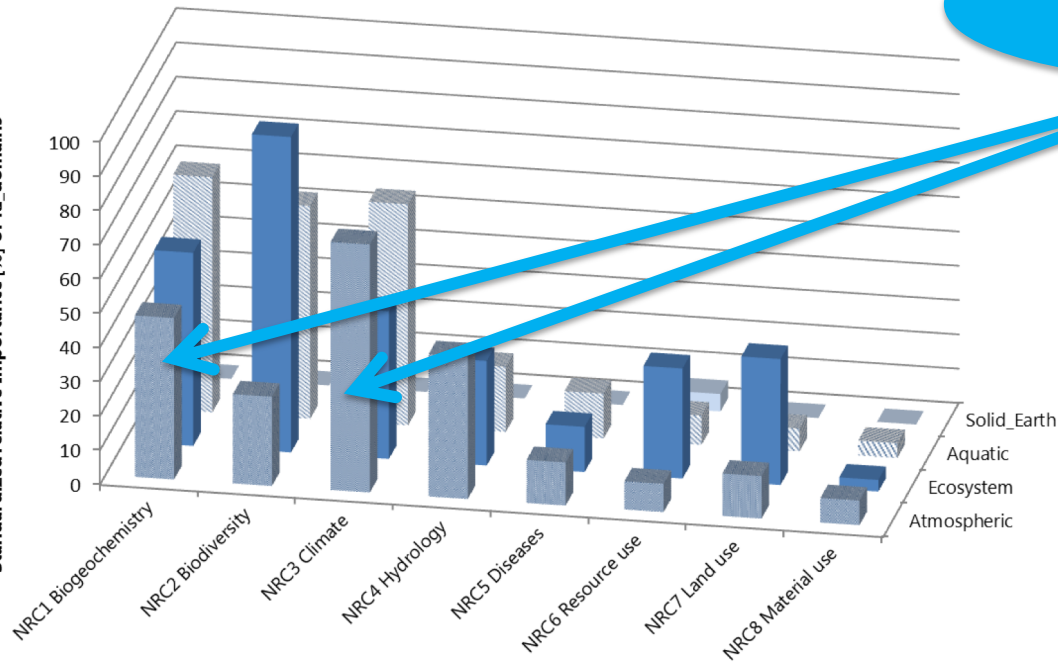
NRC Grand Challenges



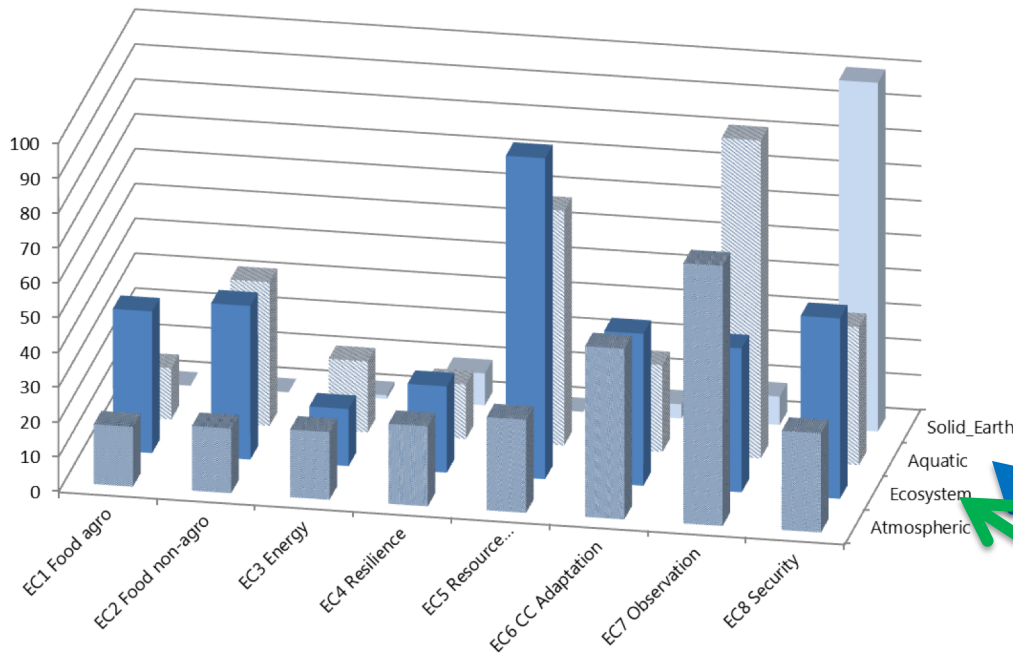
ENVRI domains relevance for ...

