



D2.1 Report on the state of the art and best practices

January 2021

Marit Hovdal Moan, Lars Ursin, Elsa González-Esteban, Rosana Sanahuja-Sanahuja, Ramón Feenstra, Patrici Calvo, Santiago García-Campá and Martha Rodríguez.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 872360.

Project Information	
Project Number:	872360
Project Full Title:	ETHNA System. Ethics Governance System for RRI in Higher Education, Funding and Research Centres
Project Acronym:	ETHNA System
Funding Scheme:	SwafS
Call identifier:	H2020-SwafS-2019-1
Start Date of Project:	01/01/2020
Duration:	36 months
Project Website:	Ethnasystem.eu

Deliverable Information	
Deliverable No:	D2.1
Deliverable Title:	Report on the state of the art and best practices
WP Number:	2
Lead:	NTNU
Contributing Partners:	UJI, FECYT, Fundación ETNOR
Related Task(s):	T2.1 and T2.2
Type:	Report
Author(s):	Marit Hovdal Moan, with contributions from Lars Ursin, Elsa González-Esteban, Rosana Sanahuja, Ramón Feenstra, Patrici Calvo, Santiago García-Campá and Martha Rodríguez.
Due Submission Date:	31/01/2021 (moved from 30.09.2020 originally)
Actual Submission:	31/01/2021

Dissemination Level	
PU	Public

ABSTRACT: This deliverable includes the reporting procedures, a quality management manual and a set of templates and organisation issues to be used within the project.

Versioning and contribution History			
Version	Date	Modified by	Reason for Modification
1.0	17.07.2020	NTNU	Comments to the draft by the project partners, and contribution to the literature review by the UJI and FECYT teams.
2.0	22.12.2020	NTNU	Text revised based on comments to the draft by project partners, and information from the 22 expert interviews.
3.0	18.01.2021	NTNU	Text revised based on feedback from project partners.
4.0	30.01.2021	NTNU	Text revised based on feedback in internal review process.
5.0	11.02.2021	BIOCOM	Design of the report to facilitate its consultation as an open publication.

Abbreviation	
AB	Advisory Board
AP	Associated Partners
CA	Consortium Agreement
CM	Communication management

EC	European Commission
EU	European Union
GA	Grant Agreement
IM	Innovation Management
IP	Intellectual Property
IPR	Intellectual Property Rights
PC	Project Coordinator
PMC	Project Management Committee
PO	Project Officer
STC	Scientific and Technical Coordinator
TL	Task Leader
TMC	Technical Management Committee
WPL	Work Package Leader

ACKNOWLEDGMENT & DISCLAIMER

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 872360.

The information and views set out in this report are those of the author(s) and do not necessarily reflect the official opinion of the European Union. Neither the European Union institutions and bodies nor any person acting on their behalf may be held responsible for the use which may be made of the information contained therein.

Reproduction is authorised provided the source is acknowledged.

EXECUTIVE SUMMARY

The report provides a comprehensive overview of governance theory and practices in the research and innovation (R&I) sector related to the concept of Responsible Research and Innovation (RRI). The report is based on findings from a review of the RRI literature related to the governance of research and innovation processes, and interviews with 22 European-based experts on R&I governance in the area of RRI. The purpose of the report has been to present some of the governance options - or building blocks - available when constructing the ETHNA system, both conceptually and practically speaking. Applying the governance framework of the EC-funded project Res-A-Gora, “The Responsibility Navigator”, the identified examples of governance practices were organized under the following ten governance principles: inclusion, deliberation, and moderation; modularity and flexibility, subsidiarity, and adaptability; capabilities, capacities and institutional entrepreneurship; and culture of transparency, tolerance and rule of law. The principles are referred to in the present report as *modules*. The concept of a module is used to articulate the idea that the principles of the Res-A-Gora framework can be understood as building blocks, which one can pick and choose from when constructing the ETHNA governance system. The cases organized under each module are meant to serve as an inspiration when reflecting on how a module could be adapted to a given institutional context.



ETHNA System: Literature review and state of the art description

Mapping examples of good governance of research and innovation (R&I) related to responsible research and innovation (RRI), in Higher Education, Funding and Research Organisations (HEFRs) in Europe

Disclaimer:

This deliverable has not yet been reviewed by the European Commission. Its content might therefore change as a result of the review process.

Marit Hovdal Moan, Lars Ursin, Elsa González-Esteban, Rosana Sanahuja-Sanahuja, Ramón Feenstra, Patrici Calvo, Santiago García-Campá and Martha Rodríguez.

Table of Contents

1. Introduction	3
Note on the procedure for collecting the data	5
2. Six framings of RRI	7
2.1 Narrative I: The self-regulation of scientific activity, by, for and with scientists	8
2.2 Narrative II: The governance of risk	10
2.3 Narrative III: More anticipatory R&I practices	12
2.4 Narrative IV: Representative co-construction of science	14
2.5 Narrative V: Aligning science with the needs of society	15
2.6 Narrative VI: Reestablishing trust in science	16
2.7 Summarising the main traits of the narratives	16
3. Conceptualising governance of R&I	20
3.1 Governance	21
3.1.1 Two conceptions of governance: “bottom up” and “decentralising” from above	21
3.1.2 Three shifts in R&I governance: technocratic, ethical expertise, and participation	23
3.2 RRI as an approach to R&I governance	24
3.3 Governance understood as describing a process or a means to achieve a desirable product	25
3.4 Metagovernance	28
4. Methodological note on the selection of examples of practices of R&I governance in the field of RRI	30
4.1 Delimiting the scope of research and innovation practices	31
4.2 De facto RRI practices	32
4.3 Normative criteria for good governance	33
4.4 The Responsibility Navigator governance framework	34
5. Examples of de facto RRI governance practices organised under the Res-A-Gora Governance framework, the Responsibility Navigator	37
5.1 Findings related to the governance theme “ensuring quality of interaction”	38
5.2 Findings related to the governance theme “positioning and orchestration”	53
5.3 Findings related to the governance theme “developing supportive environments”	64
Summary	75
References	77
Imprint	82

Introduction

1

The ETHNA project aims to develop a governance structure (the ETHNA system) that can contribute to ensuring that research and innovation processes are responsible, in the sense of being ethically acceptable and socially desirable. In so doing, the ETHNA system will facilitate compliance with the six RRI keys as defined by the European Commission: Research ethics, public engagement, science education, open science, gender equality, and governance.

The present report gives an overview of governance theory and practices in the R&I sector related to RRI. The findings are meant to feed into the conceptual articulation of the ETHNA system, as well as the design of the pilots that will test the functioning of the ETHNA system, or elements of it, in six higher education and funding and research centres in Europe (HEFRCS).

The report is based on findings from a review of the RRI literature, with a particular focus on the governance of research and innovation processes, and interviews with 22 European-based experts on R&I governance in the area of RRI, or RRI-related topics.

The selection of examples of governance practices in the R&I sector related to RRI has been guided by Arie Rip's conception of *de facto* governance (Rip, 2018a), which proposes that governance is constituted to a large degree "by bottom-up actions, strategies and interactions ... [that] add up to outcomes at the collective level which function as governance arrangements" (p. 75). The report thus contains examples of practices that demonstrate a "range of ways that actors guide, negotiate, and formalise normative understandings of responsibility and translate these into instruments ... to govern practice" (Randels et al. 2016, p. 32). Examples of more traditional, top-down modes of governance that display a more distributed form of governing, in the sense that they open up for dialogue with a range of actors, have also been included.

Furthermore, we have chosen to apply a broad understanding of the concept of "governance practice", to include both processes and as well as concrete institutional expressions of governance. An example of the former are that of processes to ensure lay involvement in R&I projects; examples of the latter are internal ethics committee systems, and gender units.

And finally, the report includes examples of good governance practices that reflect a narrow, or backward-looking, conception of responsibility, as well as practices that assume a broader, more forward-looking understanding of what responsible research and innovation entails. Put differently, the practices identified can be understood in light of different RRI-narratives with respect to what the main purpose of doing RRI should be: making R&I more *anticipatory* in order to *avoid future harm* or aligning R&I with the needs and expectations of society at large, thus contributing to *doing good*, or both.

The wide lens applied in the search for good governance practices related to RRI has thus resulted in a variety of governance practices. Rather than giving one practice, or one type of practices, priority over another, we propose to view the different practices as expressions of different modules in a governance framework.

The idea of viewing the practices identified as modules in a governance framework is inspired by the Res-A-Gora project's RRI governance framework **THE RESPONSIBILITY NAVIGATOR**. The Responsibility Navigator consists of the following ten principles for good governance, which are meant to provide an "orienting framework to enable "navigation" towards [RRI] learning and institutional transformation" at a systemic level (Lindner et al., 2016, p. 136): Inclusion, deliberation, and moderation; modularity and flexibility, subsidiarity, and adaptation; individual capabilities, in-

stitutional capacities, institutional conditions for change agents, and culture of transparency, tolerance and rule of law.

We have chosen to organise the findings from the literature review and the interviews under the ten governance principles articulated in the Res-A-Gora project. We refer to these principles as governance *modules*, to signal that they can be further developed, either as part of a complete governance framework, or independent of it. The different elements of the ETHNA system (the ethics committee, the ethics code, the alert line, and the indicators) can be understood to correspond to one or more of these ten modules. The examples of governance practices organised under the respective modules in this report are meant to serve as an inspiration to how the different elements of the ETHNA system could be organised.

When assessing whether a given practice listed under the modules is a good example of R&I governance for the purpose of the ETHNA system, we suggest that the assessment be guided by the overarching quality criteria for good governance in the R&I sector that underpin the ETHNA project, which are those of *ethical* and *effective*. We elaborate on these criteria for good governance in [section 4.3](#).

The section containing the list of examples of governance practices is preceded by a section on framings of RRI and on the concept of governance. The overview of possible framings of RRI is meant to aid in the reflection on, and articulation of, the main purpose of the ETHNA system. The answer to the question of purpose will have concrete implications for the design of governance tools in the ETHNA governance structure, since the different framings seem to entail, or at least place the emphasis on, different governance tools.

Similarly, the concept of governance affects the range of governing mechanisms available. In the field of R&I, the concept of governance denotes, as a minimum, the act of “open[ing] up science and innovation (Andy Stirling, 2008) to a wider range of inputs. The use of the concept of governance thus excludes as governing mechanism, for instance, an ethics committee organised as a self-regulating entity, consisting only of scientists. There are various ways of conceptualising what it may entail to open up the governing of R&I in accordance with the concept of governance. The section on governance is meant to demonstrate some of the options available.

Note on the procedure for collecting the data

The literature review was developed using the date bases of SCOPUS, Web of Science and Google Scholar with an initial time interval of 2011 to 2020. The preliminary search string has been “RRI”, “Responsible Research and Innovation”, “RRI AND research integrity”, “RRI AND governance”, “RRI AND public engagement”, “RRI AND science education”, “RRI AND Gender”, “RRI AND gender AND innovation”, “RRI AND open access”.

Moreover, 55 EC-funded projects on RRI and the six keys were screened. 12 of them were used to identify examples of practices in ethical governance and the tools used to institutionalise the RRI keys in HERCF’s (CIMULACT, JERRI, FIT4RRI, MORRI/SUPER MORRI, RRI Practice, SATORI, SIENNA, STARBIOS2, RES-A-GORA, RRI-Tools, PRO-Ethics).

The consortium partners also contributed with examples of governance practices that could serve to inspire the ETHNA system. Only one of the cases were included in the list of examples of R&I governance provided in this report. This is due to a change in analytical focus in selecting rel-

evant cases, from a focus on governance practices that meet the criteria of ethical and effective, to a focus on *de facto* governance practices on the ground, as it were, as well as more decentralised, previously centralised forms of governance practices as systemic level.

22 expert interviews were conducted. The interviewees reflected on factors that enable and/or prevent the integration of RRI, or aspects of that concept, in R&I processes. They also reflected on how enabling factors could best be integrated in a R&I governance system, and how factors that serve to prevent the integration of RRI could be expressed, or alleviated, at structural, organisational or individual level.

Interviewees were selected using a Peer Esteem Snowballing Method. This resulted in a bias with respect to the majority of the experts interviewed, who were based in Norway. The remaining interviewees were based in Sweden and Spain. The bias was sought corrected by conducting an additional four expert interviews with experts based in the Netherlands, Greece, and Spain.

It should be noted, however, that the group of informants were not chosen to be geographically representative, but to make it possible to investigate thoughts and ideas related to a phenomenon (R&I governance in the area of RRI) in as much depth as possible, with representatives from a broad variety of positions within a range of distinct organisational structures: university, research centre/hub/strategic area, and research funding organisation. Several of the informants sits in or have participated in EU expert groups on RRI, international panels, and lead international networks.

In this sense, the report investigates the phenomenon of R&I governance in the area of RRI, illuminated by the insight of international expert stakeholders who happened to be based in Norway at the time of the interview. In some areas, the institutions are ahead conceptually and practically when it comes to integrating aspect of RRI in R&I processes.

Six framings of RRI

2

“[T]HERE IS NO CONSENSUS AT ALL ON THE OVERALL GOAL AND PURPOSE OF RRI IN THE EU – FOR SOME THE GOAL IS REFLEXIVE PRACTICE AND GOVERNANCE OF SCIENCE AND TECHNOLOGY”; FOR OTHERS IT IS “BETTER ALIGNMENT BETWEEN CIVIL SOCIETY AND THE R&I SECTOR...”

(STRAND, 2019, P. 56)

A dominant narrative that seems implicit in much RRI efforts is that the scientific disciplines of science, technology, engineering and math (STEM) lack sufficient reflexive ability to critically reflect on the ethical acceptance and social desirability of a given research and innovation project, but that the social sciences and humanities (SSH) can correct this deficiency by making STEM more reflexive. In this section we spell out the presumptions that inform this and five other narratives of RRI, expressing a diversity of normative understandings of what it entails to act *responsibly* when doing research and innovation, and corresponding governance tools. The discussion in this section is meant to feed into the conversation on the goal and purpose of RRI that the ETHNA project identifies with. The framing of RRI in the ETHNA project will have concrete implications for the design of governance tools in the ETHNA governance structure.¹

2.1 Narrative I:

The self-regulation of scientific activity, by, for and with scientists

Responsible research in this narrative is about “the self-regulation of scientific activity, by, with and for scientists, to freely and independently identify and pursue their own problems, as members of a closely knit organisation. ... In exchange for such freedoms, the scientific enterprise must comply with certain guarantees thus creating a *de facto* Science State contract” (Randels et al., p. 33; Guston & Keniston, 1994; Krause, 1999).

Acting responsibly in this narrative involves adhering to permissions and prohibitions articulated in society’s norms and laws regulating scientific activity, and scientific standards of conduct. These include that of making research results publicly accessible, primarily through peer-review publications, avoiding scientific fraud, respecting the integrity and autonomy of human research participants, and the welfare of animal research objects. The self-regulation of scientific activity also includes that of maintaining “the scientists’ own field of operation” ranging from “health and safety in the laboratory, ... support of young scientists ... most recently stretched to issues of gender and diversity within the research community” (Randels et al. 2016, p. 33).

¹ This presentation of RRI narratives centered around normative understandings of what it entails to act responsibly in R&I is adopted from Sally Randels et al. (2016). “Framing and frameworks: six grand narratives of *de facto* RRI” in Ralf Lindner et al (eds.) *Navigating towards shared responsibility in Research and innovation: Approach, Process and Results of the Res-A-Gora project*, pp. 30-37. Link to e-book: <https://indd.adobe.com/view/eaeb695e-a212-4a34-aeba-b3d8a7a58acc>

2.1 Narrative I: The self-regulation of scientific activity, by, for and with scientists

There is a particular understanding of the “moral division of labor” (Rip, 2018b; Rip & Shelley Egan, 2010) between science and society in the meaning of responsibility assumed in this narrative, captured in the infamous statement “[S]cientists take credit for penicillin, but Society takes the blame for the Bomb” (Ravetz, 1975). Science is charged with progress; the political, social and ethical consequences of science is the responsibility of society.

As Rip explains, “[s]een from the side of society, the scientific endeavor is legitimate as long as scientists deliver, both in terms of their producing what is promised (progress, even if this can be interpreted in different ways) and their adhering to the normative structure of science (cf. the issues of integrity of science). This is a mandate which justifies the relative autonomy of science – a sort of macro-protected space”(Rip, 2018b, p. 11).

Importantly though, “[t]his need not be a one-sided critique of closed science. One consideration is that it is important to have the scientific endeavor be protected from undue interference. This is quite clear for the micro-protected spaces of laboratories and other sites of scientific work, and the meso-level protected spaces of scientific communities and peer review” (Rip 2018, p. 11).

The regulatory mechanisms through which scientists’ responsibilities are negotiated and assessed include research integrity committees, ethics committees and state agencies, such as national research councils.



2.2 Narrative II:

The governance of risk

Uncertainty is inherent to science and technology R&I processes, as witnessed in the technologies of genetically modified organisms, and nuclear technology. The same goes for advances in artificial intelligence technology, and stem cell technology (Felt, 2007; Kuhlmann, Stegmaier, & Konrad, 2019).

In the management-of-risk-narrative, responsible research and innovation is about handling and mitigating potential risk related to technology development. As Sally Randles et al. explain, “[t]he central question is how to balance the opportunities and benefits afforded by new technologies, with uncertain technology-induced risks and harms” (Randles et al. p. 33). Strand and Rommetveit invoke the metaphor of a “hand-brake” to illustrate the role that RRI is thought to have in this narrative, namely to slow down, and take control of, the “runaway train of science and technology...” (Strand and Rommetveit, 2019. P. 4).

The governance of risk has been concerned with ‘products’ of science and innovation, in particular impacts that later become unacceptable or harmful to society or the environment. The conventional approach to assessing risk thus understood in R&I draws on a mix of external regulatory mechanisms, relying heavily on technical expertise, and the undertaking of cost-benefit analyses based on various tools of prediction. Other regulatory mechanisms in risk governance includes ethics review, but also internal, self-governance mechanisms, involving for instance voluntary foresight exercises by researchers.

In a critical analysis of European risk governance in the area of research and innovation Felt et al. (2007) draw attention to the distinction made between “risk assessment”, which is envisaged as an objective fact-finding exercise, and “risk management”, which focuses on how one should practically handle the risk identified, which thus “introduces more normative questions ... – about economic costs, ethical issues, and subjective social values and interests ...” (Felt et al. 2017, p. 32). Felt et al. are critical of this distinction, because, as they argue, risk assessment is never objective; rather it too “inevitably rests on normative commitments” (Felt, 2007, p. 33). Felt et al.’s point is that risk assessment involves making choices that are value laden (as demonstrated in “the most straightforward of technical questions” namely “what are the relevant forms of risk? Human health, environmental burden ... quality of life?”), and which consequently are bound up with broader social and political issues” (ibid 34,35). Risk assessment should therefore be opened up with respect to “its own detailed framings, practical epistemic criteria and interpretive judgements” (ibid, p. 37), for instance by “introducing more systematic frameworks for public-deliberative interactions” (ibid, p. 38).

