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Deliverable D3.6

Governance and Institutionalisation of Responsible Research and Innovation in Europe: Transversal lessons from an extensive programme of case studies: Stakeholder Report.

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ResAGorA

Content

Res-AGorA – A brief project overview

The EU seeks to become a genuine Innovation Union in 2020 striving for excellent science, a competitive industry and a better society without compromising on sustainability goals as well as ethically acceptable and socially desirable conditions. Europe thus needs to develop a normative and comprehensive governance framework for Responsible Research and Innovation (RRI). This is the major goal of Res-AGorA.

The Res-AGorA framework will build on existing RRI governance practices across and beyond Europe. It will be reflexive and adaptable to enable the inherent tensions in all governance of RRI to be actively addressed by procedural means aiming to facilitate constructive negotiations and deliberation between diverse actors.

The project will achieve these objectives through a set of work packages providing an empirically grounded comparative analysis of a diverse set of existing RRI governance arrangements and their theoretical/conceptual underpinnings across different scientific technological areas (WP2 and WP3), a continuous monitoring of RRI trends and developments in selected countries (WP5) and, based on the cumulative insights derived from these work packages, co-construct with stakeholders the central building blocks and procedures of an overarching future governance framework for RRI (WP4).

This governance framework will deliver cognitive and normative guidance that can be applied flexibly in different contexts. Res-AGorA will thus have direct impact on RRI practices (science, industry, policy), and strategic impact in terms of the political goals (Horizon 2020) and competitiveness (Lead Market through growing acceptance of new technologies).

Res-AGorA will ensure intensive stakeholder interaction and wide dissemination of its tangible and intangible outputs in order to maximise impact, including comprehensive and interactive stakeholder engagement, liaisons with other ongoing RRI activities funded by the SiS Work Programme, and a final conference.

For more information and updates on Res-AgorA's activities, please visit www.res-agora.eu.

ResAGorA

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Preface: Objectives of the deliverable

The focus and purpose of Deliverable D3.6 is to present the transversal lessons on the governance and institutionalization of responsible research and innovation drawn from Res-AGorA's extensive case study programme.

The submission of D3.6 was slightly delayed (official deadline: February 27, 2015) in order to enable the authors to take full account of comments from the internal consultation process with Res-AGorA's Advisory Board on a draft version of the report and to incorporate advice from the midterm review which took place February 9, 2015, in Brussels.

Special thanks to the Res-AGorA case-workers who have made this report possible:

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Karlsruhe, March 6, 2015

1 Introduction

The EU seeks to become a genuine **Innovation Union** in 2020 striving for excellent science, a competitive industry and a better society without compromising on sustainability goals or ethically acceptable and socially desirable conditions. There is a debate emerging on how best to translate these broad aims into **principles for responsible research and innovation**. Indeed a number of frameworks of Responsible (Research) and Innovation have already begun to appear, or in a few cases are in early stages of being tested or applied in practice, for example incorporated into funding criteria in the Dutch and British research councils contexts.

In February 2013, Res-AGorA was commissioned by the European Commission and tasked with proposing a governance framework for Responsible Research and Innovation (RRI) ***for Europe***. Res-AGorA does not aim to develop another detailed normative governance model to supports actors around the world. Rather our aim is to design a meta-regulatory[1] framework for Europe to enable a broad steer to R&I systems by providing principles of governance. Beyond this broad steer, we delegate to actors to negotiate their own variants of frameworks and tools for responsible research and innovation, The governance framework Res-AGorA will produce will not set the normative (societal goals) or detail of tools , techniques or processes, but will work on two levels: proposing a broad steering framework of principles; and providing evidence from our base of case studies on existing initiatives and practice, translated into 13 Lessons for Stakeholders and policy (Section 3 of this report). We present our preliminary conclusions and a small number of stakeholder and policy implications that stem from the lessons (Section 4 of this report).

The programme of case studies and empirical work which underpins our transversal lessons were undertaken between August 2013 and December 2014. The cases **represent a spectrum of research and innovation situations and organisational contexts. In the following, we first outline very briefly the main concepts developed in Res-AGorA. Our lessons then act as a series of check-points for organising and orienting actors towards responsible research and innovation, covering three themes i) Our overarching lesson (Lesson 1) elaborates our main recommendation on *responsibilisation and deep institutionalisation*. The next twelve lessons elaborate the elements which we consider necessary to bring about responsibilisation and deep institutionalisation of RRI in two groups ii) the detail of governance processes and practice; and iii) factors concerning institutionalisation processes and institutional change towards responsible research and innovation.** This report provides one input to a series of five Stakeholder workshops which will take place across Europe in 2015; aimed at co-constructing a governance framework for RRI in Europe.

Some conceptual building blocks: The concept of governance of RRI

Governance of research and innovation (R&I) is not only distributed across multiple kinds of actors, but also heterogeneous producing variety according to local cultural and political contexts. This is certainly true in Europe, but also elsewhere in the world. Roles and responsibilities get shaped at different levels and in various actor settings. What is 'responsible' does not only depend on the specific context of research and innovation, as our cases analysis and lessons will demonstrate, but is

[1] A broad steering framework of principles intended to harness the self-regulatory capacities and capabilities of actors.

justified by different normative directions and should start from the conceptual assumption that these directions in many cases are contested. Instead of downplaying such tensions we investigated how responsibility is conditioned for different modes of 'RRI in the making'[2] and sought to draw lessons on what and how capabilities and capacities for institutional change would be needed in order to translate and transform current research and innovation systems, actor constellations, and organisations towards greater anticipatory[3] capability and responsiveness to a range of societal demands facilitated through governance processes and instruments.

Q1 What is responsible research and innovation?

We suggest that the interplay of two assumptions underpin and define responsible research and innovation. We consider responsible research and innovation to be a **process of continual (and contested) institutional change**. At the heart of this dynamic is how different values about how to do research and innovation 'well' (well-doing[4]) become embedded (institutionalised) into organisational structures, processes and practices, but also are contested across different groups in society.

These two assumptions are

a) **That bottom-up actors' understandings of *de-facto* responsible research and innovation[5] (or rri), forms an interplay with new formal, top-down explicit frameworks of Responsible Research and Innovation (or RRI). We represent this dynamic throughout the report as rri/RRI.**
b) **That attempts to standardise, stabilise and integrate across disparate groups particular framings and interpretations of what is a priority for responsibility and what is not, forms an interplay with tensions pulling in the opposite direction, creating local, context-specific, variants.**

The practical negotiations, struggles and outcomes we see in the cases represent these dynamics playing out in practice; and many of the transversal lessons we propose flow from them.

Q2 What is being governed?

We can discern **a variety of Responsible Research and Innovation 'narratives' together forming an unstable contemporary discourse on what responsible research and innovation is, which societal goals are to be prioritised, what it should aim to do on behalf of whom, and how it should translate to on the ground practice and implementation.** Whilst *de-facto* rri covers this entire range in different combinations, foci, and variants; the institutionalisation of new RRI Governance

2 As an unfolding, emergent, open and negotiated phenomenon

3 Paying conscious attention to the future benefits and consequences of research and innovation happening today.

4 Dorbeck-Jung, B. & Shelley-Egan, C. (2013) Meta-Regulation and Nanotechnologies: The Challenge of Responsibilisation Within the European Commission's Code of Conduct for Responsible Nanosciences and Nanotechnologies Research) *Nanoethics* (2013) 7:55–68

5 Rip, A., (2010) 'De Facto Governance of Nanotechnologies', in Goodwin, M., Koops, B.-J., and Leenes, R. (eds.) *Dimensions of Technology Regulation*, Nijmegen: Wolf Legal Publishers, 285-308.

Frameworks does not. In particular, RRI Governance Frameworks still focus more on 'Science, Research and Technology' than on 'Innovation'. Nevertheless some of our cases intentionally targeted innovation contexts **to better understand how Responsible Innovation is *de-facto* governed**. We would expect this level of instability for a concept and policy direction which is very new.

We propose **5 grand narratives to capture the historical development of the range of (largely separate) Research and Innovation** [6] settings and objectives that rri/RRI covers:

1) Empowering Citizen Participation and Deliberative approaches to Science with/for Society (SWAFS). Democratising Science & Technology development (CP-S&T). Responsible Conduct of Research (RCR).
2) Responsible development of New and Emerging Technologies (R-NETs) including balancing risk/benefits. Ethical, Legal and Societal Aspects of emerging technologies (ELSA). Mediating Technology Controversies (MTC), Constructive Technology Assessment (CTA) and other Technology Assessment methodologies, such as Life-Cycle Analysis (LCA) and Foresight.
3) Responsible Business and Management of research and innovation, Corporate Social Responsibility (CSR) .
4) Responsible Research and Innovation Systems (RRIS), Responsible Industry, commercialisation and markets (RI). Responsible Value Chains (RVC). Sustainable Development (SD). Ethical Consumption (EC). The 'Good-life' and bottom-up responsible innovation.
5) Re-orienting Research and Innovation Systems towards societal problems and challenges (RIS-SPC) and social-mission oriented innovation.

The 5 grand narratives are schematic and not mutually exclusive. Indeed many of our cases span and incorporate two or more of the narratives. They are furthermore informed and analytically constructed with reference to our scientometric analysis of the RRI literature.[7]

We can say that whilst Grand Narrative (5)- the re-orientation of Research and Innovation Systems towards Societal Problems and Challenges (RIS-SPC) - may represent a 'pinnacle' of an integrated understanding and objective of RRI, thus-far this remains at best an aspiration. Our cases suggest that RRI towards grand-narrative (5) is far from institutionalised or evidenced in widespread practice as yet, in particular in a form that has an explicit, integrated, futures-orientation aiming to enrol wider societal reflection, anticipation, participation and responsiveness from a wide spectrum of actors into the process.

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[6] Randles, S., Loconto, A., Lindner R., and Walhout A.M., *Framings and Frameworks of Responsible Research and Innovation* (presentation to the EASST Conference, 17-19 September 2014, Torun and paper forthcoming).

[7] Tanciogne, E., Randles, S., Joly, P.B. (2014) 'Research Governance: How the concept of RRI is slowly maturing' Euroscientist . Special Issue: RRI Overview, November 2014 http://www.euroscientist.com/rri-overview/ and Tanciogne, E., Randles, S., Joly, P.B (2014) 'Small and Divided Worlds: A systematic review and scientometric analysis of RRI Literature' presentation to the EASST Conference, 17-19 September 2014, Torun and paper forthcoming).

We can further formulate a stylised **spectrum of R&I situations <u>of</u> rri/RRI governance**. Our case studies were intentionally selected to give **insight onto this entire spectrum**:

A) Responsible Research:
   a. Setting Research Funding Priorities
   b. Governing the Development of New and Emerging Technologies
   c. Mediating struggle in Technology Controversies

B) Responsible Innovation
   a. Shifting Large Innovation Systems
   b. From Producers to Consumers: Constructing Responsible Value Chains
   c. Grass roots, garage, and 'bottom-up' innovation, including social innovation

C) Addressing Societal challenges
   a. Orienting R&I systems towards societal problems and challenges

Together, then, our cases can be mapped onto a landscape which combines attention to one or more of the 5 'grand narratives', with one or more of the spectrum of research and innovation situations. They also differ as to their focus within the rri/RRI dynamic, although only two of the cases considered the implementation of a formal RRI (policy-driven) Framework being the UK Research Councils; and the Dutch NanoNextNL cases. Because experience with explicit RRI Frameworks is so new, most of our lessons learn primarily from *de-facto* rri.

Q3 What are responsible research and innovation *<u>governance processes</u>*****?**

Governance we consider as **the purposeful mobilisation of institutional arrangements to achieve certain societal goals or tackle specific research and innovation 'grand' challenges. The conceptualisation of responsible research and innovation ***<u>governance processes</u>*** that we assume for this report is underpinned by the Res-AGorA Research Model[8] which for readers' interest we have put in this report at Appendix II.** In our rri/RRI context, this governance challenge is the perceived need of actors to transform research and innovation to better reflect societal aspirations and concerns (such as sustainable development, poverty alleviation, health and safety, resource depletion, climate change, ethical conduct etc), whereby the interpretation of this need can be very different for different actors involved.

Institutional arrangements combine **actor constellations (plural and fluid groups of organised actors) with specific governance instruments** (legal instruments, economic incentives, Standards, Codes of Conduct, ethics frameworks and committees, technology impact assessments, performance

[8] Walhout, A.M, Kuhlman, S., Dorbeck-Jung, B., Edler, J., Randles, S., Gee, S., *The Res-AGorA Research Model*, January 2014 copied here at Appendix II to show the bridge between our conceptual work and our case studies selection, development and analysis. For those interested in further reading on the Res-AGorA conceptual underpinning see Res-AGorA Deliverable D2.2: Walhout, A.M., Kuhlman, S., Dorbeck-Jung B., *Research Heuristic and Key Concepts* July 2013 which can be found at http://res-agora.eu/eu-deliverables/. We also for interested readers provide our underpinning Res-AGorA conceptual 'Eye' diagram of RRI Governance as *Distributed* and *Anticipatory* at Appendix III.

management systems etc). Below, we list six core elements of governance processes. These elements were derived as an *output* of the case study work following reflection on the full corpus of case studies , attending to how actors (through the eyes of the case authors) progressed through the governance process revealed in their respective cases. Although before the case work commenced we had anticipated and incorporated these elements into our model, the case work caused us to strengthen our emphasis on the importance and significance of ***pre- existing institutional conditions*** , such as political system, culture, and case-specific histories into which each case was uniquely embedded, in shaping the specificity of the cases (core element No1) . Furthermore, learning from the cases we highlight the importance of the initial framing and representation of societal needs reflected in contested interpretations of what is 'good' or 'ought' to be: preferred values embedded into research and innovation practice and governance processes , which we call 'normative orientations' (core element No2). The last element is a stylised construct which maps to, and provides a bridge to our first transversal Lesson No1: *Responsibilisation and Deep Institutionalisation* which we will pick up and explain in Section 3. Suffice here is to signal that *responsibilisation and deep institutionalisation* represents as aspirational outcome that would see actors particular normative preferences for rri/RRI become embedded into organisations, wider constellations of organisations, and research and innovation systems more broadly, through governance practices and institutionalisation processes which we elaborate through Lessons 2-13 in Section 3.

From our cases we propose 6 core elements of governance:

1) Pre-existing Institutional Conditions.
2) (contested) Normative Orientations
3) Formation of Principles
4) Governance Arrangements: Actors and Instruments (practices & procedures)
5) Outputs & governance innovations
6) (Aspirational) Outcome: *Responsibilisation & Deep Institutionalisation*;

Q4 What observations and transversal lessons can we learn from the cases?

The study derived **thirteen lessons concerning the effectiveness of a range of governance instruments and institutionalization processes to achieve the embedding of responsible research and innovation according to a variety of normative goals and rri/RRI objectives**. Ultimately seeking greater responsiveness and transformation of R&I systems towards the range of societal objectives and goals listed above, we nevertheless highlight that even these objectives are not always mutually compatible or mutually aligned. Furthermore it is the contestations over normative goals (what is deemed 'good' for society or what 'ought' to happen to bring about societal betterment according to different actor rationales) which is the source of much of the struggle and negotiation present in the cases.

However, in Res-AGorA we neither evaluate nor judge the range of normative goals which actors contest. Rather, we are looking from a more instrumental perspective, for the factors which the cases reveal make governance processes more or less likely to succeed in embedding pre-defined set of normative goals into research and innovation processes and systems. Indeed, we find it is often

this lack of reflection and prior open agreement, or at least clarification and definition, on what those normative goals should be, that produces ambiguous or contested outcomes.

We further highlight and draw attention below to the importance of context, indeed to differences in pre-existing institutional conditions (such as national political cultures and power asymmetries in actor groups involved) in explaining differences in outcomes in apparently similar cases. We also highlight multiple pre-existing (and often competing) institutional logics conditioning the outcomes of the cases. Frequently we see the logic of economic growth competing with the logic of societal responsibility. We see a logic of accelerated technological advance competing with a logic of taking greater care, concern, and precaution. rri/RRI negotiations are primarily about balancing these competing logics. Sometimes they can be brought into line in a narrative, and sometimes they cannot.

Nevertheless we also find an encouraging degree of mutually supportive and interdependent lessons, suggesting that we can identify a **sufficient number of supporting principles towards a governance framework for RRI for Europe. This is an achievable ambition**. **These Lessons will go forward to contribute to the development of the Res-AGorA governance framework, to be considered alongside the deliberations of the Stakeholder workshops.**

By way of an easy-reference and summary, we list below our **Res-AGorA 13 transversal lessons for the governance and institutionalisation of responsible research and innovation,** divided into 3 clusters. The first lesson refers to the overarching idea of *responsibilisation and deep institutionalisation*. The next eight lessons refer to **governance processes** at the level of actor practices and experiences whilst the third group of four lessons concern the '**background' institutionalisation processes and conditions**, and how these would need to simultaneously change in terms of their capacity and their normative orientation, ie institutions would themselves need to be transformed to create the external environment in which actors practices of rri/RRI governance on the ground would be encouraged, incentivised, and enabled.