EC Grand Challenges

Atmosphere



NRC Grand Challenges

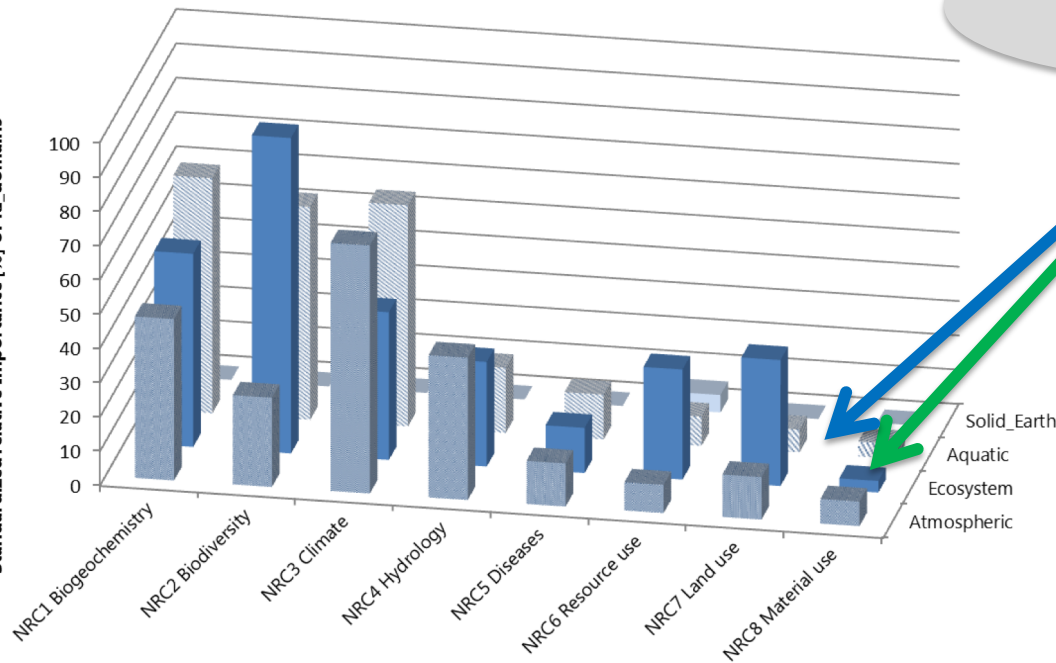


ENVRI domains relevance for ...