The critique of the risk assessment/risk management dichotomy echoes Beck’s argument that the uncertain future associated with scientific and technological advances and associated risks in “knowledge society”, warrants a broadening of actors involved in deliberating about the technologies that are being developed, the trajectories that new technology should take, and how our future should be shaped (Beck, Lash, & Wynne, 1992). In a similar vein Jasanoff argues that risk “is part of modern human condition, woven into the very fabric of progress”; given this all-encompassing presence of risk in everyone’s lives, we should all be involved in deliberating about how to deal with it (Jasanoff 2007, p. 223). On this basis, Jasanoff calls for a move towards “technologies of humility”, which involves “reconsider[ing], existing relations among decision-makers, experts and citizens in the management of technology, notably including citizens in “systematically assessing the unknown and uncertain” (Jasanoff, 2007, p. 223; Stilgoe, Owen, & Macnaghten, 2013) .

The introduction of the precautionary principle in European risk governance challenged the sharp distinction between risk assessment and risk governance (McNelis, N. 2000; EC 2001). As Felt et al. (2007, p. 36) explain, the precautionary principle assumes a more complex understanding of risk, as denoting a *particular state of knowledge* about possible harmful consequence of a given R&I project. Risk thus refers to situations where “we know both the probabilities of possible harmful events and associated ... damage”; according to Felt et al., “this is where the various techniques of risk assessment are most usefully applicable”.

However, there are also other states of knowledge concerning possible harmful effects of R&I, where the techniques of risk assessment are not (as) useful. So, for instance, *uncertainty* describes situations where we “know the types and possible scales of harms but not their probabilities”, in which case “risk assessment is strictly not applicable” in Felt et al.’s view; similarly, the concept of *ignorance* is also relevant in the governance of risk, which denotes situations where we simply *lack knowledge* about possible future harms - “we don’t know what we don’t know” -, which also renders conventional regulatory risk assessment unsuitable. The precautionary principle encompasses all of these varied conceptions of uncertainty.

Applying the precautionary principle thus has important practical implications for the appraisal of harms that may potentially follow from research and innovation, particularly perhaps with regard to involving the public in risk governance. Drawing on pioneering work in these areas, notably by the European Environment Agency, and Stirling’s work on the precautionary principle (e.g. A Stirling, Renn, & Zwanenberg, 2006), Felt et al. summarise the “constructive new practices” of risk appraisal that the precautionary principle suggests. With respect to public engagement these include “drawing on relevant knowledge and experience arising beyond specialised disciplines (e.g. that of “birdwatchers relating to fisheries management”); “engagement with the values, knowledge and interests of all stakeholders possibly affected (e.g. the “experience of local communities in pollution of the Great Lakes”) and “general citizen participation in order to provide independent validation of framing” (Felt et al. pp. 28, 39).

The precautionary principle shows that risk-governance narrative may incorporate a broadening of inputs from non-academic experts as well as from the wider affected public in the assessment of risk in R&I, blurring the distinction between risk assessment and risk management that characterises conventional regulatory risk assessment.

However, it remains the case that the focus of risk assessment, even when undertaken in accordance with the precautionary principle, is primarily focused on identifying a given *product* of research and innovation, and the related question of how one can best alleviate, or avoid a product deemed harmful. It does not ask why we should undertake a given R&I project in the first place, or whether there are other, alternative trajectories a project could or should take. As Stilgoe et al observe, “current forms of regulatory governance offer little scope for broad ethical reflection on (these kinds of questions concerning) the *purposes* of science or innovation” (Stilgoe, Owen, Macnaghten, et al., 2013).

Despite the introduction of the precautionary principle and pioneering attempts at institutionalising new, more inclusive forms of risk-assessment, then, the risk-governance narrative does not seem to open up for science accountability in the broader sense of the term, which questions about the *purpose* of science seem to entail.

2.3 Narrative III:

More anticipatory R&I practices

In this narrative, responsible research and innovation is about anticipating potential negative social, environmental, and economic consequences of new technology (biotechnology, nanotechnology, nuclear research, information technology). As Guston explains, the concept of anticipation “denotes the ability to take in something beforehand. ...It is not a synonym for “predict”, “expect, or “foresee; rather, it is an approach to foresight ... which casts multiple futures as objects of deliberation rather than a single predicted future as a future of pursuit [or avoidance)” (Guston, 2010, pp. 433,434). The metaphor of a handbrake slowing down the runaway train of science can also be invoked to illustrate the role that RRI is thought to have in this narrative, albeit through other governance mechanisms than in narrative II.

An important governance mechanism in this narrative is constituted by soft law mechanisms that facilitate self-governance, based for instance on collectively agreed codes of conduct, guidelines, and an agreed set of indicators.² Soft law regulation aims at encouraging and enabling researchers themselves to “anticipate and reflect on the risk of their own research outcome/technological innovation, and decide to slow down or stop the process” (Strand and Rommetveit 2019, p. 4).

With respect to ethics assessment, Forsberg et al suggest that inclusive deliberative assessment processes would - in contrast to current ethics assessment systems - entail an assessment of R&I projects aiming at *anticipating* (negative, unwanted) social, political and environmental consequences of the R&I activity,” discuss available alternatives to the technology, [and] provide recommendations on how science and technologies can respond to the challenges that correspond with increased focus on societal needs [...]” (Forsberg et al., 2015, p. 24. Emphasis in original).

The so-called Collinridge-dilemma is central in this narrative. As von Schomberg explains, the Collinridge dilemma refers to the problem that “ethical issues could be easily addressed early on during technology design and development, whereas in this initial stage the development of the technology is difficult to predict. Once the social and technological consequences become clearer, the development of [the] technology is often far advanced and its trajectory difficult to change”(von Schomberg, 2011,p. 8; Collinridge, 1980).

The solution to this dilemma is not to fine-tune existing risk assessment procedures, as in narrative II. Rather, the solution is that research and innovation become more *anticipatory*; that is, better equipped to “anticipate and avoid R&I trajectories that instantiate the dilemma” (Strand 2019, p. 56). The idea of *responsible* research and innovation can be seen as a response to the question of how to make research and innovation processes more anticipatory. Anticipatory governance of R&I would thus aim to create a research atmosphere that enables the disclosure of present and future harmful scenarios, and points to feasible alternative, less harmful R&I trajectories.

The ‘meta-assumption’ at play here is the belief that one can avoid the Collinridge-dilemma “if these practices become reflexive and so can account for their own value-ladenness and their

² These types of governance tools characterise the EU’s Open Method of Coordination (OMC). The OMC is an approach to governance based on voluntary cooperation. A central governance tool in the OMC is an agreed set of indicators, the Laeken indicators, which are applied to monitor the progress made by Member States towards the EU’s common social inclusion objectives. For a discussion of OMC as governance mechanism see e.g. (Dawson, 2016).

own context of implication” (Strand 2019, p. 58). As Strand observes, “this assumption seems to be shared in all strives for reflexivity, going back to Marxist and feminist critique, through radical science, post-normal science and the concept of socially robust technology, all the way to the RRI of the 2010’s” (Strand 2019, p. 58).

Anticipatory governance of R&I entails the integration of social science and humanist (SSH) perspectives in sciences, technology, engineering and mathematics (STEM) practices, to ensure social and ethical sensibility, and hence a more reflexive decision-making (Guston, 2014; Guston & Sarewitz, 2002). Implicit in Schomberg’s definition of RRI is the idea that the social sciences and humanities (SSH) knowledge and practice has a crucial role to play in enabling the practices of science, technology, engineering and mathematics (STEM) to reflect critically on their research activity, and its possible harmful consequences. However, as Strand points out, *we do not know if this assumption of the effectiveness of reflexivity holds*” with respect to making research and innovation practices more anticipatory” (Strand 2019, p. 58. Emphasis added).

The mechanism thought best suited to achieve the aim of more reflexive science and innovation practices ranges from “quite elitist belief in the normative expertise of SSH, ethics, “Technology Assessment” experts and the like, to beliefs in the power of deliberation and democratisation”, through broad stakeholder engagement (Strand 2019, p. 58).

Implicit in the beliefs in the power of deliberation and democratisation is the acknowledgement of the normative aspects of science and technology. To illustrate the point, consider a sample of technical questions that often arise in connection with the assessment of risk of new technologies:

“What are the relevant forms of risk (human health, environmental burdens, ecological integrity, monetary values, social disruption, ethical offence)? How should we measure these (for instance, health can be measured alternatively as frequency or mode of death or injury, disease morbidity, or quality of life)? What degrees of aggregation or differentiation across varied populations is appropriate? What should be the appropriate baselines and thresholds of ‘safety’ under each? How do we compare impacts on different groups in society (workers, the public, children, elderly ... [etc])?” (Felt 2013, p. 34).

As Felt et al. argue, “there neither exist nor can be any definitively ‘scientific’ way to resolve - or even frame - these crucial questions that underlie any ostensibly objective or scientific definition of risk” (Felt 2013, p. 34). One implication of the understanding of science and technology as intrinsically value based is that science, and particularly science associated with high levels of uncertainty and risk, is treated as being part of – and not outside – normative and political debate. Incertitude in science, combined with its valueladenness demand that its purposes and possible outcomes are democratically negotiated (Felt et. al. 2013, p. 41).

The belief in stakeholder engagement as an efficient means to achieve reflexive science constitutes an RRI narrative in itself:

2.4 Narrative IV:

Representative co-construction of science

In this narrative, responsibility in R&I entails democratising research and innovation, by involving those affected by the new technologies in the future in debating the shaping of that future, notably by participating in the framing of the problems and questions to be researched (Sally Randels et al. 2016, p. 34).

The focus here is on the *process*, where *democratic procedures* are thought to contribute among other things to “the awareness of a more local, historically and socially contingent knowledge production”, and in this sense a more reflexive, “socially robust”, knowledge and technology (Nowotny, 1999; see also Jasanoff 2007). Inclusion in this narrative is an end in itself, and not a means to achieve a given end.

From a governance perspective, a belief in the power of deliberation “would entail ...bringing in a range of stakeholders, citizens, and social actors in upstream engagement exercises to cancel the tunnel vision of STEM [science, technology, engineering and mathematics] practitioners. This form of democratic governance model of R&I, which promotes the interaction of a diversity of agents in R&I processes, with a view to integrating heterogeneous values, concerns, intentions and purposes would contribute not only to making STEM more anticipatory but also align research agendas with society (Owen, Macnaughten, & Stilgoe, 2012; Strand, 2019).

Importantly, as Randles et al. emphasise (2016, p. 34) the demand for inclusion in this narrative “is not just about inclusivity of a wider and more diverse range of perspectives, but that inclusion follows a co-construction ambition ... [where] wider interests participate in the framing of research, innovation and responsibility “problems”; it is about how the processes of inclusion are constructed.

A governance structure that aims at promoting and facilitating “upstream engagement” echoes the assumption that an inclusive, deliberative approach to science and innovation practices is an *efficient mechanism* for making R&I more reflexive, and - as a result - more anticipatory, and thus responsible.

The belief in the *efficiency* of upstream engagement as a mechanism to achieve more reflexive R&I practices has been justified with reference to the observation that “... insight in the *diversity* of those participating in social-political interactions can only be gained by involving them in the governing process, considering them necessary sources of information ...” (Kooiman 2007, p. 76). In a similar vein, Sykes and Macnaughten suggest that “choices concerning the nature and trajectory of [science and] innovation can be co-produced with publics in ways that *authentically* embody diverse sources of social knowledge, values and meanings” (Owen et al. 2013, p. 38. Emphasis added).

It has also been argued that research and innovation must engage with the public to serve the public (Braun & Griessler, 2018; René von Schomberg, 2013), and that “dialogue is the right thing to do for reasons of democracy, equity and justice (Owen et al. 2013, p. 38). Others, however, have criticised the belief in public participation as an efficient mechanism for making R&I more reflexive, arguing that there is a lack of empirical evidence supporting its assumed quality and impact (Rowe & Frewer, 2000).

The EC document “Options for strengthening responsible research and innovation” (EC 2013) contains a definition of RRI that places inclusion of stakeholders at the heart of what it means to act responsibly when doing R&I:



“Responsible Research and Innovation (RRI) refers to the comprehensive approach of proceeding in research and innovation in ways that allow all stakeholders that are involved in the processes of research and innovation at an early stage (A) to obtain relevant knowledge on the consequences of the outcomes of their actions and on the range of options open to them and (B) to effectively evaluate both outcomes and options in terms of societal needs and moral values and (C) to use these considerations (under A and B) as functional requirements for design and development of new research, products and services”.

As Burget et al. observes (Burget et al., 2017, p. 6), the quoted definition of RRI not only presents RRI as being about “inclusiveness and participatory governance”, but also defines RRI “as an approach[to governance] that gives some sort of orientation to research and innovation” towards desirable societal outcomes, which contrasts to the framing of RRI as an approach to governing processes.

2.5 Narrative V:

Aligning science with the needs of society

In this narrative, responsibility in R&I is a matter of aligning science with the needs and expectations of society at large; that is, the goal of creating technologies that not only are not harmful, but also *good*, in the sense that they can be said to be socially, ethically and environmentally desirable, and therefore also socially acceptable. To illustrate the role that RRI is thought to have in this context, Strand and Rommetveit uses the metaphor of a “railway switch” that redirects “the runaway train of science and technology before it totally destroys the world” (Strand and Rommetveit, 2019, p. 4).

The importance of involving the public is important also in this narrative. However, in contrast to the former narrative (narrative IV), involvement here is a means to achieve an end, not an end in itself. In contrast to the previous narrative, then, the focus here is not on process but on desirable societal outcomes, “with processes such as deliberation or participatory governance aiding this outcome, not being ends in themselves” (Randels et al., 2016, p. 35). This entails that the aim of aligning science with the needs and expectations of society at large can also be achieved by other, or complementary means, within this narrative.

So, for instance, in this narrative, RRI can also be seen as part of a broader attempt at inter-disciplinary, cross-sectoral “and even transdisciplinary” collaboration, as a means to solve the grand challenges of our time (Strand and Rommetveit, 2019, p. 6). RRI becomes an answer to the organisational challenge of coordinating a diversity of actors in order to achieve “the best possible outcomes” (ibid). The metaphor of “networks of actors, institutions and expertise” can therefore also be used to capture this narrative of RRI, and the co-regulation, co-creation and co-production as governance mechanisms thought conducive to facilitate, coordinate and steer network interaction, mixing self-regulatory and state-regulatory modes of governance (Strand and Rommetveit 2019, p. 6).

This narrative contains in it the presumption that it is actually possible to steer science in the direction of addressing, and solving, “urgent European policy challenges that are strongly scientific in nature – including climate change, sustainability, environment and development”, thus ensuring that the technologies that come out of science and innovation processes are perceived as “good” (Felt, 2007,p. 1; Strand, 2019,p. 58).



2.6 Narrative VI.

Reestablishing trust in science

In this narrative, responsibility in R&I is about finding ways to reestablishing trust in science among the general public. This narrative is closely connected to narrative five, as attempts at improving involvement, collaboration and communication through co-regulation can also be understood as a means to re-establishing legitimacy, and hence trust in science. The narrative can be illustrated by the metaphor that the science “train is on tracks towards economic growth, increased human welfare and progress, but that “ungrateful citizens are obstacles in it way, raising barriers and protesting in the middle of the railroad, or hindering and slowing it down through inertia, ignorance and lack of knowledge ... From this perspective, RRI is a solution to the questions: how do we educate, reassure and calm down the ignorant public and make them trust science again?” (Strand and Rommetveit, 2019, p. 5).

Closing the divide between risk assessment and risk management - a dichotomy that still dominates global risk governance regimes - is a central aspect of this narrative, as the divide arguably contributes to exacerbate the mistrust in science. As Felt et al. argue, the dichotomy places risk assessment firmly in the domain of science, which traditionally has excluded the involvement of citizens and other stakeholders in deliberation about what is “fundamentally political questions”, thereby contributing to “the high level of public distrust in risk-governance” (Felt et. al., 2007, p. 33.) As such, this narrative overlaps with that of narrative three, on anticipation, as a shift towards anticipatory R&I practices would entail a move away from the risk assessment and the science-society/objective-normative dichotomy that it assumes.

2.7 Summarising the main traits of the narratives

As mentioned above (footnote 1, p. 8), the six narratives presented in the previous sections are centred around different normative understandings of *what it entails to act responsibly* when doing research and/or innovation. In this sense they may appear mutually exclusive. However, the narratives are perhaps best understood as *complementary*, especially with respect to the main concerns emphasised (scientific autonomy, avoiding harm, making science more reflexive and thus anticipatory, co-constructing knowledge, contributing to some social good, re-establishing trust in science).

To some degree, the narratives are also *overlapping*, especially perhaps with respect to the importance given to opening up science to stakeholders and lay citizens. The narratives are also overlapping with respect to the concept of responsibility that seem implicit to them. Narrative one and two can be understood to assume a so-called backward-looking concept of responsibility; narratives three to five can be understood to assume a so-called forward-looking concept of responsibility. These two concepts of responsibility are elaborated on in the text box below, on pages 17f.

Notwithstanding the overlaps between the narratives, the differences that nonetheless remain between them may point to different sets of governance mechanisms. So, for instance, if the main purpose of an R&I governance system is to ensure broad involvement in R&I processes, a relevant governance mechanism would be that of constructing good processes for involvement or rigging meeting places fit for that purpose; if, by comparison, the main purpose is to ensure that R&I contribute to solve the grand challenges of our time, a main governance mechanism may rather be that of facilitating transdisciplinary collaboration, where involvement of lay citizens could be one element, but not necessarily so. The table below, on page 19, summarises the main traits of the six narratives.



Two concepts of “responsibility” in RRI: retrospective and forward-looking

In contrast to retrospective conceptions of responsibility, framed as accountability, or liability, for harmful impacts or consequences of past actions, forward-looking conceptions of responsibility focuses attention on value-laden dimensions of responsibility, asking what kind of society we want to see come out of our science and innovation practices (Owen et al. 2012, p. 756).

It is worthwhile elaborating on what it entails in practice to introduce a forward-looking conception of responsibility as a guiding principle for R&I governance - in contrast to that of a retrospective one. Arguably it requires a fundamental shift of mindset towards acknowledging “the intrinsically normative aspects of science and technology, including risk” (Felt 2013, p. 40).

One characteristic of retrospective, or backward-looking, conceptions of responsibility is that they focus attention on *one-off, time-limited* acts, which are undertaken in *the past*, by *identifiable agents*, with *adequate control and knowledge* of the likely harmful consequences of the act (including unintended, yet reasonably foreseeable harm) (Cane, 2002; Hart, 1968; Honoré, 1999).

One problem with this focus on time-limited conduct in the pasts, is that processes, which were initiated in the past and are still ongoing, such as for instance research and innovation *practices*, and structures within which processes take place, such as the current, global academic incentive structure, fall outside the realm of evaluation when the question of responsibility for harm arises. Instead, backward-looking conceptions of responsibility “is premised on an understanding of harmful acts as *temporary deviations* from a legal and social background structure that is assumed as normal” (Young, 2007, p. 176).

The concern with time-limited harmful conduct thus also overlooks the fact that harm can be experienced, not merely as a one-off harmful incident, but as an existential reality, permeating everyday life, in a structural way. To accommodate forms of harm that are structural, and thus not timebound, we need a concept of responsibility understood as generated by “deeds already underway”, to borrow a term from Hans Jonas (Jonas, 1984, p.128) rather than as retrospectively generated by deeds already done.