(1) Towards Responsibilisation and Deep Institutionalisation

Governance processes

(2) Transformative interaction needs to be inclusive open and transparent
(3) Intermediation and moderation
(4) Anticipation: the importance of building future-oriented learning through a repertoire of anticipatory techniques and methods
(5) Robust, inclusive, and contextualised knowledge
(6) Timing: the importance of time, timing and managing tensions of different temporal horizons.
(7) Multi-level governance: the importance of taking account of multiple levels of governance and seeking synergies between top-down and bottom-up processes.
(8) Alignment : the importance of aligning and synchronising the normative goals, objectives and procedures of different instruments and measures.
(9) Boundary objects: the effectiveness of instruments as boundary objects and of actors as boundary-crossing agents.

Actors, Agency and Institutionalisation processes.

(10) Institutional Change : simultaneous institutionalisation and de-institutionalisation processes, organisational re-design and the creation of an rri/RRI culture.
(11) Capabilities : the systematic building of capabilities at the level of individuals, groups, and organisations enabling them to fully participate in rri/RRI transformation processes.
(12) Capacities: the systemtic and systemic building of resources at a societal level to enable rri/RRI to become part of a broader cultural shift
(13) Institutional leadership and entrepreneurship

Following a brief outline of the methodology used in the study (Section 2) these lessons will be elaborated in turn and text-boxes used to give short illustrations from the cases (Section 3). Finally we provide conclusions and some preliminary implications for stakeholders, practitioners, and EU policy making (Section 4).

2 The basis for these lessons - methodology

The lessons provided in this report are based on an analysis of 26 empirical case studies and two further ongoing studies informed by the Res-AGorA research model[9] as outlined above. The main purpose of this model was, first, to characterise the cases in terms of the landscape of actors and governance instruments used in the case and second to scope a range of different governance situations that the cases represent in order to be able to draw general lessons out of idiosyncratic cases. It was also to establish an understanding of what is it that is governed and what successful governance towards rri actually means.

The selection of the cases to be included followed a rigorous internal commissioning process co-ordinated by the Manchester team where case-workers were asked to first submit proposals indicating the scope and focus of their proposed case, explaining what they felt the case would bring to understandings of *de-facto* rri and governance processes. They were asked to indicate the detail of case-specific methodology (which actors to include, which processes and governance instruments or organisational foci to research, desk literature and sources to be used, case-management and timetable). Case-workers were also asked to put forward some initial working hypotheses on what relevant insights they thought their case would generate. After discussion, co-ordinated from Manchester but involving all consortium partners, cases were one by one approved and 'Green lighted' to commence field-work. Nearing the end of Stage 1, case workers were asked to present their preliminary findings at the next full consortium meeting, where each case was discussed by the full consortium. On completion of each case, case workers were asked to provide a 4-6 page report, including a section *'lessons for Res-AGorA'* which was again discussed by telephone bringing together case workers, the Manchester/Twente teams, and all interested consortium partners. Teleconference meetings intentionally involved consortium members tasked with leading various aspects of the Res-AGorA programme such as the elaboration of the Research Model, the drafting of the Framework principles, and the design and development of the co-constructive Stakeholder workshops. This intensive process aimed to maximise the learning from each case study into the various other work elements of the Res-AGorA project, in parallel rather than sequentially. This process also led to a second and final version of the individual case report, which was then signed-off by the Manchester team, for uploading to the Res-AGorA website. This process was repeated for Stage 2 and Stage 3: ie each stage followed a systematic process of calling for case-studies according to an increasingly specified 'Research Model' with case descriptors acting as a common template across the cases; approving proposals and 'green lighting' the commencement of fieldwork, receiving preliminary in-person presentations, and receiving interim and final reports from the case-workers which were discussed through teleconference before approving final versions for uploading to the Res-AGorA website.

The successive selection of cases ensured that the empirical research covered the breadth of situations in which organisational actors and individuals are confronted with rri challenges and seek to engage in governance activities to derive at a rri framework, mechanism, process or outcome that is accepted by the stakeholders involved in this situation. We developed a range of dimensions which characterise such governance situations.

[9] See this report Appendix II.

Chronologically, the case studies proceeded in 3 stages:

Stage 1 (Pilot Cases): September – December 2013

This first stage was more inductive, our aim was to learn and observe from a first round of 'experimental' case work. At Stage 1 we selected 8 cases inductively to explore different basic understandings of responsibility, its contestation and operationalization in different research and innovation 'situations'. Stage 1 was conducted between September –December 2013.

Reflecting on our first wave of cases we realised that rri situations differ between cases that are driven by

a) the conditions for and consequences of strategic **research and emerging technologies**

b) the conditions for and consequences of **innovation activities**,

c) the expectation that a certain research and innovation activity shall contribute to a specific **societal challenges** (**directionality** of research and innovation).

This basic differentiation of cases is based on our initial analysis. We learned that the actor constellations and expectations, the process dynamics and the framework conditions – and thus the governance challenges – differ considerably between cases at the early stages of research and those close to the introduction and diffusion of the market. Moreover, we have again a different set of issues when we deal with cases in which the interactions and aspiration as to rri are driven predominantly by trying to steer research and innovation activities towards societally defined challenges. We have thus taken care in the selection of cases and the drawing of lessons to include cases across those three types.

Of course, this distinction is stylised, in general cases show elements of all three types. However, most cases represent one of the three types much stronger than the other two, and there is added value highlighting these distinctions in terms of defining the underlying situation of each case, the main determinants of the process and the lessons to be drawn. At the same time, however, we stress the importance of taking into account not only the spectrum from research, innovation and challenge, but the interplay of rri challenges across the three aspects.

Stage 2 (development): February – April 2014

For Stage 2, the case selection and research proposals from case workers more closely followed the Research Model which had been developed and refined by the Twente team following Stage 1. The 10 case studies were conducted between February and April 2014 and were selected to cover:

- A variety of responsibility claims and their contestation
- Heterogeneous actor arrangements (actor constellations and governance instruments) involved in negotiating or implementing responsibility claims.
- Practice and processes towards responsibilisation (or not).

Stage 3 (focus on organisations & completion and wrap-up of the case-study programme) June 2014-February 2015

For Stage 3, cases were selected to target contexts which were emerging as important from Stages 1 and 2 where we wanted to train a torch, and in line with the Research Model. Stage 3 was conducted between June 2014 and February 2015. Selection at this stage was informed by transversal analysis of Stage 1 and 2 which we summarised in an interim lessons report[10]. Cases in Stage 3 focused on organisations central to the development of rri (de-facto responsible research and innovation): multi-national corporations; universities, research funding councils and institutes; and engineering professional associations.

[10] Reported in Deliverable 3.5 (http://res-agora.eu/assets/ResAGORA-case-lessons-report-D-3_5-final.pdf)

3 The thirteen lessons

Lesson 1: Responsibilisation and Deep Institutionalisation

In a sense this lesson provides an over-arch to lessons 2-13. Therefore together the thirteen lessons provide an empirically-supported list of learning points from where the design of a coherent set of principles towards a framework for RRI for Europe might step-off. From our position, then, the main purpose of governance of responsible research and innovation is to work towards ***responsibilisation and deep institutionalisation***. These are theoretical constructs rather than empirically-generated and therefore are not evident in any one case alone. But different cases give insight into, and empirical support for the two concepts and how they might translate into practice. **Responsibilisation provides an objective for meta-regulation** and acts as a '**pre-requisite for actors to internalise social values (such as consumer safety or occupational health) and to ensure that these values are built into regulatory practices'** (Dorbeck-Jung and Shelly-Egan 2013: 56, developing Shamir 2008)[11] .

It is worth a brief tangent to appreciate the thesis that Shamir (2008)[12] puts forward to support the idea of responsibilisation, as it is upon this idea that Dorbeck-Jung and Shelly-Egan build . Shamir argues that a dual-dynamic is occurring. On the one hand, State or government agencies have embraced 'marketisation' and efficiency regimes which re-work the boundaries and the role of the governments, in particular since the end of World War II in Europe, as being the primary actor *taking responsibility for the wider public or 'common good'*, tightening this responsibility in recent decades according to market and efficiency rationales. Meanwhile, the private sector and businesses are increasingly expected, or opt for moral reputation-enhancing reasons *to take responsibility for a wider set of cares and concerns* – in economic terms 'externalities'- such as environmental guardianship, community development, education, health and well-being of society; beyond the immediate stakeholder groups touched by the organisation of say workforce, customers, suppliers and shareholders. In essence the corporate sector is entreated to a moral responsibility for the wider common good whilst the State sector is drawing tighter boundaries around itself concerning the interpretation and operationalization of the common good. Where these new boundaries and divisions of responsibility lie are contested, and the variety of ways in which the boundaries are re-negotiated are also up for debate. But, for example, in the case of the corporate sector the overflowing from the private to the public sphere of responsibility is in evidence and instrumentalised through corporate social responsibility (CSR) programmes and the establishment of non-profit Foundations within corporate organisational designs (See Grand Narrative No3 in Section 1). Included into these new cares, are a prospective concern for the future well-being of the planet, peoples and places on which the corporations' ability to thrive and prosper in the future depends. In terms, then, of *responsibilisation* Shamir's thesis, if we believe it, (re)opens the question of ***the nature and division of responsibilities and moral labour*** between two central actor groups in society: the State and Corporate Sector, at the same time, throwimg open and into question the previously more stable settlement of responsibilities between the two sectors.

We can extend this argument to bring in the role and responsibilities of civil-society (and local communities) and the right of civil society to participate and influence debates and action

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[11] Dorbeck-Jung, B. & Shelley-Egan, C. (2013 Meta-Regulation and Nanotechnologies: The Challenge of Responsibilisation Within the European Commission's Code of Conduct for Responsible Nanosciences and Nanotechnologies Research) Nanoethics (2013) 7:55–68

[12] Shamir, R. (2008) 'The age of responsibilisation: on market-embedded morality' Economy and Society 37, 1, 1-19

concerning techno-economic futures. This point is also famously taken up by Beck (1992)[13] when he asks *'Who shall take the hot potato?'.* Beck's concern is different to Shamir; but their positions are compatible, and both speak to the common question concerning the nature and distribution of responsibilities for research and innovation futures in/by different actors in society. Different to Shamir, Beck calls to account the autonomy of the scientific/technology enterprise and the notion of an autonomous and privileged sphere of techno-scientific expertise. He calls for a widening in the number and scope of actor constituencies participating in the (voluntary) regulation of and vigilance over the sphere of the practices of science and research and the development of new technologies: a kind of society-wide vigilance by civic society over the techno-scientific enterprise (See Grand Narratives 1 and 2 in Section 1). Beck's thesis can also be contested, not least by the view that scientists, technologists, (and in one of our cases, engineers) do, in fact, self-regulate to a very high standard through governance mechanisms which self-attribute a very high level of ethical (professional) responsibility instrumentalised through professional Codes/Oaths of Conduct and Ethics. And that in the professional collective setting these ethical responsibilities and reflections are supported by the acquisition and maintenance of life-long career proficiency, determining and institutionalising the scope and content of relevant professional knowledge needed to be a recognised practising professional, including setting technical standards and values which will preside over the legacy to the world of the products and services that the profession puts into the world (see the case by Arnaldi 2014 on Engineering Ethics). This point runs somewhat counter to Beck's thesis premised on the autonomous *and irresponsible* scientist/technologist/engineer. However, Beck's thesis, coming soon after the Chernobyl disaster which rocked the chemical industry and opened to external and internal questioning the practices of the industry, became rather a populist and symbolic trope for the idea of opening up and questioning the nature and distribution of responsibilities for research and innovation processes to a wider range of actor constituencies in society. Together, Shamir, Beck and others[14], (re)open questions about the division of responsibilities, *between* and *across* different actor groups, and *for* the full range public (commons) and private (individualised) cares and concerns. We can add other actors such as the role of the press and media. For better or ill (see our case on Fracking in UK and Austria where in the UK followed the contours of polemic or polarisation of the debate that the discourse and polarisation of actors also demonstrated in the UK case, Lang 2014) the media and press have become an active agent in calling for transparency and accountability of different actors. Responsible research and innovation, then, is just one setting where these debates play out and questions about the distribution of responsibilities are raised or re-vistied. Negotiating new patterns of *moral division of labour* and *new divisions and distributions of those responsibilities*; gives rise to the fundamental contemporary questions of rri/RRI ie '*Who Should Take Responsibility for What?* And it simultaneously, explains why the question arises at this particular contemporary juncture *'Why now?'*.

If responsibilisation addresses questions of *'Who? Should take responsibility for What? And Why now?'* ; deep institutionalisation is a concept which tackles the complementary question *'How?'*. The **deep institutionalisation of responsible research and innovation we see as a set of necessary conditions against which claims to responsibility can be assessed. It involves effective transformation towards a set of articulated normative goals embedding values into practices and**

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13 Beck, U. (1992) *Risk Society* , Edition Sage Publications: London

14 Eg see Rip's intervention in Randles, S. Dorbeck-Jung, B., Lindner, R., Rip, A. (2014) Report of the Roundtable at S.Net Boston 2013: Where to next for Responsible Innovation?' in Coenen, C., Dijkstra, A., Fautz, C., Guivant, J., Konrad, K., Milburn, C., van Lente, H. *Studies of New and Emerging Technologies: Innovation and Responsibility, Engaging with New and Emerging Technologies*, IOS Press Heidleberg

processes and orienting action towards those goals' (Randles et al 2014: 32)[15]. Deep institutionalisation therefore represents a ***process of cultural change*.**

Lesson 1 therefore represents the synthesis of lessons 2-13, towards responsibilisation and deep institutionalisation as a **plurality of societal values embedded into normative goals; and thence into, regulatory and governance processes, procedures, instruments, and organisational structures and incentives, and ultimately into taken-for given practices, routines and institutions**. It captures the idea that institutional change is holistic and penetrating, rather than the cynical or superficial adoption of one or more instruments or reporting mechanisms in the name of responsibility, a possibility which we will in a minute call **responsibility wash.** It also pays attention to the fact that institutions are themselves a reflection of sets of prior-layered political, economic, and societal conditions which gives rise to a plurality of geo-political conditioning contexts, which as we have seen for example in the fracking case can produce diversity. Indeed in our case comparing fracking in Austria and UK, polar opposite outcomes occurred in different geo-political contexts, with the practice of fracking becoming economically incentivised in the UK whilst the developer was dis-incentivised to continue with the approval process in Austria, because the bar set for undertaking a rigorous Environmental Impact Assessment (EIA) as a condition of planning and issuing a licence for exploratory drilling, became too high (Lang 2014).

As we now move to lessons 2-13 we begin to highlight, with evidence from the cases, how in some cases practices can be singled out as representing 'good practice' along the dimensions elaborated in the Lessons; whilst in others, things could have been differently in order to maintain trust and credibility of the rri/RRI governance processes. We note for examples cases where contradictions or perverse behaviours appear. For example there are a number of instances where a claim to being 'responsible' has coincided with governance procedure which, often by the actors own accounts, has been superficial, or where the inclusivity of actors or the speed of the process has undermined actors trust in the process and undermined its legitimacy. We can see examples in the cases (particularly important to note if in the future, RRI is to move from an 'experimental' idea to a more widespread policy objective) for claims to responsibility to go hand in hand with a continuation of the status quo, with no transformative motive or effects evident. We can call this possibility for a 'shallow' or superficial response '***responsibility-wash'***, taking from precedents of 'green-wash' or 'ethics-wash'[16]. We can also see potential for RRI to become a bureaucratic, or bureaucratised response, layering new procedural requirements onto previous ones rather than seeking fundamental re-orientation or institutional change. We can call this category of response '***responsibility-overload'***. Finally we have evidence in the cases of re-labelling of existing processes, structures or organisational units as RRI. Whilst re-labelling is a natural transition or holding strategy for actors whilst deeper reflection and design-options for change are considered, (as in our case into the Fraunhofer Society in Germany), it does help to highlight this strategy as '***RRI re-labelling'***.

[15] Ibid Randles et al (2014): 32.

[16] Randles, S. (2008) 'Industrial Ecology in Europe: From Nano-Ethicswash to Real-Time Regulation', *Journal of Industrial Ecology* Vol 12(3) pp 270-274.

Lesson 2: Transformative Interaction needs to be inclusive, open and transparent.

A key feature for transformation towards responsibilisation is the nature of the **engagement of actors**. The analysis across our cases has shown that interaction, in order to transform actors attitudes and behaviours, and thus bring about real change, needs to be **inclusive, open and transparent**. The breadth of inclusion in interaction needs to reflect the heterogeneity of actors in a given governance situation. More concretely, we have seen in a number of cases that governance mechanisms are more likely to be transformative if they include the diversity of actors in a way that engages them in direct debate and develops mutual trust and shared understanding through genuine joint activities. In cases in which certain heterogeneous interaction is limited and certain types of actors are excluded from direct interaction, there are limits for the learning about divergent positions and a build-up of a minimum shared understanding[17]. We have also seen that new communities who engage in a bottom up discourse about the understanding of responsibility in connection with their activities run the risk of developing a closed shop mentality and thus not link to debates and concerns in the broader society. One example here is the case of garage innovation around open source 3 D printing (see box below) .

Case: The responsibilisation and regulation of garage innovation open source 3D printing (Söderberg 2014)

The case has shown intensive debate amongst garage innovators, but a lack of awareness about broader societal issues and thus poor development of an understanding of responsibility that is shared between insiders and outsiders of the community and thus acceptable more broadly.