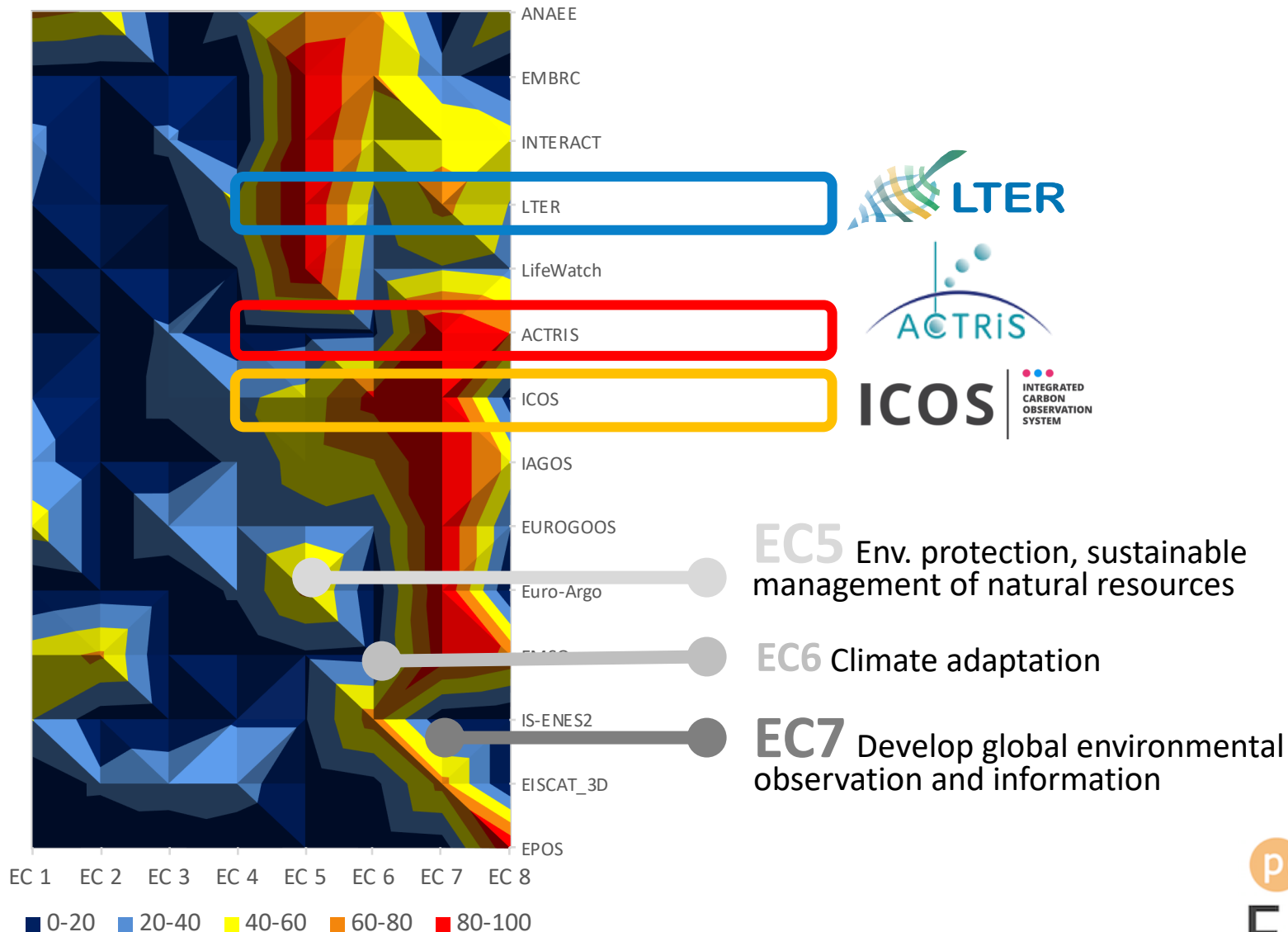
EC Grand Challenges

**Aquatic,
Ecosys & Biodiv**

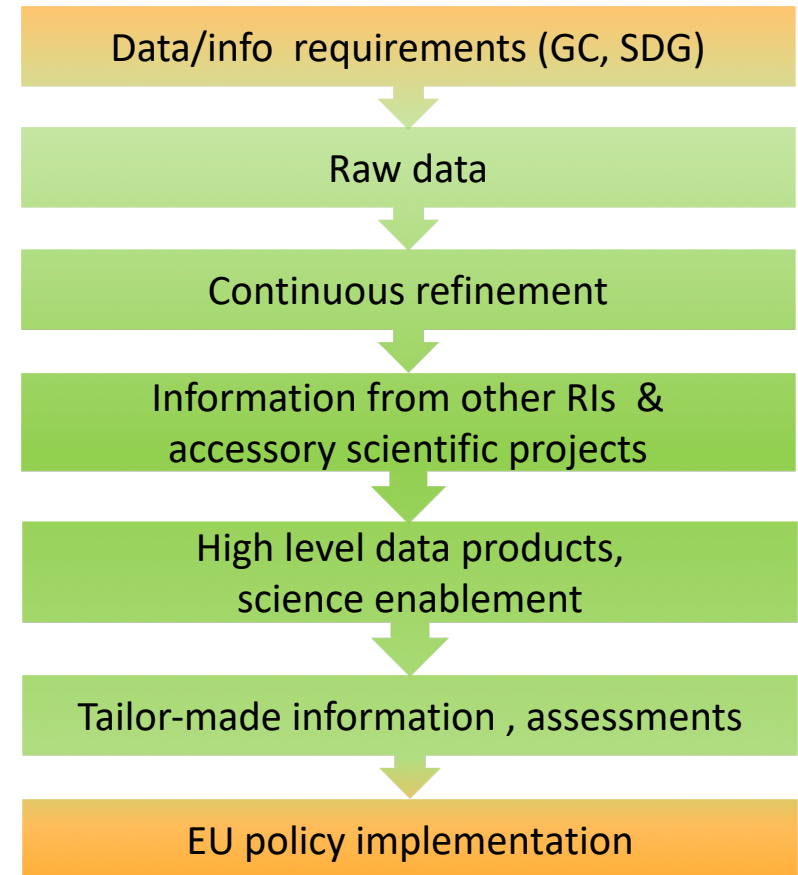