A second problem with retrospective conceptions of responsibility is that responsibility arises only in the event that a harmful outcome can be linked to an identifiable wrongdoer. As Young explains, this ‘identity condition’, implies that one isolates “the one or ones liable ... thereby distinguishing them from others, who by implication are not responsible” (2007, p.176). The identify condition is problematic also in the context of R&I practices, given the plurality of actors often involved in the knowledge production process, and the fact there is often no interaction between actors involved in the R&I process and those affected by the outcome.

Lastly, retrospective conceptions of responsibility only recognise harm that could reasonably have been foreseen. With respect to R&I processes, we do not always know what (harmful) effects in society they will have. The backward-looking model of responsibility lacks the conceptual apparatus for placing responsibility when the effect of action is unknown.

Retrospective notions of responsibility have traditionally translated into a governance of R&I practices concerned with avoiding harmful ‘products’ of science and innovation, with a consequent focus on risk governance. However, R&I governance processes “premised on formal risk-assessment, have done little to identify in advance many of the most profound [negative] impacts we have experienced through innovation” (Stilgoe et al 2013, p, 1569).

Retrospective accounts of responsibility are inherently limited in guiding decisions related to the trajectories of R&I, both due to the narrow concepts of risk that they assume (Felt 2007, chapter 3; Stilgoe et al. 2013), and the hierarchical, top-down, regulatory forms of governance that they seem to entail, which run counter to the unpredictable, future looking, collective enterprise of science and innovation practices.

In response to the inadequacy of traditional R&I governance models, premised on retrospective conceptions of responsibility, “a number of multi-level, non-regulatory, forms of science and innovation governance models have taken [a] forward-looking view of responsibility ... attempt[ing] to introduce broader ethical reflection into the scientific and innovation process ...” (Stilgoe et al. 2013, p. 1569).

At the core of forward-looking conceptions of responsibility is the idea that assigning responsibility to an agent concerns, “the forward determination of what is to be done”, in order either to create a desirable outcome, or to prevent an undesirable one. The focus is not on a particular wrong committed by an identifiable agent who merits blame or punishment, but on “getting the right people and institutions to work together to producing a desirable outcome or preventing a bad one” (Jonas 1984, p. 92; Cane, 2002, p.31-33).



Two concepts of “responsibility” in RRI: retrospective and forward-looking

What matters for responsibility to be generated on the forward-looking model is the combination of an *outcome that is deemed valuable* (be it the prevention of a harmful outcome or the facilitation of a desirable one), and *institutional capacity* or power to affect whether the outcome is achieved or not.

With respect to R&I governance, a forward-looking view of responsibility entails a shift in focus from “preoccupations with ‘downstream’ risk-governance”, to a broader interest in the governance of profoundly political, and therefore public, concerns about what kind of society we want - and do not want -, and what kind of knowledge is required to get there (Felt 2013, p. 40).

A central premise underlying the concept of forward-looking obligations is that the responsibility to act so as to produce a desirable state of affairs, or to prevent bad outcomes in the future, increases proportionally with the capacity to influence others or our surroundings, be it peoples’ rights and freedoms, society’s basic institutions, or the environment or climate (cf. Jonas, 1984, p. 93). Science and technology have the potential to influence people, society and their environment in profound ways, in both a positive and a negative sense. Higher education, funding and research institutions (HEFRCS) – the institutions that constitute the structural framework within which research and innovation take place – thus carry a heavy responsibility to take the necessary institutional steps to ensure that the outcomes of R&I practices are just, from a social, economic, environmental and human rights perspective.

Applying this understanding of a forward-looking conception of responsibility to R&I governance entails at least two presumptions about the nature of science and the relation between science and society, both of which are debatable: (i) that potentially harmful trajectories of science and innovation can be identified and stopped or changed before new technologies are ‘locked in’ to societal practices and structures (Arthur, 1989), and (ii) that the direction of science can be steered towards whatever society deems desirable.



Table 1. Six framings of RRI

Six framings of RRI			
Narrative	Concept of acting responsibly when doing R&I	Concerns	Governance mechanisms
Narrative I. The self-regulation of scientific activity, by, for and with scientists	Adhering to permissions and prohibitions articulated in society's norms, laws, and scientific standards of conduct.	Maintaining the relative autonomy of science to define and pursue the problems identified by the scientific community, in exchange for delivering what has been promised (new knowledge, progress).	research integrity committees, ethics committees and state agencies, such as national research councils.
Narrative II. The governance of risk	Handling and mitigating potential risk related to new technology development.	Identifying a given product of research and innovation, and the related question of how one can best alleviate, or avoid a product deemed harmful.	External review involving technical expertise; ethics review involving stakeholders; self-governance mechanisms, such as voluntary foresight exercises.
Narrative III. More anticipatory R&I practices	Anticipating potential negative social, environmental, and economic consequences of new technology.	Making R&I more reflexive, thus enabling the disclosure of present and future harmful scenarios, as well as feasible alternative, less harmful R&I trajectories.	Soft law mechanisms that facilitate self-governance, based for instance on collectively agreed codes of conduct, guidelines, and an agreed set of indicators. Also, inclusive deliberative assessment processes and ethics review.
Narrative IV. Representative co-construction of science	Democratising research and innovation, by involving those affected by the new technologies in the future in debating the shaping of that future.	Constructing good processes of inclusion in R&I; that is, processes which secure a broad variety of perspectives in the framing of problems, as well as in the evaluation of the possible and actual outcome(s) of R&I.	Mechanisms moving beyond lay representatives in ethics assessment committees, such as citizen juries, advisory committees, consensus, conferences, focus groups, surveys.
Narrative V. Aligning science with the needs of society	Aligning science with the needs and expectations of society at large.	Creating technologies that not only are not harmful, but also good, in the sense that they can be said to be socially, ethically and environmentally desirable, and therefore also socially acceptable.	Mechanisms that facilitate, coordinate and steer network interaction, mixing self-regulatory and state-regulatory modes of governance, captured by the concepts of co-regulation, co-creation and co-production.
Narrative VI. Restabilising trust in science	Reestablishing trust in science among the general public.	Educate, reassure and calm down the public, thereby also reestablishing the autonomy of science to some degree.	In many ways similar to narrative V: Mechanisms that may improve involvement, collaboration and communication through co-regulation.

Conceptualising governance of R&I

3

WHAT SEEMS TO BE STILL UNCLEAR, THOUGH, IS HOW THE IDEA OF RESPONSIBLE PROCESSES AS THE VERY BASIS OF RRI SHOULD OR COULD BE INTERPRETED PRACTICALLY ... (BURGET, BARDONE, & PEDASTE, 2017, PP. 14,15)

3.1 Governance

3.1.1 Two conceptions of governance: “bottom up” and “decentralising” from above

The ETHNA project is a contribution to the RRI discourse on the governance of research and innovation (R&I). *Governance* in this context refers to ways of *steering* processes in a desirable direction, in this case in the direction of *responsible* research and innovation, with “some authority and/or legitimacy” (Rip 2018b, p. 76).

Governance can be conceptualised as a mode of governing that entails the exercise of authority by other actors than those at the policy makers level or the top-management, which allows “politics [to be] shaped through several and diverse initiatives and authorities” coming from ... “networks and partnerships consisting of a range of public and private actors (Aars, Fimreite, & Homme, 2004, p. 24. My translation). This conceptualisation of governance emphasises the bottom-up dynamic of governance and points to the fact that while “governance arrangements may be designed to serve a purpose, [they] can also emerge and become forceful when institutionalised” (Rip 2018b, p. 76).

As Rip points out, there is an important analytical distinction to be made between the above conceptualisation of governance understood as constituted by “bottom-up actions, strategies and interactions”, on the one hand, and governance understood as a mode of governing that “opens[] up an earlier centralised arrangement and make[s] it more distributed, on the other” (Rip 2018b, p. 76).

Landeweerd et al. (2015, pp. 1,2) conceptualise governance in the R&I sector as “the set of processes by which it is taken that stewardship [i.e. management] over ... science and technology practices (research, innovation, etc.) ought to be organised in continuous calibration with those practices”. This continuous calibration, or adjustment, must necessarily entail dialogue with those enacting science and technology practices, thereby allowing a range of actors, including “policy makers, researchers, industry and civil society groups and nongovernmental actors” to partake in the shaping of those practices. In this way, decision-making processes are sought embedded within practice itself, rather than centralising the authority of decision at the policy makers level (Landeweerd et al. 2015, p. 16).

Landeweerd et al.’s definition of governance can be seen as an example of what Rip refers to as governance whereby earlier centralised arrangements are made more distributed, in contrast to governance as bottom-up actions and interactions that may in turn become institutionalised. Importantly, the distributed authority that governance entails should not be confused with earlier self-regulatory governing regimes characterised by scientists governing themselves internally, based on codes of conduct (Tancoigne, Randles, & Joly, 2016, p. 44).

The concept of governance expresses a shift in the discourse on how science should be regulated, from *internal* self-regulation by scientists based on codes of conduct, to *external* regulation, yet with the ambition of allowing the actors enacting science and technology a greater degree of autonomy and a voice in how the regulation is exercised. Governance is a non-hierarchical mode of governing, in the sense that it entails a move away from attempts at steering research and innovation towards predefined aims (expressed for instance in thematic funding programmes), or by stable means, (such as economic incentives and predefined indicators of performance). Compared to old regulatory models of *government*, which articulate hierarchical co-ordination mechanisms based on [centralised] authority (Jessop, 1998, p. 32), the concept of governance expresses a mode of external regulation “that is more decentralised and open-ended” (Stilgoe, Owen, Macnaghten, et al., 2013, p. 1569). Indeed, in contrast to government, “governance is distributed almost by definition” (Rip 2018b).

The literature describes various forms of steering R&I in the direction of responsibility in a decentralised, open-ended way (Stilgoe et al. p. 1569). Stilgoe et al summarise these to include anticipatory governance models (Barben et al. 2008), tentative governance models (Kuhlmann et al., 2019), “real-time and other forms of technology assessment” (Rip, Misa, & Schot, 1995), “upstream engagement” (Wynne, 2002), and “value-sensitive design” (Van den Hoven, Lokhorst, & Van de Poel, 2012). Other terms articulating the idea of non-hierarchical governance is “multi-stakeholder governance”, which is a mode of governance that entails governance structures allowing for an equal possibility of input among the different partners in steering [a given] initiative” (Fransen, 2012, p. 166). Others use the terms network- and interactive modes of governance to capture the essence of governance (Kooiman, 1999).

Guston’s description of anticipatory governance practices at the Center for Nanotechnology in Society at Arizona State University (CNS-ASU) may serve as an example of what a multi-level, non-regulatory approach to steering R&I processes in the direction of responsibility entails in practice, with respect to governance tools (Guston, 2010, p. 432): “CNS-ASU unifies research programmes ... across three critical, component activities: foresight (of plausible future scenarios), integration (of social science and humanities research with nano-scale science and engineering), and engagement (of publics in deliberations). CNS-ASU also performs educational and training activities as well as public outreach and informal science education”.

Governance in the CNS-ASU case focuses on facilitating the integration of reflexivity in research and innovation activities and coordinating meeting places between scientists from the natural and social sciences and lay citizens. It aims at influencing actors in networks not by top-down steering, but by coordinating and facilitating cooperation, leaving concrete aims of the R&I activity to the networks, and allowing for probing and failing in the process (Kuhlmann et al., 2019).

Echoing the case described by Guston, Strand et al. observes that “[t]he question of how to govern ... R&I networks from the perspective of funding bodies and/or government ...is rapidly transforming from policy perspectives based on central control and accountability to a perspective where *coordination and stimulation* are key concepts” (Strand et al. 2015).

Importantly though, governance is not purely about coordinating and facilitating, but may involve a mix of soft and hard(er) governing mechanisms.

Hence, as Stilgoe et al. point out, the governance mechanisms of facilitation, coordination and stimulation are commonly complemented with more traditional “policy instruments such as nor-

mative codes of conduct, standards, certifications and accreditations..." (2013, p. 1569). That said, the prerogative of de-centralising authority contained in the concept of governance means that governance in the area of R&I denotes, as a minimum, the act of "open[ing] up science and innovation" (Andy Stirling, 2008) to a wider range of inputs. Some would argue that this opening up entails creating new spaces of 'public dialogue'" (Stilgoe, Owen, & Macnaghten, 2013, p. 1569), which in turn seems to point to governance mechanisms that encourage and enable networking, broad inclusion and deliberation. Landeweerd et al. have shown how the understanding of what "opening up science and innovation" would, or should, entail in practice has changed several times in the post war period:

3.1.2 Three shifts in R&I governance: technocratic, ethical expertise, and participation

Landeweerd et al. recounts three successive shifts away from the codes-of-conduct (internal) approach to regulating science, which occurred in the decades following the second world war (Landeweerd, Townend, Mesman, & Van Hoyweghen, 2015). Each are associated with distinct approaches to regulating science, and to various degrees of an "*opening up*" of science to a wider range of inputs (Stirling 2008).

The first shift introduced a technocratic mode of governing, implying the opening up of science to scientists and technological experts conducting independent peer evaluations, focusing primarily on risk and risk assessment, and the regulation of scientific conduct and competition through law. This mode of governing is often associated with top-down, centralised forms of governing R&I through rules and regulations, as opposed to bottom-up, decentralised forms of governance, through soft-law mechanisms.

The second shift (mid 1990s) institutionalised ethical review as a governing tool in R&I. Science was opened up to a wider range of inputs from ethics experts, who were included in scientific review panels under EC research programmes, notably ELSI/ ELSA (ethical, legal and social aspects) "to provide input on the moral delimitations of science and technology (Landeweerd et al., 2015, p. 8). However, ethics became a governing tool, "institutionalised as a normative instrument to justify law and regulation" (Landeweerd et al., 2015, p. 8). One consequence of this development is, as Stirling observes, that ethics expert advice is used to "de-politicise science and technology", by "closing up" controversies on normative issues, by aiming for consensus (Stirling 2008). In this sense, the second shift did not involve a move towards governance, in terms of opening up science to a wider range of inputs.

The third shift (early 2000s) involved an institutionalisation of a public participation mode of governance; a development that preceded the introduction of RRI into the European science policy discourse, but which has become a narrative in itself in the various framings of what the goal and aim of RRI should be: "Due to a perceived democratic deficit of the European Union" approaches to R&I governance were developed to directly involve citizens in decision making on science and technology, using a range of different techniques, such as citizen juries and advisory committees, consensus conferences, focus groups, and surveys (Landeweerd et al., 2015. p. 2).

Public engagement governance tools have been criticised, among other reasons, for framing the participation exercises in ways that are useful to particular interests (Ulrike Felt, Fochler, Müller, & Strassnig, 2009), for downplaying the low political status of the outputs of these exercises, and for serving as an "efficient tool of de-politicising science and technology, in much the same

3.1 Governance

3.2 RRI as an approach to R&I governance

way as ethics expert reviews (Landeweerd et al. 2015, p. 14. See also an overview of the literature critical to public dialogue in Stilgoe et al. 2013, p. 1572).

This skepticism to public engagement was also expressed by some of our informants:

"I am sceptical to including all sorts of people in the research and innovation processes. They do not have the right language and the right knowledge to participate on an equal footing ... Besides, once you have been part of a process, even only a small part of it, it is difficult to be critical to the outcome of that process afterwards..."

Aksel Tjora, NTNU

"If lay involvement is to make sense, the layperson must be involved, contribute to, understand, and be able to use the result. If not, it's a bit like ... you use other people's time to continue with your standard academic activities. That is a fundamental ethical issue as well."

Aksel Tjora, NTNU.

"In one of the pilots we [partners to the EC-funded PRO-Ethics project – see info box on page 38] look at how we can have an ethically healthy pre-call consultation. We have taken as our starting point three projects that have been announced with us [the Norwegian Research Council] and looked at how we have involved stakeholders in pre-call consulting in those processes, with a view to how users and residents can be involved more systematically in pre-call consultations..."

Erna Wenche Østrem. Senior advisor public engagement, NRC.

Both informants seem to call for an ethics of involvement in processes of including stakeholders and lay citizens in R&I processes. An ethics of involvement concerns, not the question of *who* should be involved in R&I processes and *why*, but the question of how the persons involved should be involved, which includes questions such as how those involved can participate on an equal footing with researchers, and how their contribution should be weighed in with that of researchers. These are questions that relate to the critique of public engagement exercises concerning the low political status of the outputs of these exercises.

3.2 RRI as an approach to R&I governance

Landeweerd et al. (2016, p. 19) criticise the technocratic risk mode of governance, the existing ELSI/ELSA approach, as well as the public participation model, for taking a top-down regulatory form when put into practice, and for sharing the pitfalls of either frustrating the voice of "societal views and opinions or becom[ing] a scapegoat for pre-existing agendas". On this account, then, none of the three shifts of R&I governance summarised above open up science and innovation to a sufficient degree. The introduction of RRI into the EU research policy discourse RRI can be understood as a call for a *fourth* shift in the governance of R&I, intended to move beyond all three modes of regulating R&I, by opening up science and innovation in a more profound way:

Firstly, RRI as a mode of governance links the governance of R&I to what von Schomberg has called "normative anchor points", such as sustainable development, and social progress (René Von Schomberg, 2012). This move involves that the governance of R&I should no longer be restricted to "the definition and implementation of regulation in the form of negative constraints for science and technology but *also* of positive aims in a societal setting" (Landeweerd et al. 2015, p. 19. Emphasis added), thereby broadening up the governance of science "to include topics and issues addressing community values and collective behaviour" (Landeweerd et al. 2015, p. 15).

Secondly, and following from the first point, moving beyond the ELSI/ELSA approach means opening up the whole *process* of science - and not just its products - to *transdisciplinary* dialogue, meaning deliberation across disciplinary divides as well as with a variety of stakeholders, including the non-expert public. Assessment should thus take place from the outset of R&I processes, when problems are framed, rather than at the stage when a project is defined or a product is ready to be introduced to the market. Moreover, the assessment should take place at various stages throughout the process, and should involve a broad range of stakeholders, rather than being constricted to scientific and ethical expertise.

Thirdly, RRI as governance tool can be understood to move beyond the participatory governance approach “that merely emphasises the inclusion of different actors”, to designate “the type of *engagement* that actors should exhibit in the process of doing ... research and innovation” in a responsible way (Burget et al. 2017, p. 14. Emphasis in original). The type of engagement that doing RRI entails can be summed up in the RRI-dimensions articulated by Stilgoe et al. (2013) as that of anticipative, reflexive and responsive.

On Landeweerd et al.’s account, RRI as a mode of governing entails opening up science and innovation in a way that allows for it being “shaped through several and diverse initiatives and authorities” through “a range of public and private actors” (Aars et al., 2004, p. 24. My translation). This mode of governing is consistent with the conceptualisation of *governance* presented above in section 3.1.1. It is compatible both with governance understood as a bottom-up dynamic, as well as governance understood as the decentralisation of previously centralised, top-down arrangements.

The move towards a *governance* of R&I activities can thus be understood as one way of responding to the normative prerogative inherent in the concept of RRI of opening up the shaping of science and innovation to society; to reduce – and even collapse, the social – science divide that informs, and is upheld by, the self-governing, technocratic and ethics expertise modes of governing R&I.

However, as pointed out by Strand and Rommetveit (2019, p. 6) the move towards a governance of R&I can also be understood as expressing a pragmatic approach to steering R&I in a desirable direction, where governance, in contrast to governing, allows for the coordination of a diversity of actors across disciplinary fields and expertise in order to “achieve the best possible outcomes (ibid).