Inclusion to be productive needs to offer the opportunity that all key stakeholder groups join in the construction of an accepted understanding of responsibility on the basis of a joint debate about preferences. Thus, what is inclusive, open and transparent interaction depends on the situation and on the composition of types actors (and roles, disciplines etc.). It is also highly inter-dependent with the dominant framing(s) of an issue at the beginning and over time. This means that understanding who is affected by a specific technology or research and innovation activity and who can represent those affected depends also on how an issue is framed at the beginning. It is thus very important that the initial framing of an issue is itself open to broad interaction rather than imposing a certain problem view which may include important stakeholder groups. The case of the UK Synbio roadmap is illustrative here. It shows that the early framing of synthetic biology as a major innovation and economic opportunity closed down the interaction and focused on shared science and firms (Van Doren 2014).

Against this background, to bring about inclusive, transparent and open, and thus transformative interaction in fact requires preparatory work and process management. In particular, preparatory learning, engagement, facilitation, outreach and trust-building is needed to encourage otherwise marginalised groups to mobilise to become fully engaged and trust that they can make a difference to R&I outcomes. Mobilisation of marginalised or otherwise excluded groups may equally involve

[17] An illustration of this is shown in the UK Roadmap for Synthetic Biology, see lesson 5, provision of knowledge (Van Doren 014).

them reflecting and enacting alternative R&I processes, systems, practices and outcomes as a counter-position to an existing 'status quo' and may involve learning how to govern such processes themselves or in conjunction with others. Furthermore, as the case of on-line consultation on EC Nano-Code (see box) shows, openness and inclusiveness are not easily achieved through online consultation.

Case: Online consultation on EC Nano-Code (Ruggiu et al 2014)

Online consultations are in principle open to all stakeholders, but ironically the low number of participants in our case of Nano Code of Conduct consultation indicates a very selective interaction. Inclusion is thus not achieved through simply opening a webpage and posing questions, it needs active moderation, a mobilisation of multipliers, associations etc. in order to generate breadth and learning. However, this moderation of online consultation processes itself can be seen as highly opaque and even manipulative. Thus, the mobilisation and moderation of online consultation and especially the interpretation of any results must be very open and transparent itself and the case shows that online consultation on its own does not seem to be an appropriate mechanism of inclusion that is seen to be legitimate and has repercussions on the variety of stakeholders affected by an issue.

Inclusive interaction however often has a balance to strike between breadth of inclusion and manageability and fairness of the process. (see box on Horizontal Foresight)

Horizontal Foresight to Address Societal Challenges in Danish Priority-setting for Strategic Research. (Velsing Nielsen 2014).

This case shows that broad foresight processes have a balance to strike. If they are broadly, comprehensively inclusive, thus increasing the input legitimacy, they risk leading to prohibitive complexity in terms of moderation. Under such conditions, paradoxically, they may revert back to an interest and power driven negotiation, due to the complicatedness of input representation, ie the wide and heterogeneous range of views elicited in the participative process.

Finally, there are processes which have a greater inclusiveness of marginalised actors into techno-economic governance as the main *objective*. Inclusiveness thus is not a means to an end, it is an end in itself, as part of a new governance arrangement. In one of our cases (see box below), the basic idea was to institutionalise a new arrangement of guarantee schemes in developing countries in the agro food sector taking the interest of local producers and supply chains into consideration. This system overcame incumbent systems and established new power relation and participation patterns. This 'bottom-up' case of participatory guarantee schemes carries many lessons in this regard, combining inclusivity, with the building of capacities, capabilities and learning. It shows that inclusive, open and transparent interaction is a necessary requirement for other important conditions of good governance processes towards rri, such as anticipatory learning, capacity and capabilities building, and finally institutional change at a pre- stage to facilitate it (as we will see in further lessons below).

Participatory Guarantee Schemes (Loconto 2014)

This case analyses the design and roll-out of new voluntary standards in the form of a new participatory guarantee scheme in developing countries which integrates agro- value chains according to specific values shared in those countries and prioritising the interests of local producers. The scheme thus uses market mechanisms to achieve normative goals. It shows how new and broader forms of inclusiveness of hitherto marginalised actors necessitate the build up of capability and awareness across the whole value chain. Furthermore, not only the inclusiveness in the build up of new rules and institutions is of importance, but the way the accreditation scheme is implemented needs to ensure a sustainable level of participation so that all actors affected take responsibility for the innovative scheme. This necessitates the build up of capacity and a broad approach of learning across the system

Lesson 3: Intermediation and moderation

Governing towards RRI will need conscious intermediation and moderation: Immediate, direct interactions are not always reasonable or feasible, for example in case of open confrontation (hot contestation) with incompatible interests and values involved and in cases in which the geographical or epistemological distance between actor groups is prohibitive. There are a range of further reasons why actors that are to be mobilised in rri governance processes are not able or willing to connect and communicate, such as the heterogeneity of framings and perceptions, with limited capabilities and capacities or with a lack of awareness or interest. Depending on the situation, intermediation can provide linkages between instruments and actors, between diverse communities, can translate from transnational down to local contexts and adapt issues to local contexts, explain, communicate and mobilise. Again, intermediators must be credible and their function and own interests must be transparent.

It is therefore one of the biggest challenges for an RRI governance framework to consider and to bring together different interests, perspectives, and worldviews in regards to R&I and to find a way of dealing with (apparently) incompatible positions. In cases of "hot" contestation and polarising conflicting interests, a mediating body can contribute to trust-building, collate data broadly and mobilise robust knowledge (see lesson 5), organise discursive processes and in doing so enable conversation. This moderator needs to be seen as neutral as regards the content and outcome of the conversation and needs to have the strategic intelligence and resources to inform and guide the process. Hot controversies need a framework that involves strong neutral moderators. Moderation is not only needed at local level between the different stakeholders and those affected. It is also needed between local and national level, as material interest and normative interests also (may) differ between local and national levels and as national level regulation and economic expectation feed back into local decisions.

Public bodies, particularly government, can play a key role in mediating contestation as shown in a case on a changing trajectory of biofuels (Gee/Edler 2014). When government plays the central mediator role, the legitimacy of the outcome is reduced if only one department is involved. This is particularly so if a lead department has a very strong problem view and interest from the beginning. The legitimacy of government mediation is increased if multiple departments are involved and the rationale behind the selection of those departments is transparent. In the case of hydraulic fracking in Austria the Federal Government played the role of 'neutral' mediator.

Case Illustration: Fracking in Austria and UK, a comparative study (Lang 2014)
In Austria, the adaptation of existing regulations around fracking (….) happened in an ad-hoc manner after the technology had been introduced and protests had already started. Given the incompatible positions of opponents and proponents of fracking, the Austrian Government was divided between two positions Economy ⇔ Environment. In the end it struck a balance by suspending actual decision making on fracking by making a (strenuous) Environmental Impact Assessment (EIA) compulsory, this being the turning point which motivated the Developer to step down. In this sense the Austrian Government acted as a more neutral intermediary. In the UK, in contrast, the government had taken sides very early on (in favour of subsidising fracking), and thus could not be credibly mediating between different interests.

Foresight processes organised by state actors are a means of moderation, of bringing heterogeneous actors together. However, they run the risk of being (seen as) purely instrumental, i.e. delivering input to a process that is not entirely relying on the foresight process only, it often remains opaque to participants why certain findings are taken into considerations and others are not.

Horizontal Foresight to Address Societal Challenges in Danish Priority-setting for Strategic Research (Velsing Nielsen 2014)

This case shows (see also Lesson 2) that if state actors organise and moderate foresight processes, they must be entirely transparent about the purpose, the limit of the exercise and their own context conditions. Alternatively, the moderator of a foresight process could be a neutral actor, not being involved in using or implementing the results of the foresight process in the first place. In addition, to support the acceptance of the entire process and its results, various stages of foresight processes (framing the issue, knowledge production as basis, input gathering, synthesising, lesson drawing) should be done by different kinds of actors with different roles. This way, despite potentially strong leadership from interested groups or "users", the process is not monopolised; different actors participate at different stages and transparency overall is fostered.

Lesson 4: Anticipation. The importance of building future oriented learning through a repertoire of anticipatory techniques and methods

Many forms of organisations set in train tasks of reflexion about the ethics and values dimensions of their own futures, the future of technologies they use and future challenges they may face, with responsibilities flowing from and corresponding to debates about appropriate values-orientations. Examples range from country-level assessments of new and emerging technologies, to organised reflections initiated by professional societies and associations, to large organisations such as multi-national corporations or universities. Such reflections are set against social, economic, political, and technological policy and trends of the day and may be formalised[18] or organised through informal social networks of friends, colleagues, mentors and peers.

Turning first to the role of Professional Associations in *de-facto* rri, our case study on this organisational form (Arnaldi 2014) reviewed the codes of ethics of a range of engineering professional societies and reveals how statements of responsibility, guardianship and, significantly, a commitment to future care are carried over into a wider self-attributed role to care for societal and environmental concerns, to a greater extent than a narrow cognitive and regulative remit of professional jurisdiction would require. Indeed, statements codifying professional values and virtues are carried through ethical codes into a *prospective* (or future-oriented) guardianship and responsibility, and into a time horizon beyond that where certainties of current technical and professional knowledge pertain and consequences can be predicted. This *voluntary self-attribution* of a wider *and* longer term responsibility in relation to the impact of the professions' work and activities on societal and environmental futures goes beyond the cognitive jurisdiction of the profession would deem necessary. This suggests a willingness to accept (indeed publicly proclaim) a self-ascribed responsibility as an indicator of higher professional standing and de-facto *public guardianship role* self-attaching a moral obligation as a status enhancing strategy within a competitive system of professions and occupations . Engineering professions, characterised by the longevity of their material and technological footprint on social and natural environments appear to invest heavily in institutionalising this responsibility. By requirement of anticipatory preparation for this role, the case further points to investments in capacities, in the present-day, by way of mobilising resources and organising activities and fora aimed at collective professional reflection, anticipation, continuous training, curriculum building, awareness raising and ethical codification around this responsibility.

Our repertoire of cases further highlight the **role of Visionaries** as institutional change agents (see Lesson 12 Institutional Change and Lesson 13 Institutional Entrepreneurialism) in not simply anticipating but rather imagining and pointing out practical routes to achieving desired futures in accordance with desired 'good' values and interpretations of Research and Innovation responsibilities (normative orientations). Such actors do not work alone, but collectively in teams comprising individuals with different but complementary technical, discipline and functional skills-sets, and/or political or resources access, and who together are adept at displaying and mobilising

[18] E.g. at professional conferences and organised fora incorporating techniques such as foresight, ethical reflections and latterly constructive technology and societal/environmental impact assessment methodologies.

political, intellectual, social and economic capital towards a desired articulated future. They also operate at the interface of rri/RRI seeking to influence the formalisation of RRI from the perspective of their de-facto experiences, and normative preferences translated into anticipatory visions and codified/amplified learning. The '**anticipation' dimension of 'visioning' alternative** (better) futures activity counterposes the consequences of the maintaining the 'wrongs' (including irresponsibilities) of a current undesirable, often dominant status-quo scenario, with the moral imperative for change, a dual play of imagining/anticipating and exhorting a juxtaposed 'alternative' future, with corresponding positive consequences for societies (often favouring particular marginalised groups excluded from current structures or power plays). Implications are incorporated for the re-specification of scientific/technological and economic/distributive structures. Such collectives, whilst requiring high levels of political capital, are adept innovators as they are able to bring into being the future they imagine by designing new governance instruments and organisations (see Lessons 11 and 12 on capabilities and capacities; and Lessons 12 and 13 on Institutional change and organisational redesign; and Institutional Entrepreneurialism). Therefore such heterogeneous teams, together with the organisational and governance experiments they 'enact' (perform) become the demonstrations of the future they anticipate (See also Lesson 12) . They are anticipatory in the sense of adaptive to continuously changing environments and circumstances.

Case: The 'Good' University (Randles 2014)

A quote from an interview with a visionary who transformed an organisation over a period of more than 12 years illustrates the role of creating and communicating a clear vision, at the same time critically challenging the current dominant design and status quo : "A good university is an institution which understands its role as one of the most powerful adaptive forces to society. Its role is not the maintenance of Western culture or the protection of ancient traditions, but in fact is the preparation for our next generation as to be adaptive as they can be to all things that they encounter, as well as driving up, in the case of a university held in the public trust, the ideals of democracy…, as an underpinning core set of values. To me, the role, or the purpose, or the objective of the public university is to be powerfully transformative to the success of society…. that we are willing to accept responsibility for economic, social and cultural vitality and the health and well-being of the community. Well if all our social scientists, and our business specialists, and our scientists, and our doctors, and our teachers, and our teacher trainers can't produce that, and if that's not the outcome, then why do we even exist? ' (interview with Michael Crow, President of Arizona State University, October 2013).

On the other hand, several of our cases provided evidence of anticipatory techniques being used for to reinforce a current position in a contested debate rather than provide a balanced perspective on an open future. For example see Van Doren's evaluation of synbio assessments undertaken by a range of different interest groups (Van Doren 2013).

Case: Comparison of different Synbio Assessments (van Doren 2013)

The comparison of different assessments of synthetic biology and its future implications found that the reports produced were paradoxically undertaken in a short timescale and served primarily to re-inforce the existing position of the authoring organisation, whether NGO (advocating a future of uncertainty requiring a precautionary approach) or business/commercial or economic policy (emphasising the opportunity for a future marked by rapid technological development, economic growth, and jobs). Anticipatory techniques are therefore susceptible to being instrumentally used to respond to the responsibility agenda without meaningful transformative potential (what we have called 'responsibility wash', see Lesson 1).

Lesson 5: Robust, inclusive and contextualised knowledge

Governance processes deal with different levels of uncertainty about the current or future consequences of scientific and innovation practice and products. To reduce uncertainty and to inform the discourse on consequences of research and innovation these governance processes need to be underpinned with evidence and knowledge. Clearly, the relative role of robust and trusted knowledge differs with the level of uncertainty in any given situation, the higher the uncertainty, the more important the quality and adequacy of knowledge becomes in the governance process.

In order for evidence and knowledge to be effective in underpinning responsibility discourses, it needs to be accepted as **valid, adequate and trusted** by the stakeholders in a governance process. For this to happen, we can identify three conditions: knowledge needs to be perceived to be **scientifically robust**, **contextualised** and sourced from a **variety of stakeholders** and **follow a transparent process.**

Scientific robustness is most straightforward, the knowledge and evidence provided must stand the test of scientific scrutiny, for example, through peer review. In his analysis of different foresight activities supporting rri processes Nielsen (Nielsen 2014) shows how important it is that forward looking interactive processes define and decide upon future options *start* with creating a knowledge base of evidence on the issue at hand. This is more effective, the more it is done in a scientific and transparent manner (both in terms of the original of the knowledge and its use in the process). It is not only more effective, but also creates legitimacy for the process as it positions and feeds the debate.

To **contextualise** knowledge means to ensure that the evidence claimed holds true in the specific physical and social conditions of a location and, if needed, is reproduced for different local conditions. In our comparative case on decision making as to the future of fracking in Austria and the UK (Fracking, Lang 2014), opponents of fracking claimed that much of the scientific expertise asserting fracking was not harmful for the environment was not contextualised, it was not derived from analysing the local situation but based entirely on general scientific evidence. Despite the scientific robustness of the evidence put forward by proponents of fracking, the credibility of the knowledge and with it of the whole governance process was questioned because of the lack of localised knowledge. Equally, our cases of large multinational firms (Loconto 2015) show that the acceptance of change processes and regulation related to rri issues is linked to an understanding that top down regulation has taken into consideration the diversity of technological, market and organisational situations. However, there is a tension as to the costs of providing contextualised knowledge. Especially in governance situations that are characterised by a number of specific, diverse actor contexts as to what the rri debate is a balance needs to be struck between contextualising underlying knowledge and evidence on the one hand (increasing acceptance) and the procedural and monetary costs involved in doing so (efficiency).

To source knowledge from a the **variety of stakeholders** means that not only scientific knowledge is of importance, but also practice and experience knowledge is needed to inform the governance process. Importantly, the various sources are to be made transparent in order to allow stakeholders to test claims of inclusiveness of knowledge and evidence. Again, the fracking case further showed that the underpinning knowledge about the potential benefits (economic, energy security and

independence etc.) and the potential sustainability and ethical threats must not only be perceived as being scientifically robust, but needed to involve input from diverse actor groups and produced by actors that are credibly neutral towards the material interest in the technology. Importantly, scientific controversies about consequences of the technology must be made explicit and explained in lay terms in order to inform the stakeholder debate adequately (see also box on Synbio Roadmap for an illustration).

Case illustration: Synbio Roadmap (von Doren 2014)

The case details the creation of the UK Synthetic Biology (synbio) Roadmap. Synthetic biology is an emerging technology class, with multiple potential applications. The case shows how the initial framing of an issue sets the boundaries within which knowledge is produced and interaction is guided. In the case of the UK synbio roadmap the initial focus on the commercialisation of synbio based innovations (that was kept throughout) marginalised a range of actors and issues related to the underlying basic research in synbio. This shows how the initial step of framing debates is of utmost importance for the scope of knowledge mobilised in the responsibilisation debates.

A second illustration of this case concerns the need for inclusiveness – which links to our lesson 3 above. The process to formulate the roadmap did not include a range of NGOs and societal groups, and thus knowledge was in general limited to scientific knowledge. Moreover, social scientists were poorly represented in the deliberations, thus cementing a hard science bias. This also shows that activists in rri debates (institutional entrepreneurs) who often initiate and open debates need to provide an initial openness of the framing to support the perceived legitimacy not only of the participation but also the underlying scientific and expert knowledge.