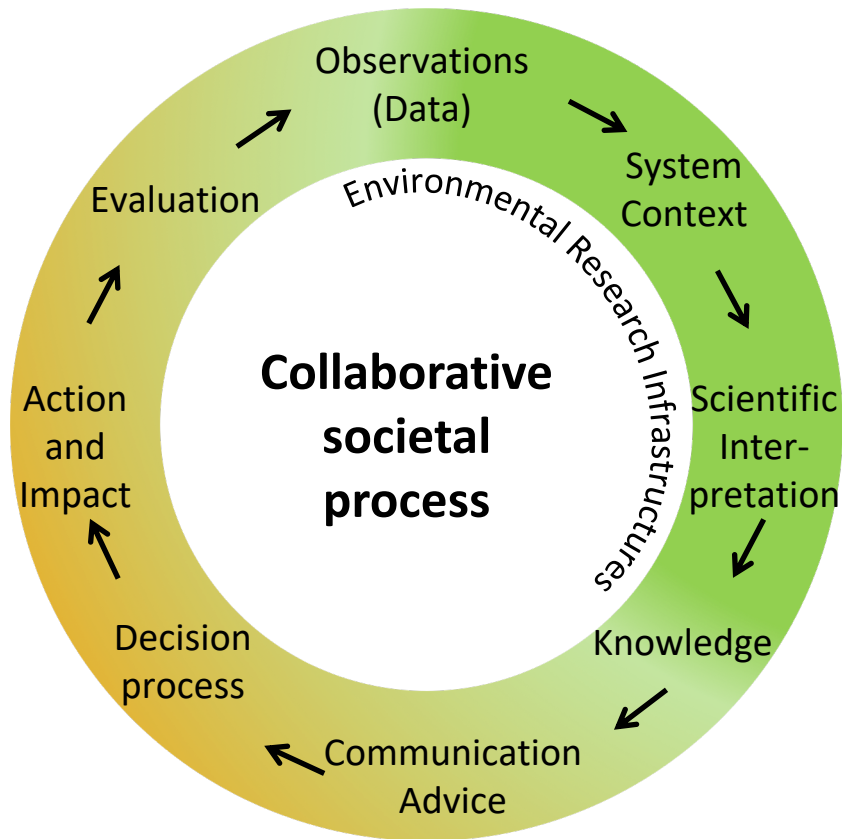
NRC Grand Challenges



Example: Visibility of special niche of ACTRIS, eLTER & ICOS in response to EC Societal GCs