3.3 Governance understood as describing a process or a means to achieve a desirable product

The concept of RRI as concept holds in it both a dimension that designates responsibility as process, as well as a one that connects responsibility to particular outcomes (Rene Von Schomberg, 2013). Von Schomberg stresses that the process and product dimension of RRI are interrelated. The innovation process should thus be “responsive, adaptative, and integrated” and products developed through the innovation processes should “be evaluated and designed with a view to [the] normative anchor points [of environmental protection] ... human health, sustainability, and societal desirability” (René von Schomberg, 2013).

Owen et al. (2013, p. 32, 33) argue that a framework for what they refer to as “responsible innovation” must include consideration not only of the *products* of research and innovation, but more profoundly of the *purposes* and underlying motivations of R&I, by which they mean “not just what we do not want science and innovation to do, but what we do want them to do”. This involves reflecting on “what sort of futures(s) we want science and technology to bring into the world, what futures we care about, what challenges we want to meet, what values these are anchored in....”. A core question here is “how can the “right impacts” be democratically defined?” (Ibid, p. 28). One possible answer to that question is by constructing a procedural framework that ensures fair deliberation on right impact.

Randles et. al argue (2016, p. 11) that the inherent normativity of RRI raises the question of “how to deal with the inevitable tensions, conflicts and related power games that arise when a heterogeneous, pluralistic actor landscape with diverging interests is confronted by norms and values intended to change behaviour”. Given the complexity of R&I networks that RRI as governance mechanism aims to facilitate, accommodate and strengthen (be it as a normative claim or a pragmatic move), the question is how best to deal with the inevitable conflicts and tensions that will arise in any “collective search for and foundation of normative direction” (Ibid, p. 10).

Randles et al. suggest that rather than contributing to this collective search for normative foundation, one should construct governance mechanisms “able to address contestation and facilitate the capacities and capabilities of the relevant actors to engage in constructive negotiations”, allowing the actors involved in R&I networks to negotiate the normative substance of the R&I activity themselves (ibid pp. 11 and 12).

In a somewhat similar vein, Landeweerd et al. (2015, p. 17) argue that “acknowledging complexity means that governance should be less about defining clear-cut solutions and more about making explicit the political issues that are at stake in science and technology. In this sense governance becomes a process in which the political nature of science and technology is made explicit, where concerned actors express that there is *de facto* not one, single answer ... This means focusing less on decision -making and more on identifying the shared values and interests we have in the issues on the table; [the focus should be] on collaboration and dialogue, and on empowering participants”.

RRI as governance approach on this procedural account “do not focus on what RRI is ...but on the processes and mechanisms by which it is thought to be realised” (Lindner et al 2016, p. 51); it is about providing an institutional framework that facilitates collective processes of cooperation, deliberation and negotiation, through a mixture of governance mechanisms. These include overarching principles for legitimate procedures and codes of conduct setting the rules of the game, the establishment of spaces for debate and negotiation, and policy instruments “helping to achieve legitimate agreements (Lindner et al. 2016, p. 48).

The philosophical foundation of the ETHNA system – Habermas’s theory of communicative action (Habermas, 1981) – presumes a procedural approach to governing research and innovation. The overarching aim is to steer R&I processes towards responsibility understood in a prospective, or forward-looking way. Owen et. al (2013, p. 35) propose that a prospective conception of responsibility suggests an evaluative framework for what kind of processes qualify as legitimate in the governance of R&I, given the aim of steering R&I in the direction of responsible practices. The evaluative framework suggested by Owen et al. is composed of the four principles anticipatory, reflective, deliberative, and responsive. The literature box below gives a brief presentation of Owen et al.’s principles, as one way of operationalizing RRI. The six RRI keys, or policy areas, defined by the European Commission are presented as one alternative – and some would argue, complementary – operationalisation of RRI.



RRI understood in terms of process requirements, keys or policy areas.

Owen et al. (Owen, Stilgoe, et al., 2013; Stilgoe, Owen, & Macnaghten, 2013) suggest that in order to be *responsible* research and innovation practices need to be:

Anticipatory, in the sense of anticipating potential future problems, and identifying alternative R&I trajectories. Tempered by the need for plausibility, such methods do not aim to predict, but are useful as a space to surface issues and explore possible impacts and implications that may otherwise remain uncovered and little discussed. They serve as a useful entry point for reflection on the purposes, promises and possible impacts of science and innovation.

Reflexive, in the sense of “reflecting on underlying purposes, motivations, and potential impacts ...”; it compels a focus on what is known (including those areas of regulation, ethical review, or other forms of governance that may exist) and what is not known, including associated uncertainties, risks, areas of ignorance, assumptions, questions and dilemmas.

Inclusive, in the sense of opening up “visions, purposes, questions and dilemmas” related to R&I practices “to broad, collective, deliberation through processes of dialogue, engagement and debate”. This allows the introduction of a wide range of perspectives to reframe issues and the identification of areas of potential contestation.

Responsive in the sense of using the process of deliberation to “set the direction and influence the subsequent trajectory” of R&I practices, by acting on inputs “to manage emerging knowledge-based technologies *while such management is still possible*” (Owen et al., 2013, p. 38. Emphasis added). In this sense responsive means to respond and to react.

Owen et al.’s process requirements can be understood as one way of operationalising RRI as a matter of processes aiming primarily at identifying the *purpose(s)* of a given research and/or innovation project.

An alternative way of operationalising RRI is the European Commission’s (EC) six RRI keys or policy areas, which focuses on the *products* of research and innovation. On this account, doing RRI entails (i) engaging society more broadly in research and innovation activities; (ii) increasing access to scientific results; (iii) ensuring gender equality in both the research process and research content; (iv) taking into account the ethical dimension of research and innovation; (v) promoting formal and informal science education” (Forsberg et al., 2015); and (vi) encouraging the uptake of an RRI approach to science and education through institutional change (governance).

In a critical discussion of the RRI keys, Kupper et al. argue that directing attention to these keys alone when doing R&I will not necessarily lead to responsible research and innovation (Kupper, Klaassen, Rijnen, Vermeulen, & Broerse, 2015, p. 12). One reason being that one can for instance do science education or gender promotion, “in such a way that it does not reflect the standards of RRI” (ibid). Others have criticised the keys for being incomplete. So, for example, the gender key excludes other, equally important, diversity factors such as ethnicity, age, and disability. Monitoring HERFCs organisations’ RRI achievements by applying the EC’s six policy keys will therefore give an incomplete picture of the state of the art of RRI performance in Europe (Monsonís-Payá, García-Melón, & Lozano, 2017; Stahl et al., 2017).

One does not necessarily have to choose between process requirements and product, such as the RRI keys, when ‘doing’ RRI. As Kupper et. al suggest, the RRI keys can be seen as possible ‘products’, or results coming out of R&I processes that are organised in line with RRI process requirements. In other words, fulfilling RRI process requirements will ideally “help[] realise the goals of each of the policy agendas” (Kupper et. al., p. 12).

"TOP DOWN MANAGEMENT DOES NOT WORK. AT THE SAME TIME, IF EVERYTHING IS JUST VOLUNTARY, IT IS DIFFICULT TO ACHIEVE CHANGE. I HAVE SOME FAITH IN GENTLE PUSH; INCENTIVES CAN WORK, FACILITATION IS IMPORTANT... A MILD PUSH IS NEEDED FOR A CHANGE OF ATTITUDE, AND THE PUSH NEEDS TO BE CONSTANT...A GOAL OF NO RESISTANCE IS IMPOSSIBLE. ESPECIALLY IN THE RRI FIELD".

TRYGVE BRAUTSET, NTNU/DIGITAL LIFE NORWAY

3.4 Metagovernance

Governance theorists tend to agree that in order to enhance networks' alignment with and contribution to a public good there is a need for "... a system of *meta-governance* to stabilise key players' orientations, expectations, and rules of conduct" (Jessop, 1998, p. 37. Emphasis added; Jessop 2002; Kooiman & Jentoft, 2009; Sørensen, 2014; Sørensen & Torfing, 2016).

As Jessop explains, "[m]eta-governance [is] the 'organisation of self-organisation'. It involves ... the design of institutions and generation of visions which can facilitate not only self-organisation in different fields but also the relative coherence of the diverse objectives, spatial and temporal horizons, actions, and outcomes of various self-organising arrangements ... [Institutions] have a major role here as the primary organiser of the dialogue among (policy) communities, as an institutional ensemble charged with ensuring some coherence among all subsystems, as the source of a *regulatory order* in and through which they can pursue their aims..." (Jessop 1998, p. 42. Emphasis added).

The concept of a meta-governance structure captures the function that Owen et al.'s four procedural principles can have in the governance of R&I in the direction of RRI, namely that of setting the 'rules of the game' and providing a common direction to R&I activities. In this sense the principles can be understood as setting the 'rules of the game' by means of common rules and standard; they constitute the regulatory order - the framework – "in and through which" R&I activities take place, to paraphrase Jessop (1998, p. 42).

The four principles of Owen et al. can provide a common RRI vision, and a common understanding of the rules of the game, in a given organisation. The ten governance 'modules' of the Res-A-Gora Responsibility Navigator (elaborated on below, in section 4.4) can be understood as ten ways in which institutional set-ups can be designed to facilitate R&I actors' compliance with this common vision. In this way, each module will also contribute to coherence of "the diverse objectives, spatial and temporal horizons, actions, and outcomes of various self-organising arrangements" - in this case those of R&I activities (Jessop 1998, p. 42).

As Sørensen argues, a meta-governance structure is needed to ensure that self-governing networks follow the rules of the game. If R&I networks are to contribute to solving societal grand challenges in a just and effective manner “they must be meta-governed with that purpose in mind”, to paraphrase Eva Sørensen (Sørensen, 2014). The ETHNA system and its composite elements could be constructed as a meta-structure in this sense. The four principles of Owen et al. would constitute the ‘house’, and selected modules would be the elements of which the house is made up. The choice of how the modules should be designed would in turn be guided by the criteria of good governance informing the ETHNA system, which are those of ethical and effective.

It is relevant here to recall Rip’s distinction between governance understood as a mode of governing that “opens [] up an earlier centralised arrangement and make[s] it more distributed”, and governance arrangements that emerge bottom-up and become institutionalised (Rip 2018b, p. 76). Rip refers to the latter as *de facto* governance practices (elaborated on below, in section 4). The examples of good practices in this report include examples of both types of governance arrangements. The modules chosen to constitute the ETHNA governance system can be designed with a view to opening up existing centralised systems; alternatively, they can be designed with a view to institutionalise bottom-up governance arrangements that are already an integrated part of R&I processes at project level. A third alternative is to integrate elements of both forms of governance arrangements in the modules making up the ETHNA structure.

Methodological note on the selection of examples of practices of R&I governance in the field of RRI

“THERE SHOULD PERHAPS BE ROOM TO DIFFERENTIATE REQUIREMENTS FOR RRI DEPENDING ON THE PROJECT IN QUESTION AND WHAT IS AT STAKE, RATHER THAN AIMING FOR A ONE SIZE FITS ALL. REQUIRING AN RRI COMPONENT THAT COVERS ALL THE KEYS, IN ALL RESEARCH PROJECTS, MAY NOT BE THE WAY TO GO”.

ROGER STRAND, UNIVERSITY OF BERGEN

4.1 Delimiting the scope of research and innovation practices

When looking for practices of R&I governance that can serve as inspiration to the ETHNA system, we have chosen to focus on practices related to new emerging technologies, rather than research and innovation tout court. These include the areas of biotechnology, nanotechnology, information technology, and environmental protection and technology. It is, as Randels et al. also point out “with regard to these practices that the discourse on RRI has emerged ... responding to ... inevitable questions about safety, sustainability and even desirability of particular technological development (2016, p. 47). Indeed, as Strand and Rommetveit remind us, when “René von Schomberg introduced the concept of RRI in a combined academic and policy-related discourse” it focused on “the need to improve the governance of emerging sciences and technologies (such as biotechnology, nanotechnology, ICT) in order to better avoid the negative side-effects of these technologies, and to proactively steer them in the direction of societally desirable goals, values and principles” (2019, p. 4).

A narrowing down of the scope to new emerging technologies involves a disciplinary differentiation in the search for good governance practices. However, no conscious distinction was made between basic and applied science, although the majority of the examples are related to the latter rather than the former. There is no normative claim intended in this bias towards the applied science. However, there is reason to discuss whether an RRI governance system should assume such a differentiation, as some of our informants suggest:

What they are doing in the SWAFS14 projects suggests that “one should to a greater extent link RRI to practical innovation projects... when you have these contexts... nursing home research, patient research... design of better recycling systems for waste, eco-design... it is closer to the lifeworld in a way”.

Roger Strand, University of Bergen.

“It is difficult for researchers, and especially research groups in basic research, to know how to involve lay people. The time perspective also makes it difficult. Perhaps it is more appropriate to do so as CIMULACT suggests [pre-call consultations]; and perhaps it is more relevant to make such demands [of public engagement] in innovation projects; which are more practically oriented?”

Marianne Barland, Norwegian Board of Technology.

4.2. De facto RRI practices

"These are such difficult fields that we cannot expect neither the Research Council nor the research community nationally or internationally to work with these things in the same way. There are different perceptions of quality and relevance in research as well. We have to live with that. We must try to allow room for different approaches ..."

Helge Rynning, Norwegian Research Council.

"I could think of a more portfolio aware variation of research, but the thing is that if we do that now, quite a few researchers will say 'let me do the fundamental science without stakeholder involvement' ... I am not sure about this, and I think it is a point of discussion".

Leonie Van Drooge, CWTS / Leiden University.

4.2 De facto RRI practices

The aim of this report has been to explore a *phenomenon* – the governance of R&I towards RRI – adopting an approach that Rip has described as "moving about" as a self-styled anthropologist ..." (2018, 75). In so doing, we have not searched for practices that are defined as (top-down) governance of R&I towards RRI as such. Rather, inspired by Arie Rip's discussion of de facto governance (Rip, 2018a), which proposes that governance is constituted to a large degree "by bottom-up actions, strategies and interactions ... [that] add up to outcomes at the collective level which function as governance arrangements", the report contains examples of practices that demonstrate a "range of ways that actors guide, negotiate, and formalise normative understandings of responsibility and translate these into instruments ... to govern practice" (Randels et al. 2016, p. 32). Following the lead of the Res- A- Gora projects application of Rip's work, this report includes examples of bottom-up de facto governance of RRI, as well as top-down approaches that have been made more distributed.

In the search for examples of good governance practices, this approach implies that we have made no attempt at representativity in the selected samples. Moreover, taking a de facto approach to governance implies that more traditional forms of governing R&I in line with the technocratic and ethical expert modes of governing has been given less consideration, except when they express instances of an opening up of centralised arrangement to make them more distributed.

We suggest that the selection of relevant practices for the design of the modules of the ETHNA system could be guided by the overarching quality criteria for good governance in the R&I sector that underpin the ETHNA project, which are those of *ethical* and *effective*. We elaborate on these criteria for good governance in section 4.3.

4.3 Normative criteria for good governance

Informed by Habermas' theory of communicative action (Habermas, 1981), an *ethical* governance system is defined here as one that promotes and facilitates (i) the inclusion of those immediately affected by it (i.e. R&I actors) in processes of *discursive justification* of the way in which the governance system is organised, and (ii) the inclusion of stakeholders (citizens, end-users, non-governmental organisations, business representatives, policy makers) in processes of critical examination and discursive justification of possible scenarios and potential impacts generated by research and innovation processes.

A governance structure based on this 'all-affected principle' would qualify as just. This conceptualisation of ethical governance is premised on the view that an R&I governance system that is based on the all-affected principle is not only just, but also conducive of more *reflexive* research and innovation practices, which in turn is thought to be a prerequisite for *responsible* R&I practices.

In addition to being ethical, the ETHNA project holds that to qualify as good an R&I governance structure must also be *effective*. Informed by governance theory on public innovation, an effective governance structure in this context refers to one that accommodates and facilitates the form that R&I activities often take, namely the form of networks (Kooiman, 1999, p. 2; Sørensen, 2014; Sørensen & Torfing, 2009, 2016).

Networks can be described as deliberative, as goals and objectives must be negotiated to arrive at a shared direction. Another defining factor of networks is that they are highly autonomous. Consequently, there is a broad *diversity* in how R&I networks are composed, and a *complexity* in how their cooperation is organised (e.g. how open or closed the network is, and how formalised the cooperation is). A final significant characteristic of networks, is that the work processes of networks are highly *dynamic*, in the sense that they are characterised by probing and failing, and the possibility of swift change of direction (Kooiman, 1999; Spaapen & Van Drooge, 2011).

We suggest that an R&I governance system that aims at integrating RRI in R&I processes is *effective* insofar as it not only accommodates, but *draws* on the diversity, complexity and dynamics of R&I networks; for instance the deliberative potential of networks, their potential for broadly inclusive processes, their tendency to approach problems in an inter- or transdisciplinary way, and their ability to change the direction of a project swiftly in accordance with new information or new insight. An R&I governance system that works with, and draws on, R&I networks in this way not only avoids stifling the development, realisation and diffusion of creative ideas generated by R&I networks, to paraphrase Eva Sørensen (2014, p. 3-4); it may also create more fertile grounds for integrating central dimensions of RRI into R&I processes, such as those of inclusion, anticipation and responsiveness.

When selecting practices of good governance of R&I towards RRI that can serve as a model for the different modules of the ETHNA system, the above conceptualisation of good governance in the R&I sector could function as the lens through which practices are identified.

4.4 The Responsibility Navigator governance framework

We have chosen to organise the findings from the literature review, the mapping of governance practices, and the interviews under the ten governance principles articulated in the Res-A-Gora project's RRI governance framework **THE RESPONSIBILITY NAVIGATOR**. The Responsibility Navigator consists of ten principles for good governance, which are meant to provide an "orienting framework to enable "navigation" towards [RRI] learning and institutional transformation" at a systemic level (Randles 2016, p. 136). The ten principles are those of inclusion, deliberation, and moderation; modularity and flexibility, subsidiarity, and adaptation; individual capabilities, institutional capacities, institutional conditions for change agents, and culture of transparency, tolerance and rule of law.

We refer to these principles as governance modules, which articulate the idea of building blocks that can be further developed, and from which one can pick and choose as one sees fit when constructing a governance system; it is not necessary to include each of the ten modules when constructing a governance framework for the purpose of integrating RRI in R&I processes.

Following the terminology of the Responsibility Navigator, what we refer to as the ten governance modules are divided into three overarching governance themes: "quality of interaction" (section 5.1), "positioning and orchestration" (section 5.2), and "developing supportive environments" (section 5.3).

The Responsibility Navigator governance framework is partly normative, partly empirical. Its normativity is expressed in a key assumption informing the project: since responsible research and innovation is a contested concept, the normative content of it should be "negotiated by the actors themselves as part of a continuous process of reflexive, anticipative, and responsive adaptation of research and innovation to changing societal challenges" (Lindner et al, 2016, p. 11). The ten principles of the Responsibility Navigator are underpinned empirically by the lessons learned from the study of 26 cases of de facto governance of research and innovation, following from the assumption that a governance framework for R&I towards RRI should be developed based on insight provided by "RRI in the making", rather than a pre-defined conception of what RRI should be (Ibid).