A further illustration of the selectivity of evidence and knowledge used is a review of a number of assessments of synthetic biology (Synbio Assessments, van Doren 2013) which shows that each individual assessment tends to privilege certain perspectives (e.g. ethical or health implications). The aim or rationale for an assessment influences the selection of actors involved, and this can impact on the provision and selection of knowledge and its perceived robustness in the assessment process. It is therefore important to explicitly specify why the assessment is being done, who for, which actors have been involved, and what considerations are underrepresented or excluded. Providing transparency can support reflexivity and provide legitimacy for the knowledge produced.

Moreover, selectivity of evidence and knowledge is linked to the material interests and resources of actors involved in the rri debates. This is particularly pertinent in cases that are very close to market with high and very tangible material interests at stake.

Case: Responsible - Irresponsible - Responsible? Contestation & the re-design of governance instruments for US bioethanol (Gee / Edler 2014)

In a case analysing the shift of the innovation roadmap of biofuels in the US, actors with significant material interests influenced how knowledge was produced and inserted in the formal negotiation process moderated by government. Similarly, actors with vested material interests can invest significant resources in influencing the knowledge base. This can undermine the legitimacy of the emerging knowledge base. The case shows that transparency as to the sources of knowledge and their justification within formal governance processes is of key importance for the legitimacy of the process. Being explicit about the role of actors with significant material interests can also help to level the participatory field, quietening loud voices and balancing representation – this also links to mediation lesson (Lesson 3)

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Lesson 6: The importance of time, timing and managing tensions of different temporal horizons

The **first main message** of this lesson is that any governance process has to take the different dimension of time very seriously into account. There are different (a) time horizons (e.g. of anticipatory processes), (b) there is the question of the timing of governance action, (c) institutional change takes time d) and there is a need to understand capabilities and capacity building for rri/RRI as a continuous process with a long preparatory lead-in.

The **second** core **message** of this lesson is that **to govern rri processes means to be aware of inherent tensions** between a pressure to follow a discourse on the imperative of speed and acceleration of research and innovation processes on the one hand; and the imperative of their slow-down to facilitate greater care-taking and true normative and behavioural change on the other hand; and that both can be claimed as compatible with increased 'responsibilisation' (See Lesson 1 Organising for Responsibilisation and Deep Institutionalisation).

There are further sub-variants of these discursive tensions over the temporal framing of 'responsibility'. A first highlights the imperative of innovation for competitive economic development (and emphasises the 'need' for an accelerated and accelerating global competition driving to rapid techno-economic development, rewarded by rapid and high returns to global capital investment). A second stresses the need for urgent and rapid societal responsiveness to a set of pressing grand challenges, most notably disease eradication, climate change and ecological catastrophe. This discourse also emphasises acceleration but calls for accelerated responsiveness from the full range of societal actors which may involve either slow down (e.g. in the rate of consumption of natural resources) or the opposite: the rapid development, deployment and targeting of new technologies and innovation processes to address societal challenges.

A third exhorts a general slowing down, in different ways and for different reasons in the name of 'responsibility'. 'Slow' movements such as 'slow'-food and 'slow'-fashion are a response to rapid consumption and associated waste and usually advocate localised, more communitarian, and proclaimed more 'ethical' responses involving the development of qualitatively different technology-economy models and combinations, and could be termed 'grass-roots' responsible innovation[19].

A fourth notion concerns the time-horizon of an entire anticipatory project, such as a national technology 'road-map' (See the van Doren 2014,the UK Synbio Roadmap case). Building consensus in the short term may be counterproductive to maintaining a more open longer-term horizon.

A fifth discourse provides an umbrella to many of the family of RRI aspirations, such as wider societal participation in research and innovation processes, and the development of new products (greater and more considered/careful deployment of RRI governance instruments such as constructive/deliberative technology impact assessments etc.) . This fifth discourse implies both a

[19] See for discussion on temporalities and Responsible Innovation: Randles, S. Dorbeck-Jung, B., Lindner, R., Rip, A. (2014): Report of the Roundtable at S.Net Boston 2013: Where to next for Responsible Innovation' in Coenen, C., Dijkstra, A., Fautz, C., Guivant, J., Konrad, K., Milburn, C., van Lente, H. *Studies of New and Emerging Technologies: Innovation and Responsibility, Engaging with New and Emerging Technologies*, IOS Press Heidleberg

willingness to invest in advance ' preparedness' to build participative capabilities in all sections of society; and simultaneously extending the timing of governance action (longer governance processes) therefore accepting longer temporal horizons; for example in the lead-time to develop new and emerging technologies. And yet since a systematic approach to RRI is a new phenomenon (whilst rri is already in the domain of de-facto existing activity) there is **no evidence from our cases that rri/RRI slows down innovation processes.** Indeed a counter-argument can be made that they save both time and resources related to unforeseen harmful consequences down the line (the main argument put forward to support advance anticipatory exercises). Arguably processes set in train in line with the broad sweep of rri/RRI normative orientations are more societally robust processes that are less likely to derail in the future. **Further the systematically incorporating early processes of anticipatory work[20] with associated institutional learning, may quicken the general thrust of the rri/RRI governance in the future. This is an open empirical question which cannot be answered at the current emergent 'in-the-making' phase of the rri/RRI dynamic.**

However **two further key messages** are worth highlighting under this Lesson. The first is that transversally across the cases, regardless of technology area, country, or originating body (whether government policy, business of NGO), there is a tendency for assessment exercises of various kinds to be commissioned with lead-times that are too short: weeks rather than months. This raises doubts about the authenticity and motivation of the exercise and the ability that it manages to influences the understanding of heterogeneous actors. If assessment exercises are about gathering best available knowledge from a wide and inclusive array of stakeholders they need to have sufficient time and resources to reach-out to the full range of stakeholders and systematically record, hear evidence, analyse and write-up inputs from them all. Otherwise, the credibility of those assessment exercises is limited, and they become a political instrument to be used within the swell of lobbying and advocacy positions.

The second and related lesson is that for RRI to become more than a superficial technocratic response, the modification of existing institutional patterns and structures, would be needed (i.e. '**deep-institutionalisation, see Lesson 1**). **This deep institutionalisation takes time, political will and resources; since incumbent institutional structures need to be altered in a process of 'de-institutionalisation' in parallel with the creation of new institutional configurations.** By contrast the simple box-ticking implementation of single ad-hoc rri/RRI initiatives in order to claim compliance with RRI principles, whichever normative orientation or RRI Framework is followed, is a rapid, but not deep, genuine or authentic affair, as many of our cases testify. In sum, deep institutionalisation takes time. For example in our case of organisational transformation 'The 'Good' University', the organisational and cultural changes at Arizona State University took twelve years and counting.

[20] Consistent with the broad findings of Gee, D. (2013): Late Lessons from Early Warnings. European Environment Agency, Brussels, ISBN 978-92-9213-349-

Case: Integration of RRI in policy advice– A review of the UK synthetic biology roadmap (van Doren 2014)

Organised and moderated rri discussions and outputs that result from it (such as roadmaps, Codes etc.) have a balance to strike between short term satisfying of immediate concerns and the interests of those involved in long term, ongoing issues. Consensus building in the short term may hinder radical thinking in the long term. While this trade-off is unavoidable, it should be made explicit and different options discussed, rather than opting for short or long term only without further discussion. Again, this has a lot to do with the initial framing of an issue entering the debate.

Lesson 7: Multi-level governance - The importance of taking account of multiple levels of governance and seeking synergies between top-down and bottom-up processes

The next three lessons: Lesson 7 (Multi-level governance), Lesson 8 (Alignment of governance measures and instruments), and Lesson 9 (Boundary Objects) are complementary and mutually re-enforcing. In fact all three speak to the wider finding which stresses that governance towards rri/RRI is more effective when it realises the **integrative potential of the rri process itself**. Integration both between levels of governance and across constituencies of actor in terms of standardisation, coherence and commensurability, is needed to be effective in creating a sufficiently stable and accepted governance system of mutually compatible instruments which give a common directionality. Whilst at the same time there are counter pressures for autonomy, differentiation and flexibility, modifying responsibility responses to new or alternative societal cares or concerns, or political, economic and technological contexts.

Multi-level governance has many different forms. It can relate to the political level of city-regions, regions, nations, EU and global governance level, it can relate to different hierarchical levels within large organisations or to different hierarchical levels between organisations at the same political level. In any of those cases it means that there is an interconnectedness of governance processes and rri dynamics between those levels. Any governance process at any given level needs to take this interconnectedness into account, and pay attention both to bottom up and top down dynamics across the levels.

The majority of the cases in our portfolio described multi-level influences, though with different manifestations. In the case of the Bolivian participatory guarantee schemes (Loconto 2015) a remarkably stable structure of local-national-international integration emerges, centred on compatible and interconnected broadly agreed values and principles (food sovereignty, health and nutrition, and opening export markets) which were translated into a range of multi-level governance instruments. The key lesson here was the deliberate design and deployment of instruments, as a fully inclusive process, taking context conditions at other levels into consideration or adjusting them even. As a result, transmission mechanisms between levels exert directionality and influence.

In the case describing the early conversations within the Fraunhofer Society in Germany about what model of rri/RRI might be appropriate for the Society to adopt, the debate was opened by an approach from 1) Federal Ministry of Education and Research taking the role of ‘shadow of hierarchy’ exerting a subtle influence via request – and not compulsion – to the 2) Fraunhofer HQ that the RRI agenda be considered, leading in turn to the Fraunhofer Society organising a workshop to facilitate a discussion inviting the 3) individual Fraunhofer Institutes and 4)research teams which opened a reflection of the future societal role of Fraunhofer (Lindner and Goos 2015). So far the Fraunhofer has not committed itself to a Fraunhofer Society-wide position, and therefore there are no plans to develop new methodologies or instruments. However it does have within its own ranks a unit which has expertise in public dialogue and participation methodologies which has recently re-labelled itself RRI. Despite this the hierarchical transmissions appear to have been more influential than horizontal ones as the influence of the RRI Unit does not seem to have been strong in the discussions so far. Rather stronger in the internal debate is how an RRI agenda sits alongside an

existing culture and income stream from research contracts with large industry and traditional technology clients, who have not to-date pressed for an RRI dimension to the Fraunhofer contracts.

In the UK there is a stark contrast with much more activity around the creation of formal frameworks of RRI, although quite different foci of RRI have emerged distinguishing the emphasis of the two main players the Biotechnology and Biological Sciences Research Council (BBSRC), and Engineering and Physical Sciences Research Council (EPSRC) which traces back to different societal perspectives de-facto emanating from science disciplines origins. Plus, the strong influence that two social scientists (Richard Owen and Jack Stilgoe) played in the development of the EPSRC framework. The multi-level structure of the research system in UK within which the Research Councils play a critical role, is described below.

Case:, Responsible Research and Innovation in the UK research councils: Two experiences with explicit RRI (Stahl Nielsen, Gee and Edler 2014)

The UK Research councils are divided largely according to subject area. Alongside the BBSRC and EPSRC the Arts and Humanities Research Council (AHRC), Economic and Social Research Council (ESRC), Medical Research Council (MRC), Natural Environment Research Council (NERC), Science and Technology Facilities Council (STFC). Their objectives are to promote and support high-quality science, to meet the needs of science users in order to enhance economic competitiveness and general welfare, and to generate public awareness; to communicate research outcomes; to encourage public engagement and dialogue; to disseminate knowledge; and to provide advice.

They sit within a science and research governance system within the UK which highlights both multi-level hierarchical and horizontal transmission mechanisms. They report to the Department for Business Innovation and Skills (BIS) which is the government department responsible for science policy and for the science budget. As such, they are the research councils' government principals. Most research council grants are awarded to researchers or groups of researchers working within Higher Education Institutions and so internal rules at universities play a role for the work of grantees.

Research Councils UK (RCUK) was established in 2002 as a 'strategic partnership' between the research councils[1] and is led by the seven council chief executives meeting in the RCUK Executive Group . RCUK is not a research council and does not fund research. Aiming to "optimise the ways that Research Councils work together to deliver their goals…"[1], it deals with activities that cut across different councils – such as the multi-disciplinary six 'challenges'[1] - and try to improve efficiency by developing shared policies and administrative procedures. It also interacts with the government (i.e. the Department for Business Innovation and Skills (BIS) see below) through the Joint Strategy Group (JSG), and with the European Commission on behalf of the seven councils.

The main message out of this case is that for the issue of developing an understanding and a practice as to RRI the political level above the individual research councils (BIS) and the umbrella organisation RCUK in the UK did not propose any overall guiding framework or mandate for rri developments and thus let the research Councils develop their own governance processes and understandings of RRI, which then took very different forms in different Councils.

The cases bear witness to the importance of a – more or less – coordinated interplay of governance levels with RRI originating in different arenas or, in the case of RCUK, a deliberate free hand for bottom up initiatives of disparate organisations at lower levels. Different organisational or political cultures will give rise to different forms of rri/RRI which one way or the other will combine levels with different pre-existing institutional framework conditions, rri predispositions, capabilities and instruments. This lesson highlights the importance of structures and reporting relationships in transmitting RRI across governance levels.

Lesson 8: Alignment. The importance of aligning and synchronising the normative goals, objectives and procedures of different instruments and measures

When multiple governance instruments are intentionally operating in an aligned manner, or indeed are co-created so that they mutually re-enforce each other, they perform together more strongly as a system 'steer'. Examples for that are an Act, aligned with a voluntary standard, financial and institutional incentive structures, a system of training and human capital support etc.. Creating a suite of **governance instruments by actors working in their localised normative contexts which then are aligned with each other and across levels (see previous lessons)** is likely to generate a better understanding of the values and normative goals of RRI as chosen by actors themselves. This is then likely to be more transformative than the top-down launch at the European level of single instruments, disconnected from the existing system of governance instruments and measures.

For example, the Dutch NanoNextNL programme builds on a long legacy of national co-ordination of multiple nano-governance instruments, and is an example of an attempt to align multiple governance arrangements.

Case: Practicing RRI in NanoNextNL (Walhout 2014)
NanoNextNL, the latest Dutch nano-governance programme, combines three different measures in a research programme, ie aligning a mix of measures, not one single measure: the inclusion of application-oriented research domains addressing societal challenges; a special track on Risk Analysis and Technology Assessment (RATA); and the requirement to comply with the European Code of Conduct for Responsible Nanosciences and Nanotechnologies Research (hereafter referred to as the 'EU-CoC'). This alignment has shown to be constructive as it created a basic understanding within the funding body and the scientists' community as to the direction of travel regarding rri. However, there have been limitations as the alignment of instruments was insufficient, with the rri component of RATA being an add-on rather than fully integrated into the main programme.

When different instruments impacting on research and innovation processes and actor practices have different normative underpinnings, motivations, logics and aims, they work across each other causing ambiguity, confusion, and paradoxical behaviours as actors seek to work with them 'on the ground' leading to bureaucratic or 'tick-box' responses. This phenomenon of measures operating to different logics simultaneously, we might call **responsibility overload** and referred to at Lesson 1. In the case of the incorporation of the EC Code of Conduct for Responsible Nanosciences and Nanotechnologies (EC CoC) within a nanotoxicology laboratory in Italy (ECSIN – European Centre for the Sustainable impact of Nanotechnology, see Arnaldi and Muratorio 2014), the case draws attention to these complexities. In that respect the overriding logic governing the responses of the toxicologists was the needs of their own market-situated **client companies** requiring a testing regime that would demonstrate in turn, to the market (their own customers) that the nano-products and processes had qualities – that they are safe and will not cause ecological harm – that are consistent to their certification as 'sustainable' products. This claim was supported through a particular battery of toxicology tests undertaken at the ECSIN and with the application to client organisations of a voluntary certification standard elaborated by ECSIN itself. While the EC CoC played little or no role in this process directly, the logic of responsibilisation incorporated into

voluntary standards proved effective as an 'inspiration and motivation for research and knowledge transfer activities'. When behavioural change is concerned, i.e. compliance is required, these local instruments were considered more effective because of the greater clarity of rules, their closeness to the local economic context, and the more explicit and deliberate establishment of connections between such regulatory instruments and the localised mandatory ones.

Interestingly, Loconto's analysis of three multinational companies in the agro-bio sector (Unilever, Nestlé and Syngenta) found this internal and external alignment between suites of voluntary instruments and measures to be a feature of multi-nationals *de-facto* governance of responsible research and innovation. Perhaps because large businesses are better able to have full control and autonomy over the normative anchors which govern within their own organisational boundaries, there are two objectives which motivate multinational firms responsiveness to rri: first, to define a lowest common denominator of regulatory compliance, second, to utilise this compliance pro-actively to enhance reputation on the market as a moral agent capable of setting and complying with self-prescribed moral and ethical standards as a marker of 'good business'. In order to do so, they devise a range of aligned instruments internally. Below, Loconto lists the range of instruments she found that just three multi-nationals mobilise in tandem towards this objective.