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

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



H2020 Project



Project Number: 654182

Spare slides for possible
questions

Grand challenges

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

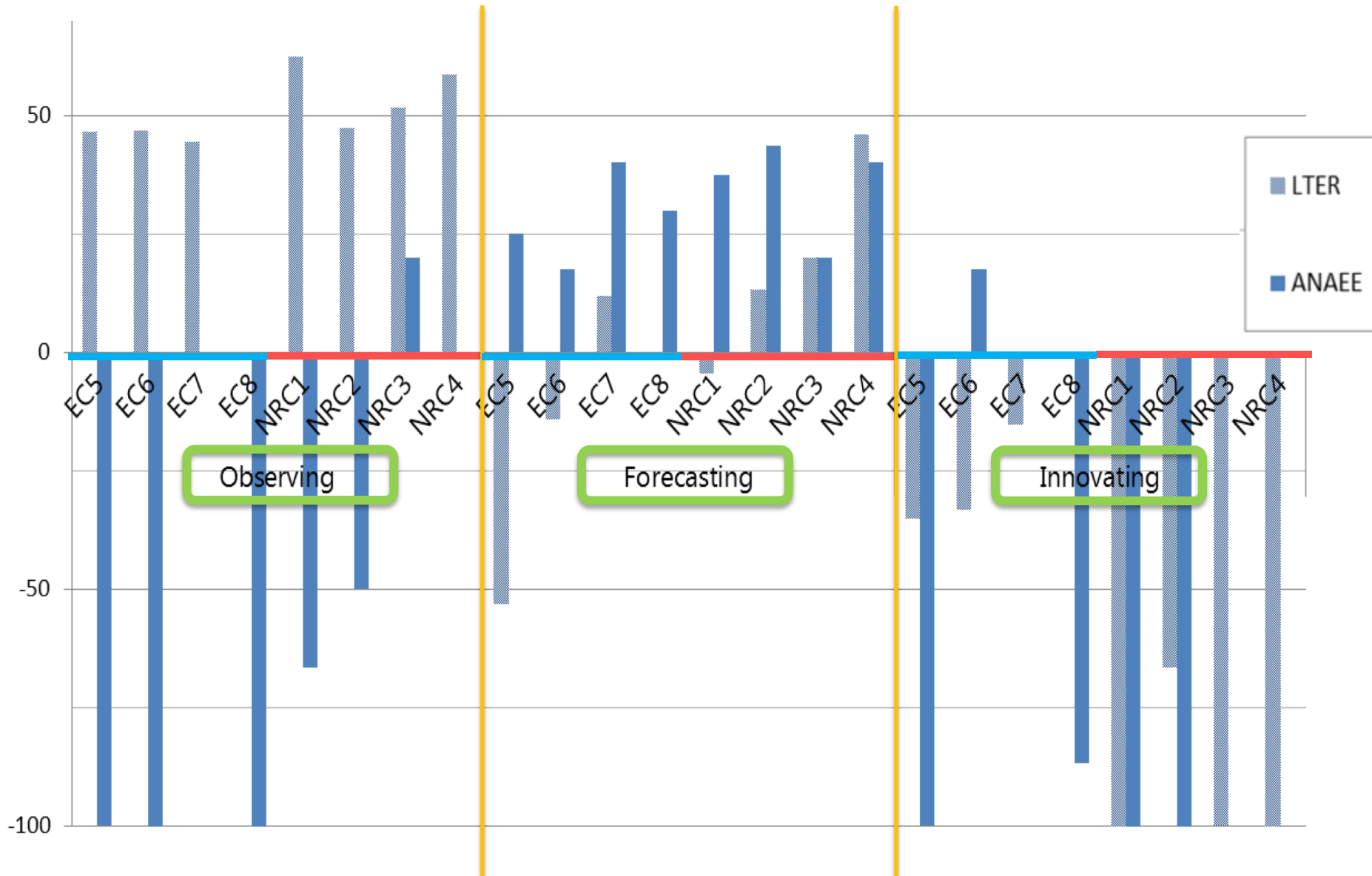
- encourage solutions
- energize a wide range of target groups
- develop a sense of the possibilities, an appreciation of the risks, and an urgent commitment to accelerate progress

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

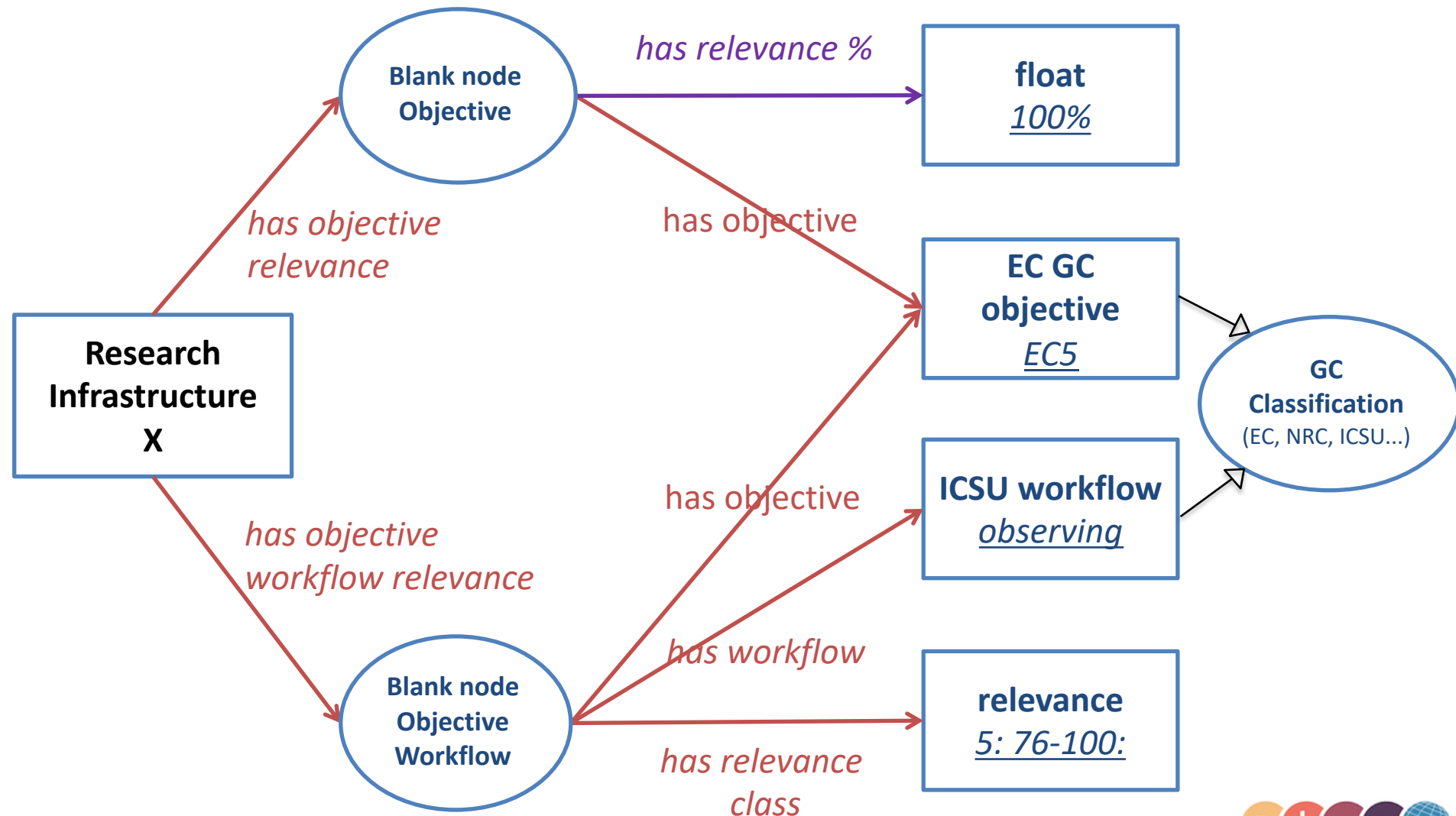
- are global in scale, difficult to accomplish, yet offer hope of being ultimately tractable
- demand extensive contributions (science, technology, non-technical disciplines)