As Randles et al. explain (2016, pp. 136, 137), the Responsibility Navigator assumes that "the design and operation of [governance instruments and arrangements] (even the formulation and operation of hard law) are not a given but are actively constructed through processes of problem framing (appraisal), coordination and negotiation. In this context, what is judged responsible is part of these interactions, where the responsibility-related governance takes place in sense- and decision-making processes in a collective way" ... thus "allowing RRI to emerge in a constructive, bottom-up process".

In contrast to the Res-A-Gora project, the ETHNA project assumes a normative basis upon which to construct a governance system, thereby defining what good governance consists in at the outset, rather than deducing it from actual practice. The Res-A-Gora governance framework nonetheless seems an apt framework to build on to further developing the conceptual apparatus of the ETHNA system. The claim that governance practices should be constructed and re-constructed through dialogue and negotiation between those affected by those mechanisms resonates with the understanding of ethical governance of R&I processes which informs the ETHNA system.

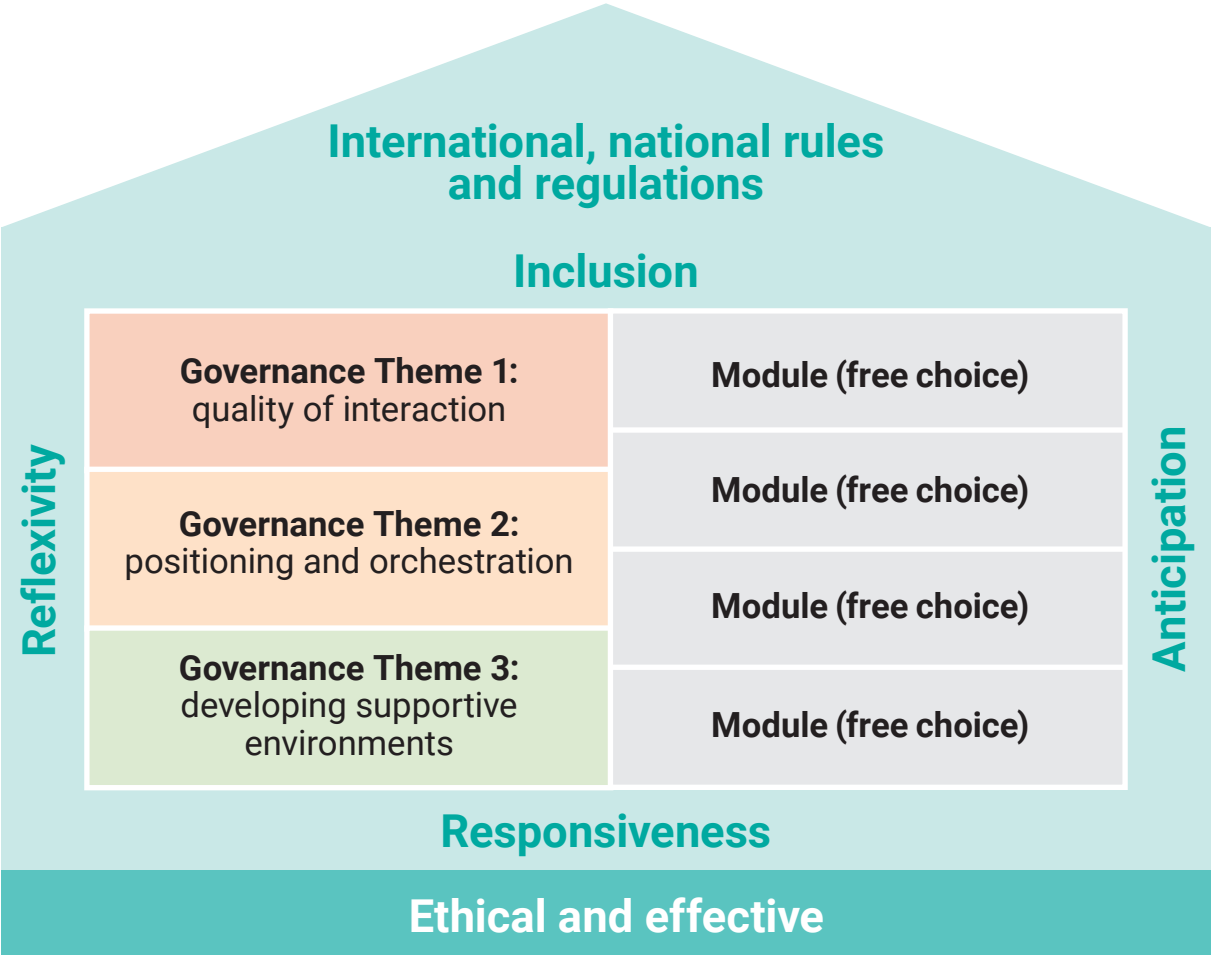
One way of operationalising the procedural principle informing the ETHNA system is by applying the four process dimensions for responsible research and innovation suggested by Owen et al. (2013): anticipation, inclusion, reflexivity and responsiveness. These principles are also reflected in the governance framework developed by Randels et.al:

The three governance themes, under which the ten modules are organised, all resonate with the governance principles of Owen et.al, albeit with a difference in focus. So, for instance, the governance theme “quality of interaction” can be seen as conducive to meeting the principle of inclusion, but also those of reflexivity and anticipation. The governance theme of “positioning and orchestration” can be understood as conducive especially perhaps to meeting the principles of anticipation and responsiveness, but also that of reflexivity. The governance theme of “developing supportive environments” can be seen to shift the focus to an emphasis on reflexivity but can also be understood as conducive to the principles of responsiveness and anticipation.

As suggested above, in section 3.4, the four principles of Owen et al. can provide a common RRI vision, and a common understanding of the rules of the game, in a given organisation. The ten governance ‘modules’ of the Res-A-Gora Responsibility Navigator can be understood as ten ways in which institutional set-ups can be designed to facilitate R&I actors’ compliance with this common vision.

As mentioned in the introduction, when assessing whether a given case listed under the modules is useful for the purpose of designing the elements – or modules – of the ETHNA system, we suggest that the assessment be guided by the overarching quality criteria for good governance that underpin the ETHNA project, *ethical* and *effective*. The illustration below is a visual presentation of the above description of how the conceptual elements of the ETHNA meta-governance structure are understood to fit together:

Figure 1: ETHNA Meta-Governance Structure





The Res-A- Gora governance framework also fits well with the criterion of effective governance in the ETHNA system as it entails drawing on the insight of those affected by the governance arrangements, notably R&I networks to arrive at what qualifies as good processes and procedures for responsibility in research and innovation. The criterion of “effective” of the ETHNA system is based on the empirical claim that most R&I activity is organised in the form of complex, dynamic and diverse networks.

And finally, the Responsibility Navigator is conceived as a meta-governance framework (Randles et al. 2016, p. 53), following Jessop’s take on meta-governance as “the source of a regulatory order in and through which [self-governing actors] can pursue their aims...” (Jessop 1998, p. 42. Emphasis added). As suggested above, the ETHNA system may also be conceptualised as a meta-governance structure in this sense.



Examples of de facto RRI governance practices organised under the Res-A-Gora Governance framework, the Responsibility Navigator

5.1 Findings related to the governance theme “ensuring quality of interaction”

The governance theme “quality of interaction” covers modules of *interaction*, *deliberation*, and *moderation*. With respect to Owen et al.’s process requirements, these modules link in particular to the process requirements of inclusive, reflexive and anticipatory. With respect to the RRI keys, the modules described under this governance theme relate in particular to the key “public engagement” but can also be understood as conducive to the keys “gender equality”, “open science”, and “ethics”.

5.1.1 Module I: Inclusion

“FOR RESEARCH TO HAVE AN IMPACT, INTERACTIONS NEED TO HAVE TAKEN PLACE. IF YOU DO RESEARCH AND YOU DO NOT TALK OR SHARE YOUR RESEARCH THEN THERE WILL BE NO IMPACT ... AND IMPACT IS NOT AN END, IT IS A PROCESS, SO IT’S ABOUT INCLUDING THE STAKEHOLDERS ON THE WAY”.

LEONIE VAN DROOGE CWTS / LEIDEN UNIVERSITY.

This governance module concerns how an organisation can manage processes of inclusion in the “navigation towards responsabilisation” (Randels et al. p. 140), to ensure that “all relevant actors are included [or] considered in the debates”, and that all actors included are relevant and able to make effective contributions to the debates” (Ibid).

EU projects on inclusion

PE2020: Developed “An online decision support tool that is intended to enable researchers, policy-makers and others wanting to engage society in research and innovation, to find the method that is best suited for their specific project needs” (quote from project webpage).

VOICES and **CIMULACT:** “had as a main objective to engage citizens and stakeholders in the co-creation of European research agendas based on real, validated and shared visions, needs and demands. These projects developed and experimented methods for citizen participation on long-term foresight, as well as built capacities in already existing methods” (Mazzucato, 2019, p. 8).

The FP7 instrument ‘Research for the Benefit of Specific Groups - Civil Society Organisations’: included “clusters of projects ... [that] developed novel technologies and applications, trying to exploit the capabilities offered by portable devices (smartphones, tablets) and the collective intelligence available through social media streams (such as Facebook or Twitter), to enable an effective participation by citizens in environmental stewardship”(Mazzucato, 2019, p. 9)

PRO-Ethics: “PRO-Ethics is working with research and innovation funding organisations across Europe to test new, ethical ways to involve citizens in decision making processes”.(Description retrieved from [RRI-Tools database](#)).

Case 1: The Norwegian Board of Technology’s (NBT) public engagement practice:³

“In almost all projects we involve experts, and also user organisations; the next assessment we make is what insights it is important to pass on to the politicians, and that is when we consider whether lay people should be involved.” Marianne Barland, Senior advisor, Norwegian Board of Technology.

The establishment and organisation of NBT was inspired by the Danish Technology Council (DBT). Its main task is to advise politicians on new technology. Citizen involvement is an important element of NBT’s mandate. As a general description, NBT invites the input from experts, interest groups, and lay people where it is considered that these groups can provide useful input to the process of developing policy advice on a given new technology. A broad inclusion of stakeholders and lay citizens is thus not only a part of NBT’s mandate, but is also considered a matter of methodological approach. It is NBT’s ambition to function as a competence centre with respect to assessing and applying methods of public involvement in the development of new technology.

NBT continually seeks to try out different methods of involvement, including people conferences, lay panels and citizens summits. As part of its role in the EC-funded project CIMULACT NBT contributed to producing an inspiration catalogue for consulting different groups.⁴

The form of involvement is often linked to ethical questions that are raised. As Barland points out, *“citizens are always influenced by the choice politicians make, but they are influenced by them to different degrees”*. For example, in a project on dementia it would be important to involve broadly; biotechnology is another field, and the development of new safety technology. These are areas where the technology raises ethical problems or dilemmas, and the technology and the legal framework regulating it is still in the making.

NBT continually seeks to ensure that those who are involved have an actual impact; that is, ensuring that involvement also entails influence. Participants are for instance allowed to formulate their own recommendations, either individually or in groups, which are handed over to the parliament. NBT may also write a separate chapter concerning the conclusions drawn from a consultation process, or a separate small report on the involvement of lay people, and hand it over to the decision-makers.

NBT also summarises concrete advices at the end of a consultation process, to ensure that there is a concrete outcome (e.g. *“we recommend that...”*, or, *“when healthcare is digitalised it is important to take x values into account...”*). The format of the recommendations differs, depending on the topic, but the ambition is that those who have participated in the process can recognise their input when reading the final report.

³ The description of the case is based on an interview conducted with Marianne Barland at NBT on 30.09.2020. The case description also draws on various NBT reports available on the NBT webpage <https://teknologiradet.no/en/homepage/>

⁴ Available at CIMULACT: Inspiration Catalogue for consulting different groups - Teknologirådet (teknologiradet.no)

Barland points out that NBT does not involve lay people as much as they would want, partly because it is so resource intensive. As a result, they are now in a process of further developing the methods of lay involvement, especially considering whether inclusion could be done digitally, in order to lower the threshold for the organisation to involve lay citizens to a greater degree, across the project portfolio.

How the case may feed into the ETHNA system

The case illustrates how the process requirement of inclusion can be understood as a question of methodological approach with respect to whether, who and how to include, depending on the case at hand, rather than representing an absolute requirement.

Case 2: The place of stakeholder involvement in the Norwegian Research Council’s (NRC) governance structure:⁵

“In all the [NRC] boards, there are now representatives from all societal interests, different social actors, from different sectors of relevance to the various portfolios...In my opinion, involvement is something the Norwegian Research Council wants to promote; it is a way to ensure that what we do is relevant ... It is part of our governance structure.” Marte Quenlid, senior advisor Open publication/Open science policy, Norwegian Research Council.

In January 2020 the NRC’s new policy on open research came into effect. The policy addresses in a systematic, strategic way open research as well as RRI, citizens science/involvement and innovation. The focus on these topics is not new to NRC’s; however, the policy is a first attempt at linking all the elements and integrating them into NRC’s work in a systematic way, as part of NRC’s new portfolio strategy.

The inclusion of stakeholders had a central place in the process of developing the open science policy, and NRC reached out broadly from the very beginning of the process. Two open hearings were thus conducted as part of preparing the draft document for the new policy.

Inclusion of stakeholders is also fundamental to the way in which NRC works to realise the policy on open science. However, the attempt at linking all the elements related to responsible research to involvement is in a start-up phase, and the organisation is in a learning mode. As one of our informants at NRC stated:

We seek to have a comprehensive but diverse way of working with this. Because the target groups for research and innovation are very different, work differently and we must have different ways of dealing with it. Through this follow-up work of the policy, we are in the process of gaining a comprehensive understanding of how these things are connected.

Erna Wenche Østrem, senior advisor, NRC.

⁵ The description of the case is based on an interview conducted with Marte Quenlid, Erna Wenche and Helge Rynning, senior advisors, Norwegian Research Council, on 05.11.2020.

The NRC is in a process of investigating at what level, and with whom, and how inclusion will and should occur at project level. In this learning process, the NRC draws on outputs from the various projects that the organisation is part of. For instance, the EC-funded project PRO-Ethics focuses on ethically healthy pre-call consultation processes, with a view to how users and residents can be involved more systematically in pre-call consultations. The aim is to develop a check list of what are the most important questions that one should ask both at the strategic level and at the project level when it comes to this question. Knowledge from this project will be fed into the NRC’s work on how best to involve stakeholders in its own work.

The involvement of stakeholders is also an important part of NRC’s new organisational strategy, involving among other things a shift to portfolio management; a development which is in line with the move towards mission -thinking and involvement at the level of the EU (Mazzucato, 2019). The process of developing the NRC’s portfolio plans will involve consultation rounds (2021/2022), where all relevant collaborative environments will be given the opportunity to express themselves, including the research environments. The process of creating new types of applications will also involve relevant stakeholders, in a form of pre-call consultation process.

The systematic approach to inclusion of stakeholders is also apparent in the new organisation of the NRC: In all its boards *“there are now representatives from all societal interests, different social actors, from different sectors of relevance to the various portfolios. They are part of [the NRC’s] governance structure”*. Marte Quenlid, senior advisor, NRC.

NRC also strongly encourages stakeholder involvement at project level as well. For example, they now have a new call for applications out where the projects are required to involve at least two social actors. In addition, there are projects where the social actors own the project, such as for instance innovation projects in the public sector. As Østrem summarised it, involvement of stakeholders at project level *“is going to be a fixed size, which one has to reckon with”*.

How the case may feed into the ETHNA system

The case illustrates how the requirement of inclusion can be met at system level by involving stakeholders in the organisation’s governance structures; at the same time, the requirement of inclusion is developed as a working method for the entire organisation by drawing on knowledge generated in projects that the organisation partakes in.

Case 3: Stakeholder involvement in Danish priority-setting for strategic research: the RESEARCH2015 project⁶

RESEARCH2015 refers to a priority-setting exercise initiated by the Danish Ministry for Research, Technology and Innovation. The aim was two-fold: first, to “develop a more structured and transparent approach to priority-setting across research and innovation institutions... through cross-disciplinary deliberation and the broad inclusion of societal actors” (Linder et al. p. 85), and second to “create a better knowledge foundation for the governance of strategic research by widening inclusion” (ibid, p. 86). The ambition was to not steer the process, but to reach consensus within it.

⁶ The case description is adapted from the Res-A-Gora project’s examples of “rri-governance in the making” (Randels et. al 2016, pp. 85-89).

The innovative part of the process was first and foremost the number of actors involved in the process, rather than the range of actors involved. The involvement of societal actors was organised in three phases, beginning with a first round of open hearings, which was open to everyone, including lay citizens. A number of inputs were received, a majority from the industry, research organisations, and individual researchers employed at universities, and only very few from individual citizens.

The second phase consisted of eight experts - four from universities, three from business and one from a private research foundation - systematising the inputs received in phase one. These were the only actors who followed the process over a longer period of time, while others contributed just once or twice.

Finally, the third phase “consisted of a user panel of 57 representatives of societal organisations” who “gave their input via a one-day workshop held with the expert group. In the third phase, ministries and public research councils helped adapt and write the final proposals. In this phase, comments were still given by a number of organisations” (Ibid).

The inclusion process of the RESEARCH2015 project was criticised for not involving representatives from the natural sciences and the industry to a sufficient degree, for failing to involve actors from outside academia, and for failing to involve the general, lay public in a more structured, systematic manner.

How the case may feed into the ETHNA system

The official evaluation of the project concluded that even though it had an impact on the exercise of policy-making, it “did not bring anything new to the table”; as such the case illustrates that there is no necessary link between inclusion and influence, and that “a more thorough and systematic inclusion of new actors that gave them a clear understanding of the different ways to affect the process could have potentially given more weight to novel suggestions for strategic research” (Ibid, pp. 87, 88).

A final lesson to draw from the project is that steering, in the form of structuring the hearing of actors in an efficient manner, is necessary “to create a reasonable balance between top-down structuring and room to maneuver for the participants” (Ibid, p. 88). The Res-A-Gora project’s ten principle responsibility framework proposes procedures that should be in place in order to structure the hearing of actors in this manner.

Case 4: Co-creation in the Public Health Alliance, Central Norway⁷

“Values are difficult to influence directly, they come as a result of change in practice forced by changes in context.” Steinar Krokstad, Director of the HUNT health survey, initiator and leader of the Public Health Alliance, Central Norway.

⁷ The description of this case is based on an interview with Steinar Krogstad, Director of the HUNT research centre and biobank, leader of the Public Health Alliance Central Norway, and project leader of HODEBRA, a public health campaign for the promotion of mental health, which is based on data from the HUNT health study, and is an initiative under the Alliance. The interview was conducted on 12.06.2020.

5.1 Findings related to the governance theme “ensuring quality of interaction”

HUNT is a large longitudinal health survey which ran from 1984 to 2016 and contains a database and biobank with health data and samples from 230,000 people.⁸ In 2015 the director of HUNT, Steinar Krokstad, took the initiative to establish a Public Health Alliance, *“to contribute to public health work and do something about the challenges that the HUNT data reveals”*.

The Public Health Alliance is a network consisting of research organisations, municipalities, labor organisations, user organisations, and charities such as the Red Cross. It promotes healthy living conditions for all, and works to influence health behaviour in the population. HODEBRA is an example of an initiative under the Public Health Alliance, which promotes mental health by inspiring to active, social and meaningful activities for all. HODEBRA is developed on the model of the Australian Act, Belong, Commit (ABC) project,⁹ and draws on data from HUNT.