Case: Critical Organisations: multi-national corporations (MNCs) (Loconto 2015)
Illustration of multiple aligned instruments of multi-national companies to catalyse compliance to external rri pressures, and to enhance their reputation as a moral agent in the market

The MNCs have been progressively working towards bringing their internal governance instruments into alignment. All companies said that there are 'fireable' activities for breaches of compliance with these codes:

- Codes of ethical conduct (for their R&D)
- Codes of business practice
- CSR programs – both external and staff motivational
- Voluntary standards
- Design tools
- Key Performance Indicators (KPI)
- HR tools and incentives
- Foundations
- International CR reporting regimes (e.g., Dow Jones Sustainability Index)
- International multi-stakeholder forums (UN Global Compact, Committee on Food Security)
- Industry Associations
- Boards of Directors

Lesson 9: Boundary objects. The effectiveness of instruments as boundary objects and of actors as boundary-crossing agents

Taking the third of this trilogy of linked lessons, we can turn to the idea of **boundary object** to shed light on **how different** levels, networks, and instruments of rri/RRI governance appear to 'knit' together systemically, in practice. The original concept of boundary object[21] referred to physical objects shared by different groups of researchers: such as research results, data, materials, specimens . Drawn upon by different research groups, these 'objects' were interpretted differently by them. Yet, there was a common enough core understanding to enable the two or more groups to coalese and engage in conversation around the 'shared' object. The data or specimens thus acted as a boundary object between the two groups taking the role of **intermediary** from where new knowledge and understandings could be built and interconnections between differentiated groups made and strengthened. In fact then, the idea of 'transmission' between levels (Lesson 7) now needs to be qualified since an important feature of the boundary object is that it is sufficiently broad (or ambiguous, or flexible) as to form a common bond, even when translated quite differently by respective groups. **Translation** is therefore a better term to capture this mutability than transmission. In so doing the boundary object contributes to a form of **system integration** premised on loose and flexible couplings.

For the governance of rri, boundary objects thus are important to link different actor groups, to provide a common anchor for heterogeneous actors to enter into debate and develop the basis for the necessary alignment to develop a mututally accepted undertanding of the rri challenge. In the case on the Code of Conduct (CoC) discussed in Lesson 8 (Arnaldi 2014) the author notes the potential for the EC CoC to function as a training tool, and by doing so to facilitate conversation between the toxicology scientists and their constituency of mainly SME client companies. .

Case: Anchoring knowledge transfer activities. The EC CoC and normative anchor points in laboratory practices in Italy (Arnaldi 2014).

This case illustrates how a shared Code of Conduct and related training activities can link actors in different organisational settings, with different kinds of expertise. This is helped by the shared affiliation of actors from different organisations to an the overarching (permanent) structure/network or to (temporary) programmes, like the Veneto Nanotechnology Research Cluster, can favour the coordination and cross-fertilisation between different missions of research and technology transfer organisations.

Another case in our study (Muratorio et al 2014) highlights the importance of voluntary regulatory tools to cross boundaries *within* organisations. This highlights the importance of understanding the need for boundary spanning, for active facilitation of alignments not only between different organisations, but between different actor groups within large organisations.

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21 Star, Susan; Griesemer, James (1989). "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39". *Social Studies of Science* 19 (3): 387–420.

Case: Standards and occupational health protection as a case for Res-AGorA (Muratorio et al 2014)

The use of validated and broadly recognised, but non-binding standards in assessing and managing risks in the handling of nanomaterials in the workplace has become a major instrument for dealing with health and safety risks governance framework. The case of those voluntary regulatory tools in occupational health and safety contexts highlights the importance of such tools as boundary objects to facilitate intra-organisational, in particular cross-functional shared work which then helps to bring about a collective position and shared understandings. Where knowldege is new, uncertain and contested, such instruments facilitate internal collaboration between departments and units and are an important internal governance tool.

Van Doren, studying the process of the development of the UK synthetic biology roadmap, argues that although in principle the roadmap has characteristics of boundary object, the way this occurs in practice - as an integrative device across different communities of potential users or participants - depends on whether they were enrolled as participants in the first place in the construction of the tool (this finding connects to Lesson 2 on inclusive interaction).

Case: Integration of RRI in policy advice– A review of the UK synthetic biology roadmap (van Doren 2014)

The construction of a roadmap that can guide a field or sector is potentially a prime tool to link different constituencies, and a boundary object in its own right. In the case of the synbio roadmap however, this function was limited, as the core group involved from the beginning shaped the overall participation. Boundary spanning objects need to be constructed with those stakeholder groups involved that are to be reached by the object.

A key message from this lesson is to understand and pay attention to boundary-objects (such as Codes, Roadmaps, training programmes) and thus the boundary crossing potential in rri/RRI governance processes. It is thus of utmost importance to pay attention to the design of instruments and measures to guide and enable the actor-led integration of research and innovation systems to coalesce around broad principles of responsibility. This lesson connects both with Lesson 3 on intermediation and Lesson 13 on the important role of institutional entrepreneurs and leadership in the bottom-up activation and realisation of this process.

Lesson 10: Institutional Change. Simultaneous institutionalisation and de-institutionalisation processes, organisational re-design and the creation of an rri/RRI 'culture'

For this report we understand institutions as stable patterns of social life such as rules and routines, as well as organisational forms. Scott (1995)[22] distinguished three pillars that underpin institutions: the regulative, the normative and the cultural-cognitive. The cultural-cognitive pillar includes the way things are 'known' and sense is made of the world. The regulative pillar includes the rules that govern the world, whether 'hard' rules such as laws; or other kinds of social rules which can be equally persistent and important in governing practice and differentiating cultures, such as manners at the table or ways of greeting each other. Here, a sense of appropriateness guides the rule and sanctions are socially rather than legally enforced. The normative pillar comprises shared or contested understanding of what is 'good' or 'ought' to be in society and social relations. Normative rules can be remarkably powerful behavioural steers. They are particularly culturally specific, and when normative rules are contested resolution or compromise can be particularly difficult to achieve.

We have found all three pillars to be important in informing the lessons of this report, but differences in normative orientations and goals we have found particularly significant in explaining differences in both inputs and outcomes of many of the cases. **Institutionalisation** involves the stabilisation of patterns of behaviour, organisational structures (both inside organisations and between organisations) and processes and procedures into 'norms'. Institutional structures are hard to change. This means that **processes of institutional change, i.e. the institutionalisation of new quasi rules and routines, ways of doing things, and organisational structures,** must simultaneously involve processes of **de-institutionalistion** (or modification) of present persistent patterns..

Our first point on institutional change is that the governance towards rri/RRI is a process that at the same time questions and challenges pre-existing understanding of what responsibility is, and how it has been embedded into practices. Thus, each governance process is situated against prior institutional patterns, whether formally instituted (think of health and safety rules) or informally but powerfully driving systems (such as the view that 'acceleration' of technological progress correlates with innovation, economic competitiveness, growth and well-being). Thus, in some of the cases we see contestation and challenges to some basic assumptions and premises. For example about the desirability of particular new technology or technologies, to drive innovation or to drive it in a particular direction towards sustainability or sustainable development, or other descriptor of societal/ethical 'desirability'. Of course what is societally and ethically desirable is also normatively contested. Thus, we see rri/RRI as the ongoing process of questioning current, established institutional patterns and norms – the 'status quo' or 'mainstream' - and struggles over the formulation of new guiding rules, routines and norms of practice and incentive structures. This is in particular the case in debates over future anticipated needs, values and well-being of society, and how to embed them into the cares and institutions of today.

[22] Scott, W.R (1995) *Institutions and Organisations* 1st Ed. Thousand Oaks CA: Sage

Critical Organisations: Multi-national corporations (Loconto 2015).
The analysis of responsibilisation processes in three multi national companies all three companies show a gradual shift in their Corporate Social Responsibility CSR policies from being *ad hoc* 'window dressing' style programs to becoming integrated into how they do business. This has differed in each company, but has generally included integrating CSR objectives into Key Performance Indicators; by introducing design tools that can change the relationships between designers and researchers.

In terms of shifting organisational cultures, our cases on multi-national companies (Loconto 2015) echo that of the 'Good University' (Randles 2015) and the establishment of effective ethics committees in Universities (Greissler 2014, see box below). They show that to overcome institutional patterns that are seen as non-compatible with new claims for responsibility organisations should not create new, isolated separate organisational units, for example a sustainability or corporate social responsibility department. Rather, the broad institutionalisation of ideas of responsibility into the culture or 'DNA' or an organisation is supported through governance incentive mechanisms such as Key Performance Indicators (for multi-nationals) and through reducing organisational fragmentation to improve learning, adaptation and feed-back loops (in universities), thereby embedding particular normative goals and understandings of responsibility into all parts of the organisation.

Non-Compulsory Ethics Committees at Austrian Universities (Greissler 2015)
The case studies on ethics committees in an Austrian University illustrates that organisations need to establish structures, procedures and incentive systems. This means they need to change conditions that impede the development of ethics in research and innovation by – inter alia – reducing organizational fragmentation and hierarchical structures limiting free communication and dialogue, provide finances and broad incentive system (not focus solely on impact factors and acquired contract money), stabilize contracts for researchers and have champions of ethical standards at high places in the University hierarchy.

From our cluster of cases, the most stark example of transformative institutional innovation involving simultaneously de-institutionalisation and institutionalisation processes is that of Arizona State University covering the twelve year Presidency of Michael Crow since 2002 (Randles 2015, see box).

The 'Good' University (Randles 2015)
The President of Arizona State University, Crow started with a fundamental critique of what he calls the 'replicant' university model of the American Ivy League which reproduces patterns of exclusive student entry and ivory-tower research, disconnected from the needs of society. His model of the 'New American University' implemented at ASU has, on the contrary been re-institutionalised around the principles of excellence, impact and access. Research excellence is interpreted as trans-disciplinary research oriented to solving societal challenges; impact requires that research to be beneficial to wider society than the internal publishing drivers of academia, and access refers to the achieved aspiration for the student body to reflect the multi-ethnic demographic of Arizona State.

Lesson 11: Capabilities: The systematic building of capabilities at the level of individuals, groups and oranisations

Capabilities-building is the practice to develop skills and competences to encourage and enable the formation of **reflexive actors** across the research and innovation spectrum, with the aim to increase the likelihood that reflexive actors are more likely to be normatively oriented to integrate societal responsiveness, integrative and boundary-crossing perspectives and futures oriented thinking, while familiar also with a suite of assessment and anticipatory methods. Capabilities-building is a **pre-condition for RRI** as it enables actors to become fully contributing participants in responsible research and innovation processes. Such capabilities can be brought about partly through formal training and learning, and partly through experiential learning. However, capabilities-building through formal learning must be deeply rooted and long-term (career-length) if it is to be transformative. Capabilities to be encouraged cover a spectrum of reflexive and collective-working skills, and the embedding of values-driven design[23] into research and product, processes, and services design, aimed at developing skills in group, team, and organisation-level reflexivity at the science-society, technology-society and economy-society interfaces; and includes the building of values-driven entrepreneurial skills (see Lesson 13). Crucially, capabilities-building for actors operating in all types of organisations, needs to be coupled with organisational, system and societal-level capacity building (see Lesson 12).

Whilst the principles of this lesson are easy to pronounce, implementation in practice has been shown to face challenges of integration. One example is the lack of buy-in from host organisations of early career (doctoral) researchers undertaking RRI related training in the Dutch NanoNextNL programme (Walhout 2014, see box below).

Case: Practicing RRI in NanoNextNL (Walhout 2014)
The RATA programme (Risk Analysis and Technology Assessment) was one of the first initiatives to seek to embed RRI within a national research programme on emerging technologies. Originally RATA was a compulsory element of all Doctoral Candidates of the Dutch NanoNextNL programme which funded Nano research and PhD projects. RATA comprised a two-day training course, networking events, and the expectation that RATA considerations would be embedded into all PhD projects. The principles were well received but operationally the programme faced some challenges, in particular recognition of the programmes worth and contribution when trainees returned to their host-lab. During the course of the programme RATA was changed from a compulsory to a voluntary element. The main lesson here is the need to embed rri /RRI practice and learning firmly within the core of the actual research project of early career researchers, not as an add on to it.

A recent UK example that appears to be more integrative with building capacities is the first ever programmatic incorporation of suites of integrated RRI training and activities into the first 5 years life of six new multi-disciplinary synthetic-biology research centres. Those centres were launched in

[23] See for example the programmes combining technology design and engineering and ethics, known as Values-Sensitive Design at University of Delft, NL, under the programme directorship of Prof Dr Jeroen van den Hoven.

January 2015 and funded by the UK Biotechnology and Biological Sciences Research Council (BBSRC) at six universities, together with industrial consortia in England and Wales, forming synbio hubs at: Manchester, Warwick, Edinburgh, Nottingham , Cambridge and Bristol and knowledge hub at Imperial College London with the aim of developing RRI capabilities within the centres' synbio researcher teams.

Professional societies and associations are an organisation type which gets little attention in RRI discourses pronouncing on who should be included in research and innovation interactions, debates and decisions. And yet our case on the establishment of Codes of Conduct in engineering professions, argues the contribution that Professional Associations play in facilitating debate and stabilising the reflexive understanding of the profession and thus affecting the attitudes to and practices of responsibility of individual engineers in everyday work (Arnaldi 2014).

Case: Responsibility and Reflexivity in engineering : professional societies and codes of ethics (Arnaldi 2014).

Arnaldi discusses the value of codes such as the two depicted here to contribute to responsibilisation of professionals:

'As Engineering professions we use our knowledge and skills for the benefit of the world, in order to create engineering solutions for a sustainable future ' (World Federation of Engineering Organisations, Model Code of Ethics).

(Engineers) conduct themselves honourably, responsibly, ethically and lawfully, so as to enhance the honour, reputation, and usefulness of the profession. (Canadian Council of Engineering 2012).

The case argues that the most important leverage for professional codes mobilised through professional association lies exactly in the fact that they support a professional identity, linked to other professional norms and routines and create a sense of professional obligation. Equally, professional associations identify the capabilities required to carry out professional work and translate these capabilities into organised competences to be standardised through professional training (including on-going career development and up-dating training). The associations provide platforms and fora in which the profession can debate within its boundaries the future requirements of professional competences. These professional debates include how the responsibility of the engineer is, and will be, constructed, as well as considering the diverse repertoire of pertinent practical situations and conditions under which those capabilities would be tested.

Lesson 12: Capacities. The systematic building of resources at a societal level to enable rri/RRI

Capacity-building means ensuring that the **resources** (financial, organisational, and social and human capital) and the **means** (in terms of re-designing institutions and incentive structures) are present to create the conditions for responsibilisation processes.. An overarching governance task then, is to build this collective **capacity at the system-level** to enable all actors to pro-actively participate in the normative goal to make research and innovation processes and product outcomes more responsive to societal cares (depicted as a spectrum of social, ethical and ecological needs) and more responsive and anticipative of potential downstream technology-society conflicts and crises that nevertheless cannot be, by their very nature, a-priori entirely anticipated nor entirely mitigated. With regard to the main goals in the governance of RRI (see also the first starting point in the previous section), important strategic objectives are:

- to orientate the **totality of the science, research and technology development** process (in Europe) to build and sustain the embedding of societal and ecological cares into research processes and practices;
- to orientate the innovation system of Europe towards addressing societal challenges as a competiveness strategy in a **multiplicity of ways** that are not top-down prescribed;
- to facilitate the **bottom-up system-building** and design of institutions and incentive structures, by collectively oriented, reflexive, and values-driven institutional entrepreneurs who are alert to, and seek to institutionally minimise 'late-lessons' scenarios.

Returning to our case on engineering professions, professional associations mediate a role beyond building the capabilities of the individuals (micro-level) and promote a collective responsibility to build a body of knowledge and expertise, as well as recognising the significance of the interface between the profession and wider society (macro level).

Case: Responsibility and Reflexivity in engineering : professional societies and codes of ethics (Arnaldi 2014)

"(Engineers shall) (f)oster the public's understanding of technical issues and the role of engineers" (World Federation of Engineering Organisations, Model Code of Ethics).

The notion of capacity-building applies equally to grass-roots or 'bottom-up' forms of self-reflection and self-governance evidenced in both the case on the development of Loconto's case on participatory guarantee schemes in Bolivia (Loconto 2014) where local collectives of farmers and consumers worked together to build suites of technologies, trading rules, and a certification scheme rooted in the principles of food sovereignty; and processes of web-based community building in the case on open-source 3D printing grass-roots or 'garage' innovation (Söderberg 2014). However, Söderberg's case shows that this process, when voluntary, contested and not subjected to stronger impulses of institutional control, has its limits. Progressing from early shoots to the building of a self-regulative capacity is far from given. The experiences described in the cases are very uneven in this

regard and seem to rely upon a strong normative steer, plus entrepreneurial and mobilisation skills within the groups and communities involved to be effective in achieving 'responsibilisation'.

Case: The responsibilisation and regulation of garage innovation in open source 3D printing (Söderberg 2014).

A first lesson in this case of the grass-roots movement of 3D printing is the need of a bottom up innovation community to institutionalise the basic norms and values they share early in the process. The bottom up process in our case illustrates the build-up of an internal community of early developers and users which are decentralised, but organised as a web-based community.

The initial community appeared to be relatively homogeneous in terms of the basic rationales of the innovation practice itself (democratisation of hardware production, open source model). A process of self-responsibilisation, driven by networking and web-based community building of initially like-minded individuals, was successful at the beginning.

However, the growth of the community and the opening up of a broad range of economic opportunity as well as instances of perceived unethical use of the technology have led to a more visible contestation of those initial basic principles, both within the community and across external stakeholders, users and producers. The open, web-based discourse could not sufficiently deal with this contestation, debates were closed to internal fora and conflicts became more visible and sustained.