Spotting special RI focus by comparing

„Mean relevance“ VS. „Relevance in a specific workflow part“



GC Ontology in the RM - „Science View Point“



GC on-line survey

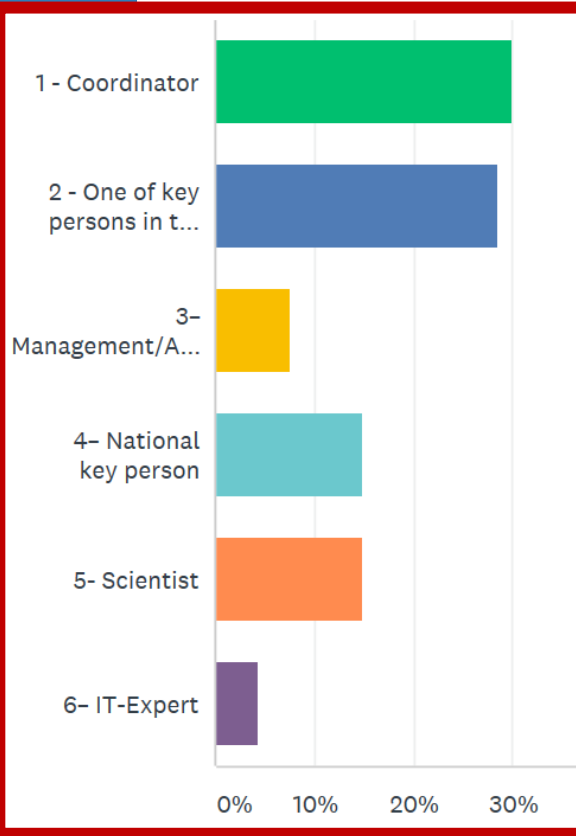


ENVRI+ WP 12.1: Environmental RIs response to Grand Challenges

Introduction

What one needs to know about the survey:

- ENVRI+ is supposed to check, how it's RIs relate to "Grand Challenges"
- 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 GCs"
- After a pre-screening we checked 4 GC classifications in detail (exercise 1)
- 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 of 10 GCs)
 - NAS/NRC: the scientific point of view (NRC Grand Challenges in 10 domains)
- One of them describes a high level workflow
 - observe - forecast - confine - respond - innovate (see explanation in exercise 2)
- For each Grand Challenge classification (EC, NAS/NRC) the work flow was mapped
- 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 survey



ENVRI+ Grand Challenges Matrix

GC classification			ICSU Scientific Grand Challenges	
			Observing	Forecasting
EC	Food	Food security		