Research projects connected to the Public Health Alliance use data and samples from the Norwegian longitudinal population health study HUNT (NTNU) as a source of information on public health challenges that should be researched further. Research is in turn initiated to document the effect of public health initiatives coming from the Alliance, such as for instance the HODEBRA initiative.

The Alliance can be seen as a self-governance tool to secure inclusion and participation of stakeholders in influencing, and to some extent setting, research priorities in the area of medical and health research, drawing on insights from the HUNT data on public health trends. Initiatives have also been taken to include lay citizens in deliberating on relevant research areas in the area of medical and health research, as well as the framing of research questions.

So, for instance, the Alliance’s annual public health conference in 2019 included a session devoted to lay citizens’ input on relevant research related to the thematic area mental health/HODEBRA. In this session, lay citizens were invited to “sit down with a researcher” and discuss issues or topics that they would like to see researched.¹⁰

How the case may feed into the ETHNA system

The Public Health Alliance is an example of self-governance of research and innovation through networks that have resulted in an institutionalisation of practices of inclusion of stakeholders, and to some extent lay citizens, in R&I processes, resulting to a degree of co-construction of the issues to be researched. It is unclear, though, to what extent this development also involves reflexive deliberation on the ethical dimensions of medical and health research, or whether the ethics of the medical and health research projects that follow from these processes are subject to traditional ethics review only.

The management at NTNU, where HUNT and Steinar Krokstad are based, has not been involved in facilitating the establishment or running of the Public Health Alliance. When asked what measures would be needed at management level to spread the practice of his research group to other research environments in the organisation, Krokstad replies:

“Attitude change perhaps? But to achieve that you have to force through a change in behaviour first”.

8 “The Trøndelag Health Study (The HUNT Study) is one of the largest health studies ever performed. It is a unique database of questionnaire data, clinical measurements and samples from a county’s inhabitants from 1984 onwards ... Today, HUNT Research Centre has a database with information on 230,000 people”. Quote from <https://www.ntnu.edu/hunt>

9 <https://www.actbelongcommit.org.au/>

10 See the Alliance’s annual report (in Norwegian only): <https://www.trondelagfylke.no/globalassets/dokumenter/folkehelse-idrett-og-frvillighet/folkehelse/folkehelsealliansen-i-trondelag/motedokumenter-fra-alliansen/20201028/vedlegg-2--arsmelding-for-folkehelsealliansen-i-trondelag.pdf>



Krokstad refers to the case of the Norwegian anti-smoking act to illustrate his point: a change in attitude in the Norwegian people against smoking in public places came only after it was prohibited by law. Requirements must thus be made of researchers with respect to involvement of in R&I processes. One way of doing this is to include the goal of public engagement in R&I in strategic documents. So, in Krokstad’s view, one may achieve an attitude change towards involving stakeholders and lay citizens in R&I processes if this aim is expressed in the organisation’s overall strategy. Krokstad adds that the management would also be wise to recognise and applaud the environments that work as desired; that it supports, demonstrates and communicates that “this is in line with our strategy”.



5.1.2. Module II: Deliberation

“FOR ME, IT [ETHICAL GOVERNANCE] INVOLVES VALUE MAPPING AND VALUE DELIBERATION, WHERE THE VALUES THAT ARE OTHERWISE IMPLICIT ARE PRESENTED AND DEBATED IN A CONTEXT, THAT IS, IN LIGHT OF CONCRETE ISSUES, SAY NEW TECHNOLOGY THAT ENABLES FACE RECOGNITION...”

MATTIAS KAISER, UNIVERSITY OF BERGEN, NORWAY.

This governance module concerns how an organisation can manage deliberative processes with respect to securing a broad range of issues being discussed, perspectives and values brought to the table, from organisational actors as well as individuals.

Case 5: Practicing ‘Hanging out’ with stakeholders in Stroud, UK¹¹

“If you do research and you do not talk or share your research then there will be no impact, so you need to have interactions, and they might contribute to the impact. And impact is not an end, it is a process, so it’s about including the stakeholders on the way.” Leonie Van Drooge, senior researcher, Leiden University.

“The vision, the narrative we develop together is alive, it will change underway. We need to keep the discussion going throughout the project.” Leonie Van Drooge, senior researcher, Leiden University.

The case serves to illustrate a conception of deliberation as “productive interaction”. As Von Drooge explains, productive interactions are interactions through which

“...the researchers, or the stakeholder or the next user ... change[s]; either [in the sense that they] understand something, or change behaviour, start using something, or does something different than before. That can include also the researcher [who sees his or her research from a different perspective]”. Leonie Van Drooge, senior researcher, Leiden University.

In order to achieve this change, interaction and deliberation related to the framing of the research question is crucial, as exemplified in a project on sustainable communities that took place in Stroud,” a town in the West of England that is known for being an example of a ‘sustainable community’; the objective of the study was to investigate “the skills, training, and ‘knowledge communities’ required to develop sustainable living” (Molas-Gallart & Tang, 2011, p. 220).

¹¹ The case is taken from the paper by (Molas-Gallart & Tang, 2011), and referred to in the interview with Leonie van Drooge, conducted on 24.11.2020.

The researchers actively sought the collaboration of stakeholders from the beginning. However, they experienced great difficulties in including relevant stakeholders in the project. As a consequence, “the lead researcher spent months trying to build trust with them, living in Stroud, visiting and helping in allotments, participating in local community events, [even] attending birthday parties, etc.” (ibid). This form of ‘hanging out’ with the stakeholders proved beneficial, mainly to the researchers, who experienced that their initial framing of the research problem did not fit the experience of those whose skills and practices were studied.

These conclusions from the study “confirmed the stakeholders’ existing practices and assumptions and, therefore, did not change or shape their practice”. The research team realised the importance of spending “more time getting to know the stakeholders before engaging in research activity”, instead of “going in cold” (ibid); i.e. the importance of “hanging out”.

The case illustrates the importance of interaction and deliberation as a research strategy, rather than just a means to create research opportunities.

As Van Drooge points out, the next question “... is of course who you hang out with. Some astrophysicists might not hang out with people who are not in science, but they might hang out with ... someone who makes the instruments, or...if you really think of choosing these research subject and understanding why your research might be important, I think hanging out is really [essential]...If you do not hang out, you might come up with socially not so relevant research.” Van Drooge.

As the article by Molas-Gallart & Tang suggests, “making productive interactions the core of impact assessment [by] focusing on processes ... rather than on valuation of impacts” would contribute to encourage researchers to engage in interaction and deliberation in R&I processes (2011, p. 225).

How the case may feed into the ETHNA system

The case may serve as an example of deliberative processes secured by making a particular form of deliberation – that of hanging out with research object in their everyday life habitat – an integral part of the research methodology.

Case 6: Community ethics committee at Harvard medical School, the USA¹²

In its report on ethics assessment and guidance in universities, the SATORI project reports on the Community ethics committee at the Centre for Bioethics at Harvard Medical School. The committee consists of “members of the informed public, allow[ing] for inclusion of a wider array of stakeholders in the ethics assessment”. (Bencin et. al., 2015, p. 12).

¹² The case is referred to in the SATORI project report by Bencin et. al. (2015) “D.1.1. Ethics assessment and Guidance in Different Types of Organisations”. The description of the case is from the Community Ethics Committees webpage: <https://bioethics.hms.harvard.edu/about/community-ethics-committee>

According to the committee’s webpage, the community ethics committee is “created under the auspices of the Ethics Leadership Group in the Center for Bioethics at Harvard Medical School” and is part of “the nonprofit Community Voices in Medical Ethics, Inc”. The committee has a threefold function: to provide public participation in ethical deliberation; to be “a policy-review resource for Harvard’s teaching hospitals”; and to be “an educational resource to the varied communities from which the members come”

The committee’s members are volunteer, and “are diverse in age, ability, cultural background, education, ethnicity, gender, language, religion, and socioeconomic status”.

The committee publishes white papers on the ethical aspects of medical and health related topics on a regular basis, which are available online.

How the case may feed into the ETHNA system

The committee constitutes a permanent forum for stakeholder engagement in matters related to the ethics of medical and health related research. It is unclear, however, to what extent researchers engage in dialogue with the committee, and hence to what degree the committees’ contribution to ethical debates in general, and ethics assessment in particular, has an influence on R&I processes. The case may nonetheless serve as an example of the institutional shape that a forum of the type called for in the quote by Mattias Kaiser above may take; that is, a permanent, transdisciplinary forum with a view to “value mapping and value deliberation, where the values that are otherwise implicit are presented and debated in a context, that is, in light of concrete issues”.

Case 7: The Urban Lab neighborhood development initiative at Karlsruhe Institute of Technology, Germany¹³

“The ‘District Future – Urban Lab’ is a sustainability research project and, at the same time, a meeting space that serves as an exchange platform for different actors and for the local community. It is a “common experimental space for technical and social innovation and mutual learning.” (p. 35) It is explicitly transdisciplinary ... which mean that it integrates reflection and deliberation with non-academic project partners... and is based on a cooperation between the Karlsruhe Institute of Technology (KIT), the City of Karlsruhe, local citizens, the private sector, NGOs, and cultural workers; The project explicitly commits itself to sustainable urban development as the main goal of its activities (p. 37).

The ‘lab’ consists of a bundle of elements, a core team of researchers, various sub-projects, a research infrastructure (the city quarter as project area and a meeting room in the premises of a former shop), and a webpage and social media accounts. Each sub-project involves two researchers employed with the institute for Technology Assessment and Systems Analysis at KIT. The researchers are responsible for managing the project, with the aim of facilitating the co-design of the project through public engagement. The various sub-projects have created activities and areas of interaction, including a repair café, a clothes swapping party, and a plant-swapping market, which are “used by researchers as occasions for dialogues with citizens on why reusing or repairing clothes or other items is sustainable” (p. 37).

¹³ The case is adopted from the RRI-Practice “Handbook for Organisations Aimed at Strengthening Responsible Research and Innovation” (Wittrock & Forsberg, 2019, p. 37). But see also the ‘lab’s’ webpage at <http://www.quartierzukunft.de/en>

The ‘lab’ project itself is based on two large-scales citizen meeting “to allow for a co-design process and to involve citizens in setting the research agenda ...” (p. 39).

The lab has been supported financially by KIT through strategic funds, and some additional temporary financial support from the Karlsruhe Civic Foundation. The aim of the project is to become financially independent.

How the case may feed into the ETHNA system

The ‘lab’ may serve as an example of a network-based approach to managing semi-permanent, project-based forums for transdisciplinary deliberation. In this case the core team of scientists, which is responsible for project management, supervision, moderation and mediation, can be seen to have taken the role of a meta-governing entity, which serves to bind the sub-projects together, by setting the rules of the game and providing a shared purpose (in this case contribute to sustainable urban development).

5.1.3. Module III: Moderation

“IF WE INSIST THAT ETHICS OCCURS IN DIALOGUE, IN VALUES BEING CHALLENGED, WHAT DOES IT ENTAIL IN PRACTICE? WE MUST RIG THE QUALITY ASSURANCE SYSTEM SO THAT IT FORCES REFLECTION TO A GREATER EXTENT THAN TODAY. RESEARCHERS MUST EXPOSE THEMSELVES TO OTHER TYPES OF INPUT, ALREADY AT THE STAGE WHEN THEY DEFINE WHAT THE PROBLEM IS...THIS MEANS THAT IT MUST BE A TRANSDISCIPLINARY FORUM, WHERE RESEARCHERS SHOULD PRESENT AND DISCUSS THEIR PROBLEM FRAMING.

MATTIAS KAISER, UNIVERISTY OF BERGEN, NORWAY

This governance module concerns how an organisation can manage processes of interaction by the means of moderation mechanisms, including facilitating and coordinating units, (semi)-permanent fora for interdisciplinary dialogue, workshops on RRI (related topics), network-facilitation, and RRI-training. Several of our informants expressed skepticism to existing institutional frameworks for ethical appraisal to facilitate dialogue and critical reflection on broader, societal issues, as articulated in the following three citations:

“It is clear that there is a great need for meeting places to discuss research ethics and that was one of the recommendations that came out of this report [the RINO project report (research integrity in Norway), where they looked at experiences related to training in research integrity].”

Helene Ingierd, Director, Norwegian National Research Ethics Committees.

...there should be a regular forum where you invite researchers from all the faculties where they will have to talk to each other and invite outsiders. The outcome of the discussions in these forums should then be followed up. It should be a kind of expectation from the management that one should participate.”

Mattias Kaiser, University of Bergen, Norway.

“What happens when you just introduce a little mess into the research and innovation activities? Perhaps all the big plans on how to introduce RRI and what to achieve, maybe they never work? Perhaps RRI at its best is an opportunity to introduce some noise and disorder into the research and innovation processes, which allows some researchers to open their eyes, perhaps slow down the thinking a bit, perhaps question some things they take for granted.”

Roger Strand, University of Bergen; Norway.

The cases 8-10 listed below are examples of ways in which platforms for inter- or transdisciplinary dialogue may be organised in a way that differs from the more traditional ethical committee systems; differ in the sense that they are less formal, focus on the entire R&I process – rather than just assessing a project description or a product –, and more geared towards facilitation and coordination.

Case 8: Platforms for transdisciplinary dialogue and cooperation under NTNU Oceans strategic area¹⁴

“[Governance towards interdisciplinarity] is about nudging the development in a certain direction, about facilitating dialogue, getting the researchers to speak with each other ... it’s about having good platforms for collaboration, having incentives, things that make it easy to collaborate across disciplinary borders... There is a kind of deliberative thought behind [the benefits of interdisciplinary research].”

Siri Granum Carson, Head of NTNU Oceans

NTNU Oceans is one of NTNU’s four thematic, interdisciplinary focus areas. The other three areas are NTNU Health, NTNU Energy, and NTNU Sustainability. In 2014 the top management at NTNU decided to organise the research activity in the organisation under four strategic areas, with the intention of stimulating interdisciplinary activity in these areas. The main purpose of NTNU Ocean is to facilitate innovative, exciting, responsible research in this strategic area. They facilitate, create meeting places, help researchers to network, and use the incentive funds they have available strategically to bring about that type of interdisciplinary activity. As a strategic area, the focus is not explicitly on RRI, but on stimulating interdisciplinary activity.

¹⁴ The description of the case is based on the interview with Carson, conducted on 30.10.2020.

The strategic area is organised outside the regular management structure, which “gives freedom of maneuver”. The strategic area takes a bottom-up approach to governing, seeking to engage researchers in transdisciplinary projects on a voluntary basis:

“I like to think that we achieve interdisciplinary research because it’s fun to work that way, it’s more interesting. Technologists are preoccupied with society. They are pushing new technology because they have to solve problems. This is potentially a very rewarding problem for those who work with developing new technology, and can provide better technology that is easier to implement, so there is a lot to gain for the researchers here”.

The strategic area thus encourages and facilitates networking mainly by coordinating and facilitating meeting places:

We also facilitate networking, for instance by arranging breakfast meetings... and other events. Some come because they are already into transdisciplinary research, because they see that there is something to be gained here, while others may have to be convinced.

Other instruments used to spur transdisciplinary collaboration is through the launching of research initiatives, building strategic investments in ocean space, and communicating clearly the conditions for working under, and receiving support from, the strategic area:

“I communicate [to the management] that this [RRI] is important to [the thematic focus area of NTNU Oceans], socially responsible research and innovation, sustainability challenges, so if you come to us and want to achieve things, then these are the criteria for cooperation. We have limited resources, but we have the freedom to lay down this type of ... prerequisite for cooperation with us”.

The measures that the strategic area employs to encourage transdisciplinary collaboration are both ‘soft’ and ‘hard’. The soft measures consist of getting the researchers to talk with each other, exchange and discuss common concerns, and in this way nudge the development in a more reflective direction. The hard measures consist of making clear that in order to succeed, get funded, and set the research agenda, researchers must meet the expectations of preventing unethical research and incorporating reflection on the social consequences of their research activity.

How the case may feed into the ETHNA system

The case illustrates how the moderation of processes of inclusion and deliberation can be loosely governed by a handful of staff centrally placed within the organisation, through the facilitation and coordination of networks, the creation of temporary meeting places, the use of strategic funds as incentives for collaboration, and by advocating the scientific advantages of transdisciplinary cooperation, including broad stakeholder involvement, to selected disciplinary fields.

Case 9: The management unit for the facilitation and coordination of RRI and other cross-cutting issues in biotechnology under Digital Life Norway (DLN)¹⁵

“The short version of DLN is that you have a large amount of projects in biotechnology, which are very different, and these are gathered under one big umbrella, which is a management project, which I lead, where we try to catalyze, facilitate, and coordinate interaction between all the projects”.

Trygve Brautaset, Head of DLN

DLN is one of the RRI flagships of the Norwegian Research Council (NRC) and is perceived as a pioneer project. DNL was established as a project network with a management team or have connecting the different nodes attached to it. The management team works to promote cross cutting issues such as RRI, innovation, IT, research education across the 36 biotechnology projects under the DNL umbrella.

The management team assists the projects, by going where the projects are. Two coordinators travel to wherever the project members are physically located, identify the task they find challenging (e.g. establishing contact with a technology transfer office – a TTO), and do the work for them, or together with them. It is resource intensive, but the natural differentiation between the projects (innovation is not relevant for all projects for instance) helps to make it affordable. The team also organises RRI workshops, seminars, and conferences, and RRI courses for young researchers.

“We see that when these people have participated [at the RRI workshop] and experience that they can take something away from it that is useful to them, they go back to their colleagues, and they become multipliers ... [RRI] ambassadors...”

DLN can be understood as a meta-governance structure, providing a framework that facilitates the integration of RRI and other cross-cutting issues in the R&I processes of the research networks connected to it:

“We have received feedback that we have managed to create a framework for RRI. I think the key [to success] here is that is that we have a meta-structure consisting of dedicated people who work on a continuous basis to support the projects.”

An important lesson drawn from the first four years of operation is that differentiation may be the way to go when seeking to integrate RRI into R&I processes:

“At first, we thought that all the projects need to do some RRI. It was the same for innovation. Everyone has to do some innovation. We have to help all the projects ... But then we gradually realised that this approach does not work. All projects are different in nature. For some, innovation is meaningless, they work with brain research e.g. And for others, it is very relevant, they are working, for example, to develop artificial pancreas for better diabetes treatment ... so now after four years [of funding] the center, the research council is unsure whether all projects should have an RRI component in them”.

¹⁵ The description of the case is based on the interview with Trygve Brautaset. Head of the Centre for Digital Life Norway (DLN), conducted on 05.10.2020.

Another lesson is that to have any hope of integrating RRI into the projects, it needs to be voluntary, only aided by a constant gentle push, which should be the role of an RRI unit like DNL:

In the center we now have 36 projects. These are very diverse. Not everything is relevant to everyone; there will be differentiation due to the nature of the project. Take innovation. Here the projects are very different, and for some it seems like a different planet. Then it becomes a useless exercise to force them to think innovation [or RRI].”

“Top down management does not work. At the same time, if everything is just voluntary, it is difficult to achieve change. I have some faith in gentle push; incentives can work, facilitation is important... A mild push is needed for a change of attitude, and the push needs to be constant. Scientists are opposed to everything. A goal of no resistance is impossible. Especially in the RRI field”.

DNL has recently received funding from the NRC for an additional period of five years.