The case shows a successful initiation of a community capable of driving the development of the technology, but a lack of strong institutionalisation of the initial norms across the community. Once contestation became hot, this deficiency became apparent, and seemed to have weakened the position of the initial core community over time also vis-à-vis other stakeholders outside the community.

Lesson 13: Institutional Leadership and Entrepreneurship

This lesson is in essence about the **enabling of key-actors, groups, organisations, and wider society to create spaces, resources, and support for values-driven institutional entrepreneurialism towards rri/RRI.** We can describe this lesson at three levels. The first level is the level of the **key actors**, or **champions**, of de-facto responsible research and innovation, these individuals are critical actors in articulating 'visions' (see lesson 4) and in providing practical roadmaps and mobilising people, resources and financial capital to design and operationalise demonstration projects of their vision, i.e. translate normative goals of societal betterment into practical action. The modus operandi of these individuals is adaptation and experimentation. Typically we find these individuals also adept at working in a team of close, committed senior and junior colleagues who share their visions (or have been recruited as like-minded to the leader), as well as mentoring younger colleagues to carry forwards and support the desired future in various complementary ways. Functional, technical and disciplinary skills differ across these teams, but ideally complement each other in an effective way providing the mechanism for upscaling the enacted vision. Important to this form of anticipation is a capability to illuminate the 'wrongs' of the current status quo, including drawing attention to routines of conduct and behaviour and (the incentive structures that drive that behaviour) often invisibly or beyond active conscious critique, i.e. taken for granted as 'the way things are done around here'. An excellent example of this role is Michael Crow, President of Arizona State University.

The 'Good' University (Randles 2015)
President of Arizona State University Michael Crow has institutionalised a new vision he calls 'The New American (Public) University'. This vision is built on the three design principles of 'Excellence' (understood as societal relevance of research conducted in multi-disciplinary teams to address societal challenges) 'Access' (a student body which reflects the demographic of the State realised through positive recruitment of Hispanic and other ethnic backgrounds) and 'Impact' (engagement particularly of local stakeholders to ensure research has societal impact) . These are brought together under the philosophy of 'public values and collective action' or 'managing publicness'

Other cases also highlight the role of key championing actors. For example in the case of **Walhout and Dorbeck-Jung : Nanosafety governance in the Netherlands (2014),** the presence of a key-actor 'pilot project' is attributed with keeping the project going, and absence of a motivated figure-head in the other, was put forward as one reason for the second project stalling. Synthesising the results from the Voices study on institutional entrepreneurs, the box below formulates a set of common characteristics.

Case: 'Voices' : Institutional Entrepreneurship and rri (Randles 2015)
Criteria, capabilities and deep commitments of institutional entrepreneurs of rri as defined through interviews with institutional entrepreneurs:

- Normative/Values-based vision of responsible research and innovation comprises:
  - Having a meta- concern for collective care & public good
  - Plus context-specific focus (e.g. ecological/environment & sustainability, food production, human health & well-being; diversity : gender and ethnic inclusion, international development, science democracy etc.)….
- Critical/reflexive about the world as it exists, and imagining a 'counter-thesis' of a better world
- Capabilities for boundary crossing and intermediation, for effective action and communication in multiple settings
- Pragmatic, but from a philosophical base, to be able to find ways to make change happen (even when change is resisted)
- Mobilises resources and collective action to do so.
- Astute resources manager including clear economic governance and income model
- Adaptive, tenacious and strategic , committed for the long term
- Risk-taking, including risk-taking with own career in order to follow beliefs and values. Potentially non-traditional, non-linear career paths.

The second level is the critical middle-management level in organisations. An example of this is the Principal Investigator in university structures, personnel at this level are responsible for teams of researchers. Institutional entrepreneurs at this level can have important influence not only over the team's work and tasks, but also influence over the team's ethical and moral reflection, opinions, and practice (e.g. Randles 2015 case on The Good University). While those individuals have a broad range of tasks and roles (responsibilities towards societal engagement, teaching and research input generation and publishing), institutional entrepreneurs are shown to be able to combine these multiple tasks effectively. This phenomenon has been investigated in separate research attracting the label 'The Ambidextrous PI'. An example here is described in the Fraunhofer Society, where a key actor and champion of RRI was the head of the new RRI Unit at the Fraunhofer headquarters. However, while she possessed many of the personal characteristics of an institutional entrepreneur, the limits of the 'top-down' setting in the Fraunhofer Society, with strong independent institutes, with a more powerful influence coming from the Ministry of Education and Research to the senior management team and governors at Fraunhofer Headquarter tasked with working out strategically what RRI would look like for their own organisation (Lindner and Goos 2015).

The third and final level is the organisational culture itself, an organisational culture of institutional entrepreneurialism involving the creation of a shared commitment to certain specified normative societal goals, involves mobilising this level also:

Case: The 'Good' University? Arizona State University (Randles 2015)

An interview quote illustrates the entrepreneurial culture in Universities: 'I mean entrepreneurship in all ways. In research, all of our leaders are also doers. By the authority of institution, entrepreneurship infuses everything we do… I believe every student to be entrepreneurially minded – how are you creative/innovative? – how do you solve problems/risk? Entrepreneurialism is an inherent and important characteristic that we want to develop across the university. How to promote this? How to put it into the fabric and make it available to all?... we provide opportunities for students to try out new ideas, ..have discussions, distil ideas, provide opportunities to turn their ideas into projects…. Some of these things are about culture they are not done in one course or school but embedded in the culture of the University' (interview with Sethuraman 'Panch' Panchanathan, conducted November 2013).

4 Conclusions

This short synthesis report has provided 13 lessons from our empirical material in Res-AGorA. The report aims to provide an insight to practitioners and policy drawing on the concrete empirical findings from the 25 case studies and two further ongoing Res-AGorA studies[24]. The generation of the case studies and subsequent data analysis was guided by a Research Heuristic which was developed and refined by combining reflections from the academic literature and theory; with early findings from our Stage 1 inductive exploratory cases. Our data analysis strategy was to 'triangulate' and strengthen our confidence in each of the lessons by looking across the repository of cases for evidence to support each lesson, from two or more contrasting cases. The 13 lessons which have been derived through this process provide a stepping-off point for the generation of broader principles to inform the construction of a socio-normative governance framework as the main output of the Res-AGorA project. This also means that the conclusions reached in this report do not represent the final conclusions of Res-AGorA at all, rather they are an interim step towards the final outputs, which will also include input from the forthcoming participatory Stakeholder workshops. The final design of our proposed Res-AGorA framework for Responsible Research and Innovation in Europe will draw upon all of these interim outputs.

For the emergent idea of 'RRI in-the making' there has been some coalescing of focus evidenced in our literature reviews[25] and case studies on:

i) A prospective and 'anticipatory' understanding of responsibility, as taking care of the future through processes and institutions set in place today.
ii) A systemic or integrative understanding of responsibility as distributed across a wider spectrum of heterogeneous actors, therefore requiring deliberate steps to organise their participation in governance processes.
iii) A spectrum of research and innovation contexts and situations, intentionally pushing towards attention to *innovation* (than perhaps current formulations of RRI, with a strong focus on *research* have done).
iv) As particularly concerned with concerted action to orientate multi-disciplinary teams of actors, and the inclusion of a wider multiplicity of organisation types and actors, to address societal problems or challenges.

Governance of rri as a process of deep institutionalisation

In our understanding, the main purpose of governance of rri is to work towards responsibilisation and deep institutionalisation, where responsibilisation acts as a '**pre-requisite for actors to**

[24] Small and Divided Worlds: A Systematic review and scientometric analysis of RRI literature. Elise Tancoigne, Sally Randles, Pierre-Benoit Joly and 'Voices Visions and Action of RRI' Institutional Entrepreneurs and Responsible Research and Innovation. Authors: Sally Randles, Elise Tancoigne, Kerstin Goos.

[25] For example Randles, S., Loconto, A., Walhout, A.B and Lindner, R., (2014) '*Framings and Frameworks of Responsible Research and Innovation*' based on the presentation to EASST Conference 17-19 September 2014 presentation to the European Commission 'GO4' workshop of the Responsible Research and Innovation projects, 12 September 2013 and paper (forthcoming).

internalise social values (such as consumer safety or occupational health) and to ensure that these values are built into regulatory practices' (Dorbeck-Jung and Shelly-Egan 2013 : 56)[26] and deep institutionalisation where '**the deep institutionalisation of responsible research and innovation is a set of necessary conditions against which claims to responsibility can be assessed. It involves effective transformation towards a set of articulated normative goals embedding values into practices and processes and orienting action towards those goals'.** (Randles et al 2014: 32)[27]

What we have achieved through analysis of these cases is significant **progress from a theorisation** of responsibilisation and deep institutionalisation, **to empirical demonstration** of elements of it Importantly, the cases cover the breadth of research and innovation activities, and thus demonstrate first, that responsibilisation must not be focused too much on the research side of the spectrum only, and second, in many cases research and innovation activities interplay and create complex rri constellations, with very heterogeneous expectations and additional governance challenges.

We have numerous examples in our cases where governance processes have led to **transformation** in the sense of responsibilisation and deep institutionalisation. However, the cases also demonstrate that transformation often has not happened or is, in our judgement, not likely to happen. For example, we see cases in which actors, intending to 'do the right thing', initiated flawed processes, e.g. deliberately or inadvertently excluding certain actors from deliberative processes, or undertaking consultations very fast, thereby losing touch with crucial criteria of legitimacy and trust-building.

Developing our 13 lessons also allows us to identify major rri governance hoaxes such as (a) inauthentic or cynical use of RRI as **'responsibility-wash'** where claims to responsibility and are not supported by practice that warrants the label, (b) **responsibility-overload**, where a bureaucratic approach is taken to loading new dimensions and expectations of responsible conduct onto old, potentially producing perverse outcome of 'tick-boxing'; or (c) **re-labelling of existing initiatives as RRI**, used to re-badge an old fad as a new one. The case analyses allow us to stress that rri/RRI must be understood, conceptualised and designed as an ongoing process of deep institutionalisation, rather than as ad-hoc initiatives without any sense for creating the necessary pre-conditions in terms of capability and capacity, with entirely unrealistic claims as for timing of change and breadth and depth of change.

Therefore, our lessons, taken together, drive to **responsibilisation and deep institutionalisation** as highlighting four distinguishing features:

(1) Its long-haul, long-term nature.

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[26] Dorbeck-Jung, B. & Shelley-Egan, C. (2013) Meta-Regulation and Nanotechnologies: The Challenge of Responsibilisation Within the European Commission's Code of Conduct for Responsible Nanosciences and Nanotechnologies Research), *Nanoethics* (2013) 7:55–68

[27] Randles, S., Dorbeck-Jung, B., Lindner, R., Rip, A.,(2014) 'Report of the Roundtable at S.Net 2013 : Where to next for Responsible Innovation?' in Coenen, C., Dijkstra, A., Fautz, C., Guivant, J., Milburn, C., van Lente, H., eds Innovation and Responsibility, IOS Press AKA , Heidelberg

(2) Its transformative dynamic: the co-evolution of technological innovations and governance innovations serves to transform agents, thus affecting a (re)institutionalisation in the process of (de)institutionalising[28] prior orientations.
(3) Its reliance of establishing the necessary institutional pre-conditions such as capability and capacity building to enable and drive responsibilisation.
(4) Its inter-dependent systemic nature, comprising the interplay with supporting infrastructures of technologies, social norms and routines, pre-existing soft governance regimes as well as economic and ideological logics.

All in all, we urge not to evaluate the effectiveness of rri processes prematurely; since like all innovation processes it will comprise successful and unsuccessful experiments both of which equally produce valuable learning (Randles et al 2014)[29]. Rather, to ensure that the lessons offered here from a substantive base of case study material, work to feed into the RRI Framework building of practitioners themselves, and that the policy maker participates in, observes, monitors, and learns from the institutionalisation of rri principles and RRI frameworks.

The following conclusions and implications for practice and policy build upon our understanding of governance of rri/RRI as processes towards responsibilisation and deep institutionalisation . Moreover the set of implications on **governance processes,** below, concerns the on-the-ground practices and procedures of actors, more or less organised through a variety of institutional arrangements, which combine groups of individuals coming together to undertake reflections, deliberations and the implementation of responsibilities. And the design and employment governance instruments, methods and techniques, to facilitate, guide or otherwise regulate their practices. This is not a smooth process rather we acknowledge from the outset that is a political process **featuring contestation on many levels and over multiple elements; from the challenging of societal goals themselves, to the details of practice and process**.

The second set of implications is addressed at policy, more specifically, and in line with the Res-AGorA remit, at policy at European level. These implications are concerned with **institutionalisation processes** and **the policy implications** and the necessary 'background' capacities, capabilities, and institutional conditions which enable or constrain the transformative potential of responsible research and innovation. This 'background conditioning' also includes the explicit or implicit embedding of normative goals and orientations into existing institutions, their contestation, and scope for the development (or not) of new articulations of societal goals and needs.

In the following we now offer preliminary reflections and implications from our study, for stakeholders and practitioners of governing responsible research and innovation; and further reflections specifically for the European Commission policy making process.

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[28] (De)Institutionalisation is a compound term which refers to simultaneous institutionalisation and deinstitutionalisation processes, rather akin the Schumpetarian notion of innovation as 'creative-destruction'

[29] Randles, S., Dorbeck-Jung, B., Lindner, R., Rip, A.,(2014) 'Report of the Roundtable at S.Net 2013 : Where to next for Responsible Innovation?' in Coenen, C., Dijkstra, A., Fautz, C., Guivant, J., Milburn, C., van Lente, H., eds Innovation and Responsibility, IOS Press AKA , Heidelberg

Governance implications for practitioners[30]

i) For hundreds of years, societal values and understandings of 'good' or responsible conduct have infused actor practices in contexts of research and innovation, whether through formally organised governance procedures and the deployment of formal methodologies and tools or not, across the spectrum of research and innovation contexts. **We have called this de-facto governance of responsible research and innovation (rri). Our cases bear witness to rich and varied examples of rri. There is much good and effective practice already existing**.

ii) However our cases bear witness to, and our lessons highlight that there are many examples where simple procedural aspects of rri such as inclusion/exclusion of actors; or rushed or in-transparent processes and the absence of a perceived neutral or intermediation body steering the governance process represent **procedural weaknesses which undermine legitimacy and trust in processes.**

iii) A key lesson for practitioners therefore is that implementing **early and open consultation and conversations about the aim of the process is important. This needs to recognise that the way the 'problem' is framed at this stage, in particular the normative orientation and goals of it** (which societal values are being assumed by whom, and to what ends?), will shape the rest of the process, in terms of which actors are included/excluded, the weightings given to different participating voices etc,. Notwithstanding we make the assumption that this process will be itself subject to contestation, such that it critically involves legitimisation and enrolment processes, and is inherently political.

iv) In cognate areas such as sustainability, (corporate) social responsibility, and ethics, organisations are finding ways to embed values throughout the organisation **as a cultural dimension 'within the DNA of an organisation' rather than as a bolt-on unit of department. It is equally important that incentive and reward structures support rather than operate in a contradictory way to these values**; otherwise perverse behavioural responses will result as individuals seek to reconcile incompatible or unclear objectives and priorities in their daily practice.

v) We see in the case studies, the realisation of societal values embedded into practice and products of organisations, together with new pressures to change or modify these values manifesting in many forms and from many directions: from the value orientations of leaders, change-agents and institutional entrepreneurs; from external regulatory pressures; from the need to maintain and build reputational assets as external stakeholders such as ethical consumers and media and NGOs who are themselves becoming more vigilant and professionalised in organising campaigns to 'out' perceived misdemeanours that fall short of discursive societal standards. **These processes bring new demands for transparency and transparent conduct with 'reputation' and 'good standing' becoming a contemporary**

[30] We refer broadly to the range of societal actors involved in research and innovation practices and processes; and others from a civil, professional or regulatory perspective with an interest in the outputs and outcomes of research and innovation processes.

indicator of competitive advantage and superior performance across a host of organisational forms. An agenda which pays explicit attention to rri can help stakeholders develop positive reputation through their own demonstrable policy and practices.

vi) As stated especially in lesson 13, our cases did also reveal **cynical approaches and the potential for responsibility wash, responsibility overload, and re-labelling of existing initiatives 'RRI'. Such strategies potentially undermine the concepts of responsible research and innovation**, both for those engaging in such practices, but also in terms of spill-over to the wider emergent 'RRI in-the making' concept and practice.

Implications for Policy Making – with a focus at EU level – supporting institutionalisation processes

i) Turning to the emergence of new explicit frameworks of Responsible Research and Innovation, which we have labelled RRI, such examples are at very early stages of development and testing. Originating from conversations primarily between social scientists and policy makers, at the EU and member states levels, particularly in the UK and Netherlands, we see also reflections sponsored by the Federal Government in Germany[31]. **Such new frameworks will take their place within a plethora of existing voluntary** instruments, and need to acknowledge, at the very least, that **systems of regulatory instruments** govern behaviours, not individual or ad-hoc ones. Attention to the alignment and compatibility of measures, and to multi-level governance phenomenon, are crucial to the introduction of any new regulatory instrument or framework.

In fact if we understand the emergence of new RRI frameworks (including any frameworks emanating from the European Commission) as entering an existing landscape of rri, then we can understand that in fact the ongoing and continual evolution of responsible research and innovation will combine the dynamics of de facto rri and RRI frameworks, in a process of mutual adjustment and governance innovation, characterised by a dual movement to standardise and stabilise on the one hand; and to create new tools and frameworks to suit specific local conditions, contexts and priorities over responsibilities and perceived pressing societal problems on the other. **Hence, governing towards deep institutionalisation [32] and responsibilisation needs to take into account the interplay of the de facto dynamics (rri) and formal frameworks (RRI) .**

ii) In fact the recommendation of this Res-AGorA report on the basis of the case lessons is that any new framework at the EU level takes the form of a **meta-regulatory tool**, with the objective of enabling actors to develop their own detailed responses in terms of shaping and steering behaviours, through local experiential learning. This involves setting broad principles for the

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31 The Res-AGorA MORRI project confirms that very little policy activity explicitly referring to Responsible Research and Innovation is taking place in the 16 member states being monitored.

32 Recall Lesson 1 – deep institutionalisation involves the embedding of particular societal values into the normative base of organisations and research and innovation systems. Simply the introduction of new RRI Frameworks does not equate to deep institutionalisation. Indeed the thirteen lessons bear witness to the kinds of efforts that are needed to deeply institutionalise new framings and understandings of RRI into existing rri landscapes as a transformational process, involving, but going a long way beyond, the design and implementation of new governance instruments and tools.

framework itself and supporting it with attention to capacity and capability building and encouraging deeper institutional change as a facilitative tool, rather than designing very detailed or prescriptive criteria 'top-down'. This is a general high-level recommendation which is addressed more explicitly in the Res-AGorA Framework principles and design process co-constructed with Stakeholders during 2015.

iii) Our lessons to RRI in terms of responsibilisation and deep institutionalisation, stress the current institutional **disconnect and disjuncture between responsible research and responsible innovation. H2020 provides a valuable opportunity to integrate these two sides of RRI.** In particular Pillar 3 provides an **opportunity to combine an approach which steers research and innovation systems towards addressing societal grand challenges, with the incorporation of RRI principles,** informed by our lessons 1-13. H2020 also provides an opportunity to widen the perspectives and disciplines inputting to RRI, if there is a genuine wish to make it about innovation as well as about research, then **perspectives from political economy can support and enhance the current focus** on Science in Society informed primarily by social scientists of science and technology studies.

iv) Our lessons on institutional change provide input to the **design of concrete policy recommendations such as supporting capability and capacity building , and supporting institutional entrepreneurs of RRI** from all kinds of organisations (policy, academia, industry , civic society and social enterprises). The lessons on institutional change point to the understanding of **the dynamics of rri/RRI as being about cultural change;** and highlight the point that **structural institutional conditions need to be addressed** in parallel with **support for ground-level practice; and that institutional change is a long and deep process if it is to be authentic and genuinely motivated.**

Appendix I: List of Cases

Stage 1 cases, conducted between September –December 2013.

Integration of RRI in policy advice– the case of synthetic biology assessments (health; medical; food; agriculture; energy). Author: Davy van Doren, Fraunhofer ISI
RRI governance in Research Infrastructures (material sciences). Author: Mickael Pero, Fraunhofer ISI
Fracking in Austria (energy and carbon capture). Author: Alexander Lang, IHS Vienna
Nanosafety governance in the Netherlands (nanotechnology). Author: Bart Walhout, University of Twente
Responsibilisation phenomena relating the EC Code of conduct for Responsible Nanosciences and Nanotechnologies Research (health; medical; generic technology). Authors: Daniele Ruggiu, Elena Pariotti, Guido Gorgoni, Simone Arnaldi, University of Padua
Occupational health protection in standardisation experiences as an example of self-regulation (health; medical). Authors: Alessia Muratorio, Guido Gorgoni, Elena Pariotti, Simone Arnaldi, University of Padua
When 'responsible' becomes 'irresponsible': biofuels in the USA and Brazil (energy; agriculture; food). Authors: Sally Gee, Jakob Edler, University of Manchester
RRI in Russia: where society is silent and the state controls the floor. Author: Evgeny Klochikhin, University of Manchester [not yet published]

Stage 2 cases, conducted between February and April 2014.

The responsibilisation and regulation of garage innovation open source 3D printing (advanced manufacturing). Author: Johan Söderberg, IFRIS
Linking responsible research and innovation on the farm: The case of Participatory Guarantee Systems (agriculture; food). Author: Allison Loconto, IFRIS
The responsibilisation and regulation of garage innovation: DIY-drug innovation in the psychonaut subculture (health). Author: Johan Söderberg, IFRIS
'Fracking in Austria and the UK – A comparative study' (geo-engineering; energy). Author: Alexander Lang, IHS Vienna
Responsible -> Irresponsible -> Responsible? Contestation & the re-design of governance instruments for US bioethanol (energy; agriculture; food; livestock). Authors: Sally Gee, Jakob Edler, Manchester University.
Anchoring knowledge transfer activities. The EC CoC and normative anchor points in laboratory practices in Italy (nano-toxicology). Authors: Simone Arnaldi, Alessia Muratorio, University of Padua
Horizontal Foresight to Address Societal Challenges in Danish Priority-setting for Strategic Research. Author: Morten Velsing Nielsen, Danish Board of Technology
Integration of RRI in policy advice– A review of the UK synthetic biology roadmap (health; medical; food; agriculture; energy). Author: Davy van Doren, Fraunhofer ISI
Xenotransplantation (health: medical). Author: Erich Greissler
Non-Compulsory Ethics Committees at Austrian Universities (cross-disciplinary). Author: Erich Griessler

Stage 3 cases, conducted between February and April 2014 conducted between June and December 2014.

Critical Organisations: Professional Associations : Responsibility and reflexivity in engineering: professional societies and codes of ethics (engineering). Authors: Simone Arnaldi, Alessia Muratorio, University of Padua
Historical and in-depth case study of a German research organisation: The Fraunhofer Society and its new RRI Unit. Authors: Kerstin Goos, Ralf Lindner, Fraunhofer ISI
Governance structures affecting data protection in advanced manufacturing – How much room does Germany's ambition to lead the fourth industrial revolution leave for RRI? (advanced manufacturing). Authors: Daniel Bachlechner, Timo Leimbach, Fraunhofer ISI
'Practicing RRI in NanoNextNL' (nanotechnology). Author: Bart Walhout, University of Twente
Critical Organisation-types, The 'Good University'. Author: Sally Randles, University of Manchester
Critical organisations: Research Councils of UK. Authors: Kalle Stahl Nielsen, Sally Gee, Jakob Edler, University of Manchester
Critical organisations: Multi-national Corporations (ag-bio; consumer). Author: Allison Loconto, IFRIS
'Voices Visions and Action of RRI': Institutional Entrepreneurship and de-facto responsible research and innovation. Authors: Sally Randles, Elise Tancoigne, Kerstin Goos. University of Manchester, IFRIS, Fraunhofer ISI

Appendix II:

Res-AGorA research model for WP3 stage 2 cases

University of Twente:

Bart Walhout, Stefan Kuhlmann, Bärbel Dorbeck Jung

University of Manchester:

Jakob Edler, Sally Randles, Sally Gee

January 2014

1. Introduction - basic understanding of how to use the Res-AGorA research model

In this document we detail the key questions orienting all cases; the developing of conceptual building blocks': their ordering and relationship to each other; and a list of the 'descriptors' that we ask all case studies to use as the critical organizing and investigative elements of your enquiry.

These dimensions (the questions, conceptual building blocks and the descriptors) provide the tools through which the research model is operationalized into the case studies. As mentioned in the introduction, we first ask the case workers to create a case study overview/proposal incorporating the elements (conceptual building blocks and descriptors) of the research model in order to organize, focus, and present your case proposal. Add your own additional descriptors if you deem this relevant. This overview will also help us by serving as a checklist in accounting for heterogeneity when drawing transversal lessons.

While the above overview/proposal basically is a filling-in exercise, the case study reports have to present the various aspects covered by the research model in a case-narrative that positions these aspects in relation to the lessons that can be learned from the case. To accomplish this task we ask the case workers to carefully read the next chapter for a good understanding of what is of our specific interest in Res-AGorA.

Importantly, Res-AGorA is not about developing the actual content of yet another normative RRI framework. We seek to develop a governance framework, a framework that takes account of the actor landscapes, governance arrangements, instruments, processes and practices (and their conditioning) that lead to specific material outcomes. Different to the Pilot cases, we now put more emphasis on micro-level deep analysis of processes and implementation, at the level of initiatives, projects, and organized action (see below on actor landscapes and arrangements) . However, we do not lose sight of meta-level or systemic and institutional conditioning that may help to explain variety in different examples of de facto RRI governance.

The most important improvement in the research model, is that we now specify how to capture particular aspects of the de facto governance of RRI and how to assess in what degrees the de facto governance of RRI is 'doing well'. In chapter 2 we explain in detail what "well-doing" of governance means. In short, well-doing is qualified as the productive and constructive interaction of actors towards effective and legitimate transformation. That is: an acceptance of a shared understanding of responsibility, and the development and application of instruments, mechanisms and processes which serve to embed this shared understanding into practice to an extent that it guides and structures reflections, learning, behavior or decision making. To count as transformation means that it not just is ***implemented,*** but that it ***makes a difference***.

The socio-normative aspect of the final governance framework will have as an explicit objective to highlight what 'well-doing' means in different context-specific cases (extrapolating to generic situations) and to provide guidance on those governance processes and practices that encourage systemic 'well-doing' of RRI governance.

So, we would like to ask you to start with assessing in what aspects and to what extent the de facto governance of RRI in your case is 'doing well' and subsequently analyze how this 'well-doing' is conditioned by the characteristics of your case as described by the other items of the research model. It is from these relations between achievements and conditions that we will draw lessons for governance. Guidance in these tasks will be provided and coordinated by UniMan.

2. The Res-AGorA research model for learning from the de facto governance of RRI

In this chapter we first summarize the basic thrust, research questions and conceptual elements of the Res-AGorA research model, as developed for Stage 1 of the empirical program (the pilot cases). Next, we discuss in detail how to understand in what degrees the de facto governance of RRI can be viewed as 'doing well'.

2.1 The Res-AGorA research model

The basic thrust of Res-AGorA is to learn from the de facto governance of RRI: the governance of RRI as it is being conditioned and shaped in real-world situations. The rationale behind our approach departs from the observation that in the governance of research and innovation (R&I) there are already manifold mechanisms by which private and public actors, involved in and affected by innovation, interact in order to define normative directions for R&I, whether these mechanisms resort under the heading of RRI or not. In many cases the governance challenge for RRI will not be a lack of principles, nor of procedures, but of strategies to improve the effectiveness and legitimacy of the governance mechanisms involved. Therefore we wish to *understand* how processes of 'RRI in the making' are conditioned and to *draw lessons* for an overarching governance framework. Both aspects of learning are captured by our two research questions:

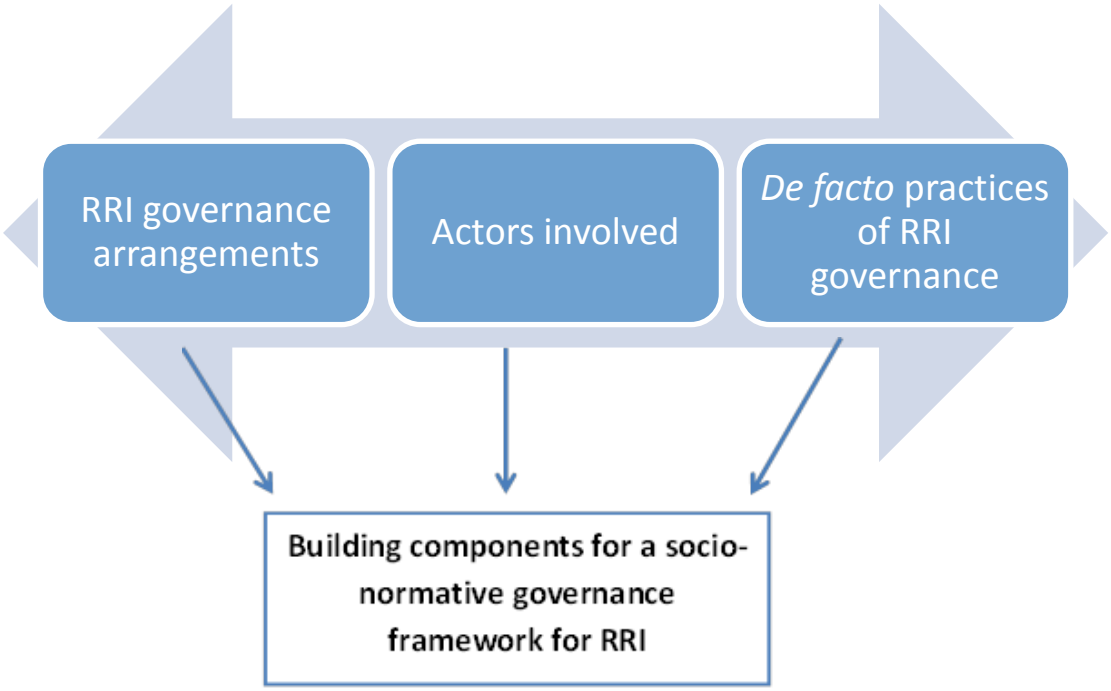
RQ 1: *How is 'RRI in the making' conditioned?*

RQ 2: *Are there building components for a socio-normative governance framework?*

We also have been drawing up a research model that describes the conceptual targets in these two research questions (see Figure 1, edited from D2.2). With regard to RQ 1 we discern three main dimensions:

- Characteristics of the **governance arrangements** and objectives around which actors mobilize resources and personnel in an attempt to realize responsibility in research and innovation
- Characteristics of the **actor landscape** involved
- Characteristics of **de facto governance practices**, being the places and spaces in which the RRI governance arrangements are called upon, objectives are negotiated and instruments are implemented.

Figure 1: Research model in search of components for the RRI governance framework



In the next chapter we provide a list of descriptors and key questions by which the three dimensions of the research model are operationalized for use in the case studies. In the remainder of this chapter we focus on the dimension of 'de facto RRI governance practices', concerning the actual governance dynamics evolving over time. This is linked to, but differing from the governance arrangements, which capture the 'formal' aspects of instruments and procedures. For analyzing and assessing the de facto governance of RRI we are interested in the actual 'arenas' (places and spaces) in which and by which the modes and qualities of interactions are defined and hence the conditioning of 'RRI in the making' takes shape. Think of processes of agenda setting, the articulation of ambitions and translations into instruments. It is in these processes that strategic behavior occurs and certain frames gain dominance, while other perspectives can be silenced.

The challenge for Res-AGorA is to capture in what aspects and to what extend the de facto governance of RRI is 'doing well', *in relation to* how the de facto governance of RRI is conditioned by the characteristics of the arrangements, actors and practices involved. To this end we will specify how to understand 'well-doing' in the next section.

2.2 Understanding 'well-doing' of (de facto) governance

So far, we have used 'well-doing' as an overarching notion for assessing the de facto governance of RRI in the same way as, for example, the notion of 'good governance' is used. The difference is that while 'good governance' criteria can be part of RRI governance arrangements and procedures, we are interested in how these are played out in de facto practices. However, as for 'good governance', we have to specify what 'well-doing' of the de facto governance of RRI entails. We will do so in two steps:

a) Discussing what is of our specific interest in the governance of RRI, so as to better understand what the specification of well-doing should be about. We will argue that key factors contributing to the well-doing of the de facto governance of RRI can be grouped under the headings of 'responsibilisation' and 'managing contestation'.

b) Understanding 'well-doing' in the context of *de facto* governance as emerging from or produced by *interactions*, which in turn can be assessed to what extend these are 'constructive' and/or 'productive'.

Conceptually, both steps translate into a matrix, displayed in the table below. In the remainder of this section we will explain how the items in the table have to be understood. However, this discussion first of all serves the conceptual understanding of how the different elements of a multi-faceted concept like 'well-doing' are related to each other. In the case studies the set of descriptors for well-doing can be used 'list-wise' (see next chapter). In a next step we have to identify which relations are relevant and useful for feeding into the construction of an overarching framework for the governance of RRI.

Table 1: Specification of factors contributing to 'well-doing'

	Constructive (input requirements)	Productive (transformation)
Responsibilisation	▪ Actor inclusion ▪ Robustness of the knowledge base ▪ Capacities for learning ▪ Embedding of responsibility	▪ Actors change behavior / attitude in line with new understandings of responsibility
Managing contestation	▪ Procedures and 'rules of the game' ▪ Transparency ▪ Trust in the de facto governance process	▪ Governance arrangements align with or are changed towards input requirements (constructive)

Ad a) Responsibilisation and managing contestation

In Res-AGorA we look to RRI as an object of governance, linking 'Responsible' to 'Research' and Innovation': "*RRI is supported by governance that is facilitating research and innovation processes and achievements following particular normative principles, objectives and outcomes*." So, we do not focus on what RRI is, but by what processes and mechanisms it is thought to be realized. Consequently, our 'well-doing' is related to processes and instrumentation in relation to the dynamic interplay of actors and factors, i.e. their resources and interests, arenas for debate and fora for negotiation[33], rules of the game, etc. In the case studies this can apply to 'multi-actor' settings, such as stakeholders deliberating over fracking or sustainability certification, but also to multinationals with their internal divisions of labor and coordination and responses to external actors and claims.