How the case may feed into the ETHNA system

The case is similar to the case preceding it. However, it illustrates more clearly the meta-governing role that an entity placed at the systemic level within an organisation, yet at the level below the top management, can take with respect to steering R&I networks in the direction of RRI, mainly through the moderation of interdisciplinary dialogue and collaboration. It also demonstrates the importance of dedicated support staff that can contribute to constantly nudging the networks in the direction of RRI.

Case 10: The facilitation and coordination of citizen science managed by the Fundación Ibercivis; a not-for-profit foundation under the University of Zaragoza, Institute for Biocomputation and Complex systems Physics¹⁶.

The foundation is sponsored by the University of Zaragoza, the Spanish National Research Council (CSIC), the Centre for Energy, Environmental and Technological Research (CIEMAT), Red.es, the Ikerbasque Foundation, the Zaragoza Knowledge City Foundation, the Government of Aragon, and the Ministry of Economy, Industry and Competitiveness.

The RRI-Tools’ catalogue of good RRI practices describe the aim of the foundation as follows: “Ibercivis aims to promote public engagement in science by supporting citizen science experiments and funding a wide range of projects, mainly at scientific, economic, educational and policy levels. Ibercivis activities include research support (software development, middleware adaptation or hardware hosting), scientific communication and engagement plans (dissemination, outreach and inreach), and participatory experiment management (design and production, competitive funding calls, public spaces, or education programmes).”

The foundation has integrated the principle of inclusion, involvement and deliberation into its strategic work, among other things by involving public, private and government stakeholders “in the organisation’s strategy development” (Kupper et al., 2015, p. 55). The broad inclusion of

¹⁶ The example is adopted from the RRI-Tools “Catalogue of good RRI practices” (Kupper, Klaassen, Rijnen, Vermeulen, Woertman, et al., 2015, p. 55).

stakeholders at systemic level results in “flexible management and collective decision-making processes” and is conducive towards reflexive and anticipatory R&I processes. Moreover, the participation in “Public fora such as the Future Innovators Summit¹⁷ promote reflection that helps refine ideas and plans” (Ibid).

The foundation also enacts a principle of openness, among other things by making “information (goals, procedures, expectations, progress, research data) ... available to all stakeholders through multiple outlets: public repositories for software and tools, audiovisuals for alternative methods of reporting procedures, and open licences for outcomes. Multimedia content is translated and software code is documented so it can be easily reused.”

How the case may feed into the ETHNA system

The case illustrates how the moderation of processes of inclusion and deliberation can be governed by setting up an entity outside the main organisation dedicated to citizen science.

5.2 Findings related to the governance theme “positioning and orchestration”

“THE QUESTION IS, WHEN TO USE CARROT, AND WHEN TO USE WHIP; THAT IS A CLASSIC QUESTION IN ALL FORMS OF GOVERNANCE”.

ROGER STRAND, UNIVERSITY OF BERGEN

The governance theme “positioning and orchestration” covers the *modules modularity* and *flexibility*, *subsidiarity*, and *adaptability*. These modules concern mechanisms to enhance “a mutual understanding of responsibility-related values and commitment”, accountability structures and organisational learning. With respect to Owen et al.’s process requirements these modules link to the requirements of reflexivity, anticipation and responsiveness. With respect to the RRI keys, the modules can be seen as conducive to the RRI keys of ethics, science education and governance.

5.2.1 Module IV: Modularity and flexibility

This governance module concerns mechanisms that can contribute to “align a mutual understanding of responsibility-related values and commitment” in the organisation, to enhance the self-governance of R&I actors with respect to integrating RRI (related issues) into their R&I activities. It focuses attention on a mix of soft governance tools, flexible solutions, and communication. As our informants suggest, there is a need for a shared standard across the organisation, which can provide a common direction to R&I projects that is organised under it, yet, which is flexible enough to allow for differentiation between disciplinary fields with respect to the way in which R&I projects meet requirements related to RRI:

17 <https://ars.electronica.art/outofthebox/en/fis/>

“... one must have some management tools, and not just a vague reference to ... recognised re-search ethics norms ... establishing a specific standard, institutionally, is also very important”.

Knut Ruyter, Science Ombud, University of Oslo.

“One finding of the SATORI project was that the ethical principles and issues for different fields are in large part different. That is a reason to differentiate between the different fields in how you structure ethics.”

Philip Brey, University of Twente.

Case 11: The discipline specific codes of conducts of the National Research Ethics Committees, Norway.¹⁸

“The Norwegian national research ethics committees [FEK] are responsible for making ethical guidelines at national level... They are meant to provide a framework for the ethical assessment. Definitive answers are rarely given. The purpose is to facilitate reflection.”

Helene Ingierd, Director of the Norwegian National Research Ethics Committees.

The Norwegian Research Ethics Act (2017) gives the Norwegian higher education and research institutions a statutory responsibility for research ethics work in their organisation. The vast majority of these institutions have ethics committees in place, mandated to handle cases having to do with fraud and other forms of misconduct in research.

The Norwegian national research ethics guidelines define the recognised research ethics norms in which the higher education and research institutions have a responsibility to provide training. The guidelines are discipline specific, and are managed by corresponding research ethics committees: the National Committee for Research Ethics in Science and Technology (**NENT**), the National Committee for Research Ethics in the Social Sciences and the Humanities (**NESH**); The National Committee for Medical and Health Research Ethics (**NEM**).

The respective guidelines place a responsibility on the institutions to include the broader societal perspective in the research ethics assessments they make; a responsibility that is already assumed in their legal obligation to provide training and education in research ethics:

“It is clear that the responsibility that the law places on the institutions when it comes to re-search ethics is about more than dealing with cases of dishonesty; it also involves a training responsibility, which I think must be understood quite broadly in order to fulfill the requirements in the law... It is not sufficient to offer a course for PhD students, there must be continuity in the training, including for other employees, and to achieve that you have to have other arenas for learning and exchange”.

However, despite the broader scope of the national ethics guidelines, it is not common for higher education and research institutions in Norway to take a more proactive, preventive responsibility for research ethics, which would assume a broader societal understanding of what research ethics means.

¹⁸ The case is based on an interview with Helene Ingierd, Director of the Norwegian National Research Ethics Committees, conducted on 09.11.2020.

The guidelines are not only directed at the institutional level, but are intended also to “promote such reflection and awareness in the researcher”:

“The entire committee system is based on the idea that research ethics broadly understood is ultimately the responsibility of the researcher, and the committee wants to promote such reflection and awareness in the researcher, and the guidelines are also intended to do so. They are not very concrete, but are meant to provide a framework for the ethical assessment. Definitive answers are rarely given. The purpose is to facilitate reflection.”

FEK recognises however, that reflection on the broader, societal research ethics dilemmas should be facilitated at system level, *“although it is unclear how exactly to facilitate that kind of dialogue. We have yet to make any clear recommendations on that issue. But we see that there is a need for something else, in addition to the existing committees focusing on research fraud; a different way of discussing these issues”*.

FEK sees that the traditional ethics committee system may not be best placed to facilitate that kind of broader dialogue on societal ethical issues: *“Different research ethics issues should be handled differently. Existing ethics committee structures may be well placed to deal with some of them. However, it is our experience that they rarely capture ethical matters that concern broader societal issues. But the national ethics committees assume that perspective in their work...”*

FEK is currently working on creating a guideline for handling fraud cases versus research ethics issues more broadly understood.

How the case may feed into the ETHNA system

The case illustrates how an ethics committee that is originally built on the model of a traditional, top-down committee system can be combined with more distributed governing mechanisms aimed at setting the rules of the game and encouraging and facilitating reflection, through disciplinary specific national guidelines, and the creation of temporary national fora for debate on issues of general interest, which raise ethical questions and dilemmas. The case also may also serve to illustrate, however, the shortcomings of these committee systems, with respect to accommodating dialogue on ethical questions related to broader, societal issues.

Case 12: The RRI-oriented Code of Conduct at “Applied Nanoparticles”¹⁹

Applied Nanoparticles s.l. (AppNps) is a spin-off of the Catalan Institute of Nanotechnology, the University Autònoma of Barcelona (UAB) and the Institut Català de Recerca i Estudis Avançats (ICREA).

AppNps has adopted an internal Code of Conduct which defines “the principles and standards of ethical conduct that should govern the actions of the related persons in the exercise of their professional activities in their relationship with the company” (d’Andrea et. al., 2018, p. 59).

¹⁹ The description of the case is taken from the Fit4RRI inventory of de facto RRI governance practices (d’Andrea & Marta, 2018, pp. 59-60).

The code of conduct places principles of responsible innovation at the core of the company’s mission and daily activities and processes. So, for instance, the code clearly states that activities related to products produced have to be useful, sustainable and safe, and the processes leading to a product have to be collaborative and inclusive.

Significantly, the content of the code of conduct is a result of a process involving the company’s shareholders and staff.

How the case may feed into the ETHNA system

The case is an example of a code of conduct which arguably is in line with principles of deliberative ethics, both with respect to the process through which it was formed, and its final content. The code not only integrates principles of RRI, but the staff and other relevant stakeholders – in this case shareholders – were involved in the process of shaping the code of conduct in question, which in turn sets the rule of the game for the activities within the company. In this sense, the code can be seen as a self-regulatory mechanism of governance.

Example 13: The Engaged University Steering Group and the Public Engagement Team at the research center BrisSynBio, University of Bristol, UK²⁰

“BrysSynBio is a center focused on synthetic biology, an ... umbrella term for collaboration between and across various fields (molecular biology, engineering, computer science, chemistry...” (p. 388). The University and the BrisSynBio center are committed to “various forms of public and societal outreach and engagement, deliberative and dialogic approach with publics and stakeholders, ... increasingly grounded in the notions of co-creation and co-production of knowledge” (p. 392).

The university has two centralised units that encourage and facilitate public engagement in R&I process: The Engaged University Steering Group (EUSG), “chaired by the Pro Vice Chancellor for Research and Enterprise, which oversees the overall engagement strategy at the University, including public engagement, knowledge exchange, partnerships and engaged learning ... [and the] Public Engagement Team which provides “support and advice to academics who want to move towards more engaged forms of practice. This can mean supporting them in putting in bids for external funding, helping them get involved in external events, or helping them think about how to make their practice more meaningfully engaged, who they might engage and how” (pp. 392, 393).

The Centre has a ‘top-down’ approach to installing a “mutual understanding of responsibility-related values and commitment” (Randles et al. 2016) in the organisation, which “consists of cultivating a culture of RI throughout the Centre. The objective is that everybody in the Centre should be familiar with RI principles, that everybody understands how RI is made meaningful in the context of the work they are conducting and in the broader context of the University” (p. 397).

²⁰ The description of the case is taken from (Pansera, Owen, Meacham, & Kuh, 2020).

In addition to this top-down, nudging, approach, the Centre BrisSyn Bio collaborates with the university’s Public Engagement team to facilitate and encourage an RI approach in concrete projects. To that end, the Centre has “dedicated funds to finance public engagement activities focused on Synthetic Biology” (394).

How the case may feed into the ETHNA system

The case illustrates an approach to governance that mixes top-down mechanisms with facilitation and coordination, economic incentives, and a communication strategy “to cultivate a culture of RI (responsible innovation)” throughout the organisation.

5.2.2. Module V: Subsidiarity (accountability structures)

This governance module concerns mechanisms for accountability, including assessment, supervision and evaluation. Our informants expressed skepticism to dominant modes of assessment and monitoring, particularly perhaps those of traditional ethics committee systems, and monitoring through the use of quantitative indicators:

Traditional committee systems remain the dominant accountability and ethics assessment mechanism for R&I projects. The question is whether this is a suitable, and not least sufficient, governance mechanism for the purpose of integrating RRI in R&I processes. As one of our informants suggested, an ethics committee system should be understood as one among several governance instruments, which is suitable at one particular stage in the R&I process (the assessment stage). In order to ensure that attention is paid to ethics throughout the R&I process, other instruments are needed:

“What I am seeing now is a shift towards paying more attention to ethics also during projects, which can be done in several ways. One is to simply to have some kind of ethics task or work-package that goes along the project, which involves ethical monitoring, ethical reflection, another way is to have this ethics by design approach, where you make ethics part of ordinary design methodology. Another instrument, more generally, is to have professional ethical codes, that also regulate the individual conduct of the individual scientist, so they don’t apply to any specific project, but regulate the conduct, the integrity and the professionalism of the researchers; another one of course is education and training. So, you ensure you have measures in place for education and training.”

Philip Brey, University of Twente.

With respect to the question of how R&I projects can be monitored, both with respect to ethics and other aspects of RRI, informants called for a responsible approach to monitoring and the use of quantitative indicators:

“In my opinion we have too much faith in monitoring. We cannot control or promote everything by monitoring. ... In RRI we need to approach indicators in a responsible way, in the sense that we do not only use quantitative data, and we need to think about the purposes and justification of why we are doing monitoring, why do we need to measure this ...”

Paula Otero, researcher at the Joint research centre of the Spanish National Research Council (CSIC) and the Universitat Politècnica de València.

“We have been talking about the matrix for four years. How do we measure effects? We have no clear answer to that yet. We have come to the conclusion that not everything can be measured in metrics and parameters ... and that is something we have slowly but surely begun to accept.”

Trygve Brautaset, Head of DLN.

The cases 14-17 below illustrate how small adjustments of more traditional ethics committee structures may open up the evaluation process, by making it more inclusive and decentralised, taking into account disciplinary differences. The cases also illustrate – taken together – that this can be done both at the assessment stage, as well as throughout the R&I process.

Case 14: The discipline-specific ethics committee system at the University of Twente, the Netherlands - modelled on the findings in the SIENNA project.

“In a system in which scientists and engineers have had a lot of ethics training, they have a big awareness of ethical issues, in such a system you would not even need ethical committees I think because the scientists are themselves well equipped and have the relevant expertise already themselves. But that is not a situation we have now. And then a research ethics committee may be the best choice you have. You have to balance it against the total situation”.

Philip Brey, University of Twente.

The University of Twente made research ethics assessment required for all fields as of 2020. A discipline-specific research ethics committee system has been established, consisting of four internal ethics committees: one for the social sciences, one for the engineering sciences, and one for the computer sciences. A central (fourth) committee was set up to monitor the three decentral committees.

The ethics system is modelled on the recommendations in the **SATORI** project, which developed a standard for ethics committees. One important recommendation coming out of the SATORI-project was that of establishing discipline specific committees; another one was that of securing a degree of transdisciplinary in the composition of the committee members. The committees should thus have expertise in the area being assessed, as well as one from a neighbouring area, legal expertise, and should include a member from outside the organisation.

The committee system is resource intensive in terms of human resources, which according to Philip Brey “cuts two ways”. The members of the committees spend time on it, they are not paid, but get slightly less teaching. And the other aspect is the researchers. If you make it a requirement, there will always be projects where there aren’t that many ethical issues, and they still must go through this process.”

Importantly, therefore, the assessment process is organised into stages, to save human resources, both on the side of the committee members, and the researchers, Brey explains:

“So, we have organised it such that if in the initial ethical assessment, the researcher tick ‘no’ in each box they don’t have to go through the process. If they only tick a few, only one or at most two persons will initially do the assessment; it only goes to full committee if there are complex or deep ethical issues to be discussed. In that way the process will take only a couple of weeks for everyone.”

How the case may feed into the ETHNA system

The case brings out nicely how a comprehensive and quite rigid ethics committee system can be set up in a way that is effective and dynamic by having stratified process criteria that make the assessment process tailored to the needs of every case.

Case 15: The Ethics and Social Responsibility Committee at UJI²¹

The former rector of UJI initiated a process to develop the UJI’s social responsibility policy. A focus group was established with the mandate to develop a draft ethics code. The focus group consisted of university staff, students and other stakeholders, including companies that the university collaborates with. The group drafted an ethics code that established the ethical values of the university: The Integrity and Responsible research practices Code. An ethics and social responsibility committee system was put in place to monitor and assess the implementation of the ethics code, including an ethics and social responsibility committee. The first meeting of the committee was held in September 2018.

The members of the Ethics and Social Responsibility Committee include staff, students, the general secretary of the university, the vice-rector of research, the director of UJI equality office, the director of the deontological committee (research integrity committee), as well as the ombudsperson for students. All issues related to breach of the Integrity and Responsible Research Practices Code are discussed in the committee.

A communication channel, called the **ethics line**, was launched in June 2018 to allow members of the staff and the students to communicate ethically problematic practices at UJI. The reports submitted via the ethics line are received by three people: the rector, the general secretary of the university, and the vice-rector. When there is a case that cannot be resolved, for instance a case that should be resolved by the deontological committee, it is forwarded to the vice-rector of research:

“The general secretary and I will receive this email, we discuss, and decide who we should delegate the case to, or we see that we need to consult additional people in order to resolve the case, for instance the vice rector of research or the director of equality, or the legal service at the university. They can give us advice or resolve the case for us.”

There is no budget set aside to manage the ethics line, and no staff, except the three persons involved in handling the inquiries received via the ethics line referred to above.

How the case may feed into the ETHNA system

The case is an inspiration to the ETHNA system project, by including three of the main elements envisioned for the ETHNA system: an ethical code, an ethics committee, and an ethical hotline.

Case 16: The Real Time assessment and anticipation platform at the research center Synbiochem at the University of Manchester, UK²²

The University of Manchester Synthetic Biology Research Centre for Synthetic Biology of Fine and Specialty Chemicals (Synbiochem) is a research institute specialising in synthetic biology. “Synbiochem adopts an interdisciplinary approach and works in partnership with all four faculties of the University of Manchester” (d’Andrea & Marta, 2018, p. 35).

²¹ The case description is based on the interview with Inmaculada Rodríguez Moya. Vice Dean, Universitat Jaume I (UJI) on 13.10.2020.

²² The description of the case is adopted from the Fit4RRI inventory of de facto RRI governance practices (d’Andrea & Marta, 2018, pp. 35-36).

All the projects at Synbiochem go through a range of RRI related processes, referred to as the “RRI platform”, involving the following steps:

- ➔ “Real-time assessment and anticipation to assess research targets, commercial applications and innovation pathways;
- ➔ Ethics and deliberation processes to anticipate potential risks, as well as ethical, legal, and regulatory issues;
- ➔ Providing the necessary expertise for analysing life-cycle and sustainability implications;
- ➔ Fostering collaborative development by promoting engagement and deliberation processes with scientists, companies, external stakeholders and publics, as well as by providing researchers with training services”

The RRI platform seeks to ensure that issues related to RRI “is fully integrated in the production process in all its steps” (ibid, p. 36).

In addition to the process requirements contained in the RRI Platform, the institute has established an internal RRI unit “in charge of providing RRI expertise, guidance and training; [t]he unit manages the RRI platform and assists Synbiochem in providing training and awareness services to industries, academics, SMEs, young researchers and the public at large” (ibid, p. 36).

How the case may feed into the ETHNA system

The case shows how the fundamental RRI elements of inclusivity, participation, anticipation, social desirability, and ethical acceptability all can be made an integral part of all projects of a research institution. Like in the DLN case (case 9 of this report), this case illustrates the use of a dedicated RRI unit to constantly uphold, guide, and improve the RRI work of an institution.