However, what makes our focus specifically challenging is that not only governance is a dynamic process, including strategic games, but that RRI is a moving target as well. While actors may agree on normative principles, objectives and outcomes in general terms, these have to be (re)articulated and specified in relation to the novelty produced by research and innovation as well as in relation to concurrent objectives, or to be reinterpreted in response to change in the societal context.

In close connection, the effectiveness and legitimacy of the governance arrangements by which the normative objectives of RRI have to be realized is often challenged. Contestation can arise from conflicting logics, polyvalent valuation, overlapping if not competing arrangements (heterarchy), incongruent framings or ambiguities in proposed solutions. While such tensions occur as much within organizations, these can be more visible *between* organized parties, up to (public) controversy, thereby bringing along its own dynamics, for example when it is about the (perceived) direction of a scientific field or technological domain field.

In this context the emerging discourse on RRI has to be understood as a quest, on the one hand for urging actors to be what they understand as truly responsive with regard to normative principles, objectives and outcomes, while on the other hand (re-)designing procedures and institutions to align competing claims of responsibility, effectiveness and legitimacy. We will group the range of factors that are said to be essential for coping with these challenges under the headings of 'responsibilisation' and 'managing contestation':

- **Responsibilisation** is about the governance of (self-)stimulating actors to care for their duties of being anticipatory, reflexive, responsive, etc… by drawing on a clear understanding of their responsibilities and un-coerced application of values. This stimulating can take the form of facilitating, equipping and rewarding of actors to take their responsibilities seriously.
- **Managing contestation** is about the governance of deliberating and negotiating competing claims of responsibility, effectiveness and legitimacy, being the result of different understandings, framings and evaluations of the need for and processes and instruments by which normative objectives are to be accomplished (whether or not specifically articulated as RRI).

[33] We use the term arenas to mean a more loose and informal gathering of actors, while fora are more formal and organised/moderated.

It is to these two groups of factors that we will specify 'well-doing' as outlined in table 2. In doing so, we will also gain a better understanding of how responsibilisation and managing contestation are related to each other.

Ad b) 'Well-doing' as constructive and productive interactions

Having discussed what the governance of RRI is about, we now turn our attention to the meaning of 'well-doing' in this respect. Actors in RRI governance certainly will require that is arrangements are 'legitimate' and work 'effectively'. Indeed 'effectiveness' and 'legitimacy' are frequently (and in various understandings) used to assess characteristics of governance, our interest is in *de facto* governance, sensitizing to the conditions by which legitimacy is constructed and effectiveness is accomplished. In fact, as mentioned above, claims about legitimacy and effectiveness are a prolific source of contestation in the governance of RRI. That's why we have discerned 'managing contestation' as capturing an important group of factors contributing to well-doing next to 'responsibilisation'.[34]

The clue to understanding well-doing in relation to de facto governance, is that the de facto governance of RRI is conditioned by how the characteristics of governance arrangements, the actor landscape and previous achievements, *interact*. In the research model we analyze the governance dynamics resulting from these interactions as being produced in de facto governance practices. In relation, we can conceptualize well doing on the one hand as adequately relating to what goes 'in' (in terms of characteristics), and on the other hand on what is resulting from the interaction. We will label these sites of qualification as 'constructive' and 'productive' interactions.[35]

Constructive interactions can be characterized by an adequate (evaluated by the actors themselves, and evaluated by the researcher) treatment of the issue(s) under discussion (including the framing of the problem)) and mobilization of resources (from mental to financial) and by process requirements perceived as legitimate by the involved actors, whereby "adequate" is not simply an objective measure, but set in context of the nature and distance between actor perceptions of what the RRI 'problem' is, and how to resolve it in governance terms (including the mobilisation of, or reference to, a particular voluntary governance instrument, and its effective utilisation.

When we apply this understanding of 'constructive interactions' to 'responsibilisation', defined above as the governance of (self-) stimulating actors to take up responsibilities, we can specify the 'well-doing' of the de facto governance of RRI by the following factors:

- Having the 'right' set of actors involved (think of different problem types requiring different modes and scope of participation), in a way that is perceived as meaningful and fair. This aspect will be conditioned by the governance arrangements, for example in providing the capacity to have actors with different stakes, power, etc… involved in a meaningful way,

[34] Legitimacy will thus, for the sake of the empirical analysis, first captured through understanding how legitimate stakeholders think the processes were. We as analysts can, when prompted, refer to legitimacy as the acceptance (of our interviewee) of the governance processes due to input (who involved, how involved), throughput (rules of the game, transparency, fairness) and the perceived outcome (effectiveness). For effectiveness we again can ask the interviewee about her/his perception, but should have in mind effectiveness in the sense of our concept, see below (productive and constructive interaction). These dimensions are captured under pint 6) in section 3 below.

[35] This phrasing has been inspired by the notion "productive interactions" introduced by Spaapen, J. and van Drooge, L. (2009): Introducing 'productive interactions' in social impact assessment, *Research Evaluation*, 20 (3), 211–218.

while in the de facto governance this doesn't have to be the case, depending on how key actors – consciously and unconsciously – put the arrangements in practice.

- Developing a shared (or a sufficient level of complementary) understandings of the governance challenges and how these have to be addressed. For example: think of how to cope with uncertainties. So, next to actor representation, there has to be an adequate 'problem representation' across the actors involved, in order to not have only participation, but also deliberation. Related to aspects of managing contestation (discussed below) we can also qualify this aspect as the robustness of the knowledge base underpinning the governance arrangement.
- Next to representation and understanding, the constructive quality of interactions critically depends on the capacities for learning and embedding of responsibilities (e.g. think of addressing various levels within organizations instead of only having 'spokespersons' involved). We can expect both to be related to the capabilities of actors, but the characteristics of the governance arrangement(s) are important as well, notably in providing for the spaces and capacities to stimulate reflexivity and responsiveness, and in the institutionalization of commitments.

With regard to 'managing contestation' we can think of constructive interactions as being typified typified by the existence of:

- Accepted procedures or 'rules of the game', which is important to the extent in which the inclusion of actors is perceived to be meaningful and legitimate.
- Transparency, which contributes to the legitimacy of procedures and inclusion as well as to the robustness of the problem framings.
- Trust in the de facto governance process, which depends on transparency and procedures, but also on the way how actors are involved (their behavior and commitments).

Productive interactions bring about **transformation**, either in the behavior or attitude of actors[36], in line with new understandings of responsibility, working towards a higher level of shared understanding of responsibility or in responsive/reflexive improvement in the governance arrangement itself (which then defines and supports specific goals . Consequently, we can expect that the de facto governance of RRI becomes more constructive, in one or more of the aspects specified above. Again, we can discern such effects as contributing to responsibilisation or to managing contestation, as has been depicted in table 2.

[36] Transformations of behaviour is not necessarily equal to 'compliance' (to a certain regulation), but already start with changing attitudes and commitments, which in turn improves the possibilities to hold actors to account.

3. Descriptors to operationalise the Research Model for the empirical work

In the following we operationalize the various dimensions of the research model to take into consideration for the case work.[37]

3.1 RRI governance arrangements

The dimension of 'RRI governance arrangements' sketches the institutional coordinates and relative role of the RRI governance arrangement within the larger system in relation to the objective/purpose being served. This starts, for each case, with an analysis of the specific situation.

1) Situate the R&I characteristics in your case. Is it about
    - Research (public and/or private),
    - Experimenting with new technologies in public settings (e.g. fracking, products entering practices or market introduction), or
    - Regulating market dynamics or value chains?
    - Etc.
2) Describe the governance arrangement(s) [i.e. the set of institutionally related instruments, fora and procedures that are central in the case study:
    - Purpose (e.g. outcome objectives such as ensuring safety, protecting equity, increasing societal relevance; or principal/procedure objectives such as ethical acceptability, (public) participation or stimulating reflexivity. Note that the purpose itself can, of course, be multiple and contested)
    - (Policy) instruments (e.g. law, soft regulation, codes of conduct, hybrid (organised) fora and arenas organising actors from plural and diverse settings
    - Systems of enforcement (procedures, informal/formal institutional structures)
3) Describe how the RRI governance arrangement(s) are positioned in the wider R&I & RRI governance landscape (in as far as relevant):
    - Vertical: relation to overarching frameworks or treaties
    - Horizontal: relation/competition to co-existing RRI arrangements

[37] Please note that the numbering here does not necessarily mean that you analyse the case in this order, it is simply an ordering device for the analysis later on and for our internal communication.

3.2 Actor landscape

The actors involved can be the 'stakeholders' in a regulatory or political setting, or the various sub-divisions within a company or research organization.

4) Describe the (key) actors involved, in terms of:

   - Organisation (e.g. Single Companies, Universities, CSOs, Ministries, business associations, professional associations, charitable foundations, media, …)
   - Roles and relations (e.g. (in)formally, hierarchical, in competition, collaborative, … Note: pay attention to 'hybrid' roles and how different roles are linked within organizations)
   - Relevant problem frames (ethical, economical, etc…), related interests (values, normativities) and power (resources, capabilities to frame the problems in de facto governance practices)
   - Capacities and capabilities of actors to relate to the dimension of responsibility and to engage in debates and negotiations (level of awareness, underlying training, ability/readiness to learn, resources to be invested etc.)

3.3 De facto practices of RRI governance

The dimension of de facto RRI governance practices reflects the actual situations in which RRI governance arrangements are put into practice. As discussed in the previous chapter we are interested in the de facto governance dynamics and effects resulting from the way in which characteristics of arrangements and of the actor landscape, interact, and in what aspects the de facto governance of RRI is 'doing well'. These elements structure the case study narrative and analysis.

5) Describe how de facto governance dynamics are influenced, in terms of the framing and the nature and significance of the problem (as resulting from how values and normativities are 'voiced' by actors and whether contestation is about these values, or about the strategies and instruments to address the problem, or the modes of implementation). Analyze how these aspects are related to:

   - Characteristics of the places and spaces of interaction, whether or not linked to the RRI governance arrangements
   - How actors are mobilized: agenda setting, resource provision, capacity building
   - How responsibilities are constructed, negotiated and taken up (including modes of enforcement / incentivisation) Note: pay attention to how individual and organizational role responsibilities are linked to collective responsibilities (the normative outcomes, principles or procedures at stake) in the context of the RRI governance arrangements.

- If actors use the (soft and hard) instruments incorporated in the governance arrangement and if so in which ways (e.g. to comply with or as conversational/reflexive tool; to implement or to experiment, etc…)
- How are interests played out, value clashes modulated and competing claims about effectiveness and legitimacy aligned

6) Assess to what extent responsibilisation and managing contestation are 'doing well':

- Describe and assess the actual transformation:
  - Is there a development of shared (or a sufficient level of complementary) understandings of the governance challenges (as for "responsibilisation") and how these are to be addressed.
  - Is there a change of behavior and attitudes, if so in how far is there a change their behavior in line with new understandings of responsibility (not only compliance, but also change of attitudes)
- What are the constructive quality of interactions, i.e.
  - the capacities for learning (reflexive actors) and
  - embedding of responsibilities (think of addressing various levels within organizations instead of only having 'spokespersons' involved).
  - Are the 'right' set of actors involved (think of different problem types requiring different modes and scope of participation), in a way that is perceived as meaningful and fair.
  - What level of trust is built up as regards the governance arrangements and practices, in how far are procedures or 'rules of the game' accepted (including issues of transparency and inclusivity) and what is the stakeholder's acceptance of (contested) outcomes
  - What is the level of (perceived) robustness of the knowledge base (as far as the level of uncertainty of the issue allows, social acceptance of including the state of the art knowledge and accepting its limitations?)

Note that , the degree of well-doing shall be elaborated by the explanations and perspectives put forward **by the actors themselves** (in interviews) **supplemented by analysis of** the case in terms of 'well-doing' **by yourselves** as case workers. We seek your explanation as to what extend certain aspects of well-doing are found to be present or not in each case in relation to the characteristics described by the descriptors in this chapter (e.g. think of characteristics of arrangements, such as institutional incentives. Or actor landscape characteristics, such as asymmetries of power or vested interests of various kinds dis-incentivising productive interaction).

3.4 Situating your case

When and how the governance of RRI can be considered as 'well doing' will differently manifest itself according to different circumstances, contexts, and situations of RRI. For example considering situations such as organizing and orienting research and innovation content, processes and outcomes towards societal problems; or engaging wider constituencies of societal actors in deliberations about the ethical and sustainable dimensions of the inception, production, distribution, consumption/use and disposal of artifacts which involve new and emergent technologies; or the outcomes and impact of organized reflections (arenas which are more loose and informal, hybrid fora which are more formal) and reporting (Nano-safety experts group in NL, Bio-ethics committees in Austria and Germany,) or the distribution and communication of responsibilities through global value chains through the use of standards or accreditation schemes; or the inclusion of ethical , environmental, safety, health, and responsible and ethical conduct reflections within research settings, or citizenship (public engagement, lay perspectives, and gender balance) dimensions in the training and formation of young scientists/engineers.

In addition to the governance dimensions, we therefore have a preliminary list of dimensions that characterize specific case situations. It is important to understand those in each case, as later on we will need to develop a simplified understanding of how certain situations and the governance challenge they pose relate to governance arrangements.

7) Situate your case in terms of:

- Level of perceived locality vs globality
- Research vs. innovation
- Technoscience domains / cross-domain issues
- General purpose technology vs specific application
- Range and variety of actors involved
- Uncertainty about (the kind of consequences), e.g. market uncertainty, regulatory uncertainty. etc.

4. Drawing lessons and assisting transversal analysis

Here we give a first idea of lesson drawing across cases, to guide case work early on. We expect one page of main lesson drawing in your final report in May. More discussion on this to follow, these are first thoughts only. The following list is slightly redundant to the above, nevertheless, it gives an idea of the cross-cutting issues for ResAGorA

8) How can/are RRI governance arrangements initiated? (including immediate history i.e. taking RRI as emergent, and shed further empirical light on 'RRI seeds' ; 'RRI in the making' etc.

9) How can they be modified, extended (internal view, organisation & coordination)

10) How can RRI governance arrangement better be positioned in heterarchical landscape (external view, meta-governance)

11) When/how would RRI need to be differently understood? (framings, in relation to construction of responsibilities)

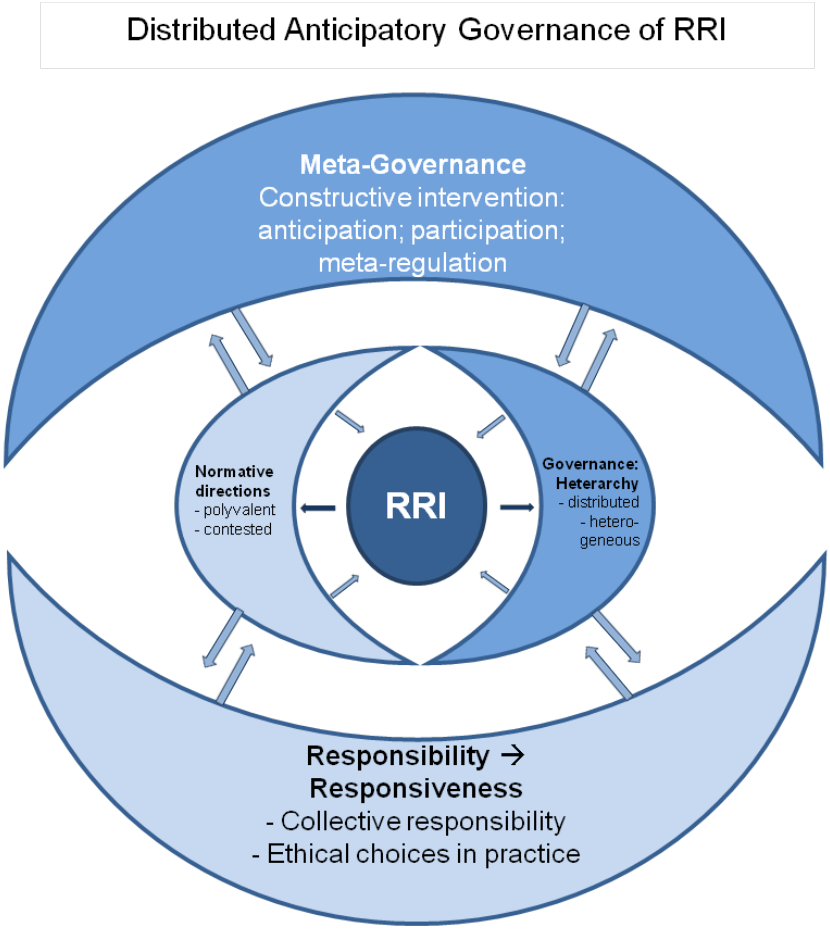
12) We then can expect building components to be found in all sorts of 'conflict management' strategies, playing out at different levels (think of conflicting logics, framings, interests, …).

13) In addition, do we see common dominant values and normativities related to the emerging technologies domain we are focusing on (e.g. strong democratic principles), reflected in the empirical cases? Or are they underpinned by other dominant values and normativities?

14) What are lessons in terms of the interactions and inter-penetrations of multiple-level analysis:

    - EU (policy and programmes)
    - Member states institutional framing conditions
    - Hybrid (multi-stakeholder) fora.
    - Single organization types (Such as multinationals, universities, charitable foundations),
    - Individuals (formation of more reflexive and societally conscious/learning individuals, presence/absence of Champions/Institutional Entrepreneurs)

Appendix III: The Res-AGorA 'Eye' conceptualisation model



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