Case 17: The Ethics Management Team, Ethics advisory Board and Ethics Rapporteurs in the Human Brain Project.²³

“Ethics and Society is one of the sub-projects of the Human Brain Project (HBP), a H2020 Flagship Project focused on neuroscience, computing and brain-related medicine; The Ethics and Society subproject aims to study the ethical and societal implications of HBP’s work and includes different kind of activities” including a “[m]ultiple approach to RRI embedment in research programmes”, an ethical concerns registration system, and an Ethics Management

Team and Ethics Rapporteurs (d’Andrea et al., 2018, pp. 60, 61).

Measures generally aimed at embedding RRI-related issues in the Human Brain Project include “[f]oresight studies aimed at identifying and evaluating the future impact of new knowledge and technologies generated by the HBP”, the “[o]rganisation of public meetings where ethical, legal, cultural, societal, and legal issues related to HBP research are debated”, and “[s]tudies on conceptual, social, ethical, and regulatory issues related to neuroscientific research and emerging neurotechnologies” (ibid p. 61).

²³ The description of the case is adopted from the Fit4RRI inventory of de facto RRI governance practices (d’Andrea et. al., 2018, pp. 60-62)

In addition, the project has established an “Ethical concerns registration system”, which is “a rapid way for people to raise ethical issues and to report them to HBP .. [through] an online registration system called “POint of REgistration” (PORE), which registers the issues reported and “keep[s] track of how they are dealt with” (ibid. p. 61). d’Andrea et. al. summarise the working of the system as follows:

“Requests may be submitted by any person within or outside the project, choosing to be identifiable or remaining anonymous. ... Issues may be related but not limited to the planning of experimentation or a phase of implementation. Each registered issue is reviewed by the Ethics Management Team. The team, which includes an ethics manager, decides how best to deal with the issue. The registered issue may be further directed to the Ethics Advisory Board (EAB) or SP12’s Steering Committee.

The Ethics Management Team collaborates “with the ethics and society researchers and HBP management to support best research practices and in close connection with the Ethics Advisory Board (established to support the Team in implementing its functions). The team interacts with the subprojects through Ethics Rapporteurs” (ibid, p. 62).

How the case may feed into the ETHNA system

This case is especially interesting because of the highly developed ethics hotline system, both regarding the rapport and request system for insiders and outsiders, and regarding the system for dealing with the incoming requests and issues raised. In addition, the case exhibits the active involvement of the public in the discussion of RRI aspects of research projects.

5.2.3. Module VI: Adaptation

This module concerns governance mechanisms that can ensure organisational learning and organisational responsiveness.

Case 18: The Gender equality programme FRONT at the University of Oslo (UiO)²⁴

“I have no faith in working with... equality, diversity or other complex things if the management is not heavily involved. If you have others do the job for you, the leader must go all in and support the work during the entire process “. Solveig Kristensen, Vice Dean for research, UiO.

Gender awareness has been integrated into the managerial processes at UiO. Several factors have contributed to this development.

One important factor is that the measures chosen to achieve gender mainstreaming in the organisation are research based. Kristensen emphasises the learning potential in linking formative, dialogue research, which is intended to have a formative effect on processes, with projects that aim at developing and testing out efficient actions for organisational change.

²⁴ The description of the case is based on an interview with Solveig Kristensen, Vice Dean for Research and Gender Equality, University of Oslo, head of the cross-disciplinary project to promote gender equality in academia **FRONT**. The interview was conducted on

As Kristensen sees it, linking these two types of projects *"will result in a symbiosis, where the project develops as the research provides information into it. This is what we have tried... and partly succeeded in doing in our two FRONT projects [Gender balance projects financed by the Norwegian Research Council]. The results from the research in FRONT I will provide the basis for the development of action packages in FRONT II. That is an important symbiosis"*.

A second important factor is that they have succeeded in bringing the top-level management on board, through processes that have resulted in a cultural change towards gender mainstreaming: *"Getting the management involved is about culture. This [gender awareness in job announcement] policy was discussed with all the department leaders ... They have also been part of the FRONT project since it was started, which has involved quite extensive leadership training on gender issues. Consequently, discussing gender balance issues is one of the things we do at management meetings on a regular basis"*.

Kristensen stresses the importance of well-functioning management structures in this context: *"I think that the reason why we have achieved this reasonably well at UiO is that we have worked intensely with the department leader meeting as a collegial leadership forum for the entire faculty... The frequency of meetings is also an important part of that. ..., [an equality office] can become a little isolated"*.

And finally, the significance of working at all levels in the organisation:

"We started at management level, because we found that we cannot achieve anything without a good understanding at that level ... and gradually this [gender balance] became a natural part of our development and operational work. There is a leadership community [also] further down in the organisation. We have been in dialogue with the management teams at each department, as well as section leaders. At the same time, we have worked with researchers, with supervision courses e.g. You have to work on all levels".

"The focus you have on the work you do is important; how you work with it in the organisation. If you work only by control, rules, systems ... it becomes negative. But if you manage to sell it in as a value issue, the university's role in society for instance ... it becomes understandable to the researchers".

Kristensen says that in addition to pushing the importance of gender equality at all levels in the organisation, they will now also start demanding that each department submit an annual gender equality report: *"The report will be discussed by the board at the individual departments, and a summary of these reports will be discussed by the faculty board. We will use the final report in our management forums as a basis for our work on gender equality. This is also about sharing examples of best practices so that they can be reproduced."*

How the case may feed into the ETHNA system

This case shows the importance of working and anchoring at all organisational levels, but to start at the top. It also points out that efforts of institutional change in research organisation ideally should happen in a research-based way. In other words: research activity should integrate RRI-practices, but RRI-practices should also integrate research activity.

Case 19: The Equality Office at KTH, Sweden²⁵

"As a university it is important that we work closely with research in our efforts to develop [the organisation]." Anna Wahl, Vice Rector for gender equality and values, KTH, Sweden.

The Equality office is a new idea that came up after gender mainstreaming was made mandatory for all universities in Sweden. The office also collaborates with a number of gender researchers, to ensure that the steps they take towards gender mainstreaming is research based.

The office also cooperates with researchers who work part time to carry out training in gender mainstreaming. For instance, KTH runs a career support programme for their assistant lecturers (first step on the tenure track at KTH), which also involves training in gender equality, and this training is run by two researchers on behalf of the office. One researcher is also involved in designing training programmes on gender equality for the faculty leaders, the recruitment committees, and various university boards.

Finally, the office also collaborates with a researcher based at the KTH institution for teacher training, who develops pedagogical tools on gender equality to be used in the education of teachers.

The equality office is not a support unit that does all the work, but a unit that provides support and coordinates the work in cooperation with many other actors in the organisation.

"We are an agent for change, and have made a strategic plan for our work, which has become a management document for the entire university; [in that sense] we have a coordinating, enabling function, together with other actors in the organisation.

... We work a lot with knowledge-raising efforts, a lot with reflection, workshops; this idea that we can bring them the knowledge, but they have to decide for themselves what to do, how to work, who to involve. We provide the tools for how to drive change, but they must do it themselves."

The Equality office is currently collaborating with the sustainability office, which is revising KTH's sustainability goals, to integrate gender equality into the revised document. Gender equality is a goal in itself, but also a goal that affects the other goals. In the first instance, they are now working to integrate knowledge about this in all their programmes for students and PhDs; how sustainable development is related to gender equality, and how it affects societal development.

"We have just established a platform for gender researchers at KTH; and we think that this platform can offer researchers a better understanding of how they can integrate a gender perspective in their research. Researchers can partake on a voluntary basis in workshops to investigate this issue themselves."

How the case may feed into the ETHNA system

This case emphasises the point of the previous case that it is important to base institutional change on research activity and results. The close connection between value-based activities and research, however, makes it both hard and vital to do unbiased research. This case also suggests that different policy agendas are intertwined and should be promoted together.

²⁵ The case description is based on the interview with Anna Wahl, Professor and vice rector for gender equality and values, head of the Equality office at the Royal Institute of Technology (KTH), Sweden, conducted on 09.11.2020.

5.3. Findings related to the governance theme “developing supportive environments”

The governance theme “developing supportive environments” covers the modules capabilities, capacities and institutional entrepreneurship. These modules concern governance mechanisms to enhance individuals’ ability to critically reflect and deliberate on the desirability of R&I processes and the outcomes of these, organisational infrastructure supportive of RRI (related) activity, and institutional conditions for (RRI) change-agents. The role of a “culture of transparency, tolerance and rule of law” also falls under this governance theme. With respect to Owen et al.’s process requirements these modules link to the requirements of reflexivity and responsiveness. With respect to the RRI keys, the modules can be seen as conducive to the RRI keys of ethics, science education and governance.

5.3.1. Module VI: Individual capabilities

“That is what I mean by change work... People must think for themselves and understand why we should do this; I think it is extra important at a university to have this feeling that ‘I stand on my own two feet’”.

Anna Wahl, KTH, Sweden.

This governance module concerns mechanisms that can contribute to “foster a culture of RRI among scientists and engineers” (Mejlgaard et al., 2019, p. 1).

Case 20: Action plan for science education as a strategic RRI tool at the University of Bern, Germany.²⁶

“Future researchers and students and university students should acquire knowledge and skills to work responsibly during their academic experiences and training” (Declich. 2019, p. 152).

The University of Bern initiated a project aimed at triggering structural change processes towards RRI by the means of a programme of science education based on a “whole institution approach” (p. 152).

A team – referred to as the Core Team – with science educators as central agents was set up “to negotiate a RRI mission statement” (p. 152). The team involved a range of stakeholders, including the dean, vice dean, members of the quality management, representatives of students, doctoral students and researchers (p. 152).

²⁶ The case description is based on STARBIOS2 guideline for RRI implementation in Bioscience organisations (Declich, 2019), Note #5, pp. 152-162.

The Core Team set up a road map to arrive at a RRI mission statement comprising four stages, including a literature review (stage one), interview with stakeholder groups within the organisation (stage one), the development of RRI educational building blocks and activities (stage two), testing and evaluation of the building blocks (stage three), the development of a training programme (stage three), a list of key recommendations based on the first three stages (stage four). The key recommendations in turn formed the basis for a negotiation process, again involving all the stakeholders, with the aim of arriving at a RRI mission statement.

How the case may feed into the ETHNA system

This case highlights the importance of training programmes to enable researchers to integrate RRI in their activities. It also demonstrates how RRI training programmes can be anchored within the organisation through a process of co-construction of the training programme modules, thereby also increasing the motivation among the staff to follow the programme.

Case 21: The Midstream Modulation approach at the Technical University of Delft, the Netherlands²⁷

“The core of this approach consists of the inclusion of humanists and social researchers in laboratory work to orient decisions and reflection. The test was developed by adopting a specific protocol, allowing the team in charge of the project to discuss ethically relevant topics with laboratory staff, as well as normative issues and the ways in which decisions are taken” (p. 37).

“A group of social researchers worked with biologists for 12 weeks using the STIR (Socio-Technical Integration Research) protocol...The STIR protocol conceptually distinguishes four decision components, i.e., opportunities, considerations, alternatives, and outcomes, from both the technical, and the social perspectives, thus mapping laboratory decisions in real-time. The protocol usually included interactions with research participants consisting of pre- and post interviews, participant observation, and regular application of the protocol and collaborative drafting of visual representations of the research process. It makes it possible to identify otherwise latent values, goals, and other considerations, and creates opportunities to reflect on decisions” (p. 37).

“In addition to micro-ethical discussions – lab practices, responsible conduct of research and environmental health and safety concerns – resulting directly from laboratory work, the feedback processes also occasioned discussion of macro-ethical issues, normative issues that apply to the collective social responsibility of a profession, and to societal decisions about technology.”

“The limit of this Advanced Experience is that the Midstream Modulation approach has been applied only as a research tool and not as an institutional procedure aimed at embedding RRI practices in the organisation.”

How the case may feed into the ETHNA system

This case exemplifies the direct involvement of humanists and social scientists in natural science projects, in an ELSA manner. It shows that there are different ways of accomplishing RRI reflection and interdisciplinarity, both by integral and more interventional models.

²⁷ The description of the case is from the Fit4RRI inventory of de facto RRI governance practices (d’Andrea & Marta, 2018, pp. 37-38).

5.3.2. Module VII: Institutional capacities

This governance module concerns mechanisms that can ensure “access to information and resources for participation, [which] requires spaces for reflection, interaction and negotiation, appropriate incentive structures, and an open knowledge base” (Kuhlmann et al. 2016, p. 30).

Case 22: The incentive structure for public communication at OsloMet, Norway²⁸

At Oslo Met, there are several subject areas within the humanities and arts, which are not performing as well with respect to publishing as do other subject fields, notably within the natural sciences. Oslo Met has therefore developed a separate indicator for dissemination, which generates funds on an equal basis as publications. As Stroem explains:

In our publication indicator, we receive funding from the Ministry of Education that is linked to scientific publishing that goes back to the institutions, which and trickles down to the departments where the publication has been developed. We take 20% of these funds and redistribute them for dissemination. So, we have created our own model, which generates points for art exhibitions, textbook development, lectures, and teacher book dissemination. This also gives these researchers room for maneuver; it generates money to those environments that are not strong in scientific publishing.

The system contributes to some extent to level out the competition; however, as Stroem emphasises, “it does not give prestige.... (to achieve that we would need) different types of research outlets, which give just as much prestige to other research outlets as the scientific article, and we are not there yet”.

One aspect of the alternative incentive system at Oslo Met is the strong tradition for citizen involvement of its four research institutes. These institutes have traditionally been oriented towards working closely with the practice field, entailing for instance “massive involvement of kindergartens and schools”. This tradition of citizen involvement in research may also be the reason why public engagement is not normally seen as being difficult to achieve in practice at Oslo Met.: “What I hear a lot is that researchers do not have time to engage in dissemination in addition to publishing. (But I) have not heard that public engagement is difficult. Maybe it’s because we already have such close contact with the field of practice?”

How the case may feed into the ETHNA system

This case shows how different institutions and fields of study have different traditions, practices and challenges concerning public outreach and involvement. It is vital to be aware of this to avoid inefficient one-size-fits-all solutions that is insensitive to context.

²⁸ The description of the case is based on an interview with Tanja Stroem, conducted on 27.10.2020.

Case 23: Focal points for action focused on different RRI keys at Universitat Autònoma Barcelona (UAB)²⁹

UAB has multiple “focal points for action” focused on achieving different RRI keys, including an Observatory for Equality, a coordinating unit for public engagement and science education, a role taken by the Institute for Science Education, an Ethics Committee on animal and human experimentation to ensure research complies with rules and legislation, an observatory for the spread of science, and an Open Access Institutional Repository.

An online communication channel/alert line has also been established, which “allows users to provide opinions, complaints, and positive feedback on the performance of UAB”:

<https://opina.uab.cat/formulari/login/auth?lang=en>

The focal points and the communication line reflect a so-called “light integration approach” to RRI at UAB, which was chosen to achieve the integration of RRI in the institutional structure of UAB without creating any new organisational units or structures. Instead of aiming for “organisational integration of activities (for example, having a single body of staff to deal with all the keys)” UAB sought to integrate RRI in its organisational structure by means of “a common policy and communication framework”, which included the following key elements:

- ➔ Integrating RRI in UAB’s mission;
- ➔ Connecting RRI with other UAB policies, including HR Excellence in Research policies, recruitment policies and career development policies;
- ➔ Streamlining the communication of RRI activities and actors engaged in specific RRI keys on the institutional website, presenting it “as part of a unique overarching RRI policy” (Ibid, p. 31).

How the case may feed into the ETHNA system

This case shows how RRI can be integrated without the need for dedicated permanent staff to organise and monitor the realisation of RRI-based research.

²⁹ The example is adopted from the FIT4RRI benchmarking report D.1.2. (d’Andrea & Marta, 2018, pp. 31-33)

5.3.3. Module VIII: Institutional conditions for (RRI) change-agents: the role of top-level leadership

“If you want change to happen, you need to look at how you can use these advocates to establish this new world ... (And) if you want to make a change on a big scale, you need to make sure that the management backs the transition”.

Valerie Van Drooge, CWTS / LEIDEN UNIVERSITY.

This governance module concerns “institutional conditions in place for change agents to help transform the status quo” (Kuhlmann et al. 2016, p. 32)

Case 24: The role of change agents in the process of creating an open access infrastructure at OsloMet, Norway.³⁰

The process towards open publication at Oslo Met started in 2009 with creating a ‘green’ publication practice, which involved making one’s article available in an open archive at OsloMet after publication. That was perceived as a cultural change. At that time there were very few open journals, and almost all had low status.

“There was a lot of opposition [to open access], it was unknown to many, they were afraid of breaking the contract with the publisher, to be looked down upon by the publisher, that the archive contained bad research. Lots of myths”.

Stroem points to several factors as key to the success of the open publication practice at OsloMet today: An information campaign was launched by Stroem and one technical assistant, who were hired to build up the technical infrastructure around the archive:

“We worked a lot with myth-breaking. By highlighting what was good about open publishing, what the researchers got out of this. We were out there all the time talking with the faculties, the departments, the research groups”.

Stroem also emphasises the importance of taking advantage of existing, hierarchical structures to increase the status of the process in the organisation:

“As a librarian, you do not have the organisational status you need to achieve a change in research culture. We therefore set up a working group that consisted only of professors from all the faculties and made one of these professors the leader of the working group, and I was secretary. I did the job, but the status was secured, because the professors subsequently went to their faculties and fronted open access. And they wrote articles”.

³⁰ The description of the case is based on an interview with Tanja Stroem, senior advisor and a central change agent in establishing an infrastructure, and culture, for open publication at OsloMet. The interview was conducted on 27.10.2020.

5.3. Findings related to the governance theme “developing supportive environments”

Stroem emphasises the importance of ambassadors in all cultural change, and that these must be nurtured and highlighted: *“They [the ambassadors of change] go home to their professional environments and contribute to that cultural change”.*

In academia these ambassadors tend to be senior staff: *“If you forget the seniors, they will function as brakes that are so massive that it becomes difficult to achieve anything...[But] if I were to do this today I would also involve the doctoral fellows. Because now, I spend a lot of time in the PhD programmes and talk about publishing. They are at the beginning of their careers. And they will take the culture they learn now with them in their careers”.*

Finally, Stroem stresses the importance not only of working from below, but also from the top, gaining the support from the management. Stroem and her colleague thus met with the management and with the board on numerous occasions: *“Having both the researchers from below and the management from above [on board] is absolutely necessary to bring about this type of cultural change”.*

How the case may feed into the ETHNA system

This example reiterates and emphasises a lesson learned in case 18: the importance of working with and anchoring institutional change at all organisational levels, but that it is crucial to have the top level onboard in order to speed up the process instead of slowing it down.

5.3.4. Module IX: Culture of transparency, tolerance and rule of law³¹

“I think transparency is a key issue in all these things [the organization of research ethics committees]”.

Senior researcher at a European University.

Case 25: The science Ombud at the University of Oslo, Norway

The Science Ombud at UiO was only instituted in 2019, following a long and, according to Ruyter, complicated process. It was questioned whether a Science Ombud was needed, whether it would serve any purpose, what the mandate would be, and whether this kind of independent unit in the system would be disruptive for research.

The idea of establishing a Science Ombud at UiO was to put in place a form of governance system that could monitor a number of issues around research integrity, broadly understood, and not limited to preventing fraudulent behaviour.

The Science Ombud at UiO has an advisory role and shall function as a low-threshold service for researchers employed at UiO. The idea is that researchers should be able to seek out a low-level independent body within the institution, in order to discuss and resolve what they themselves experience as ethically problematic issues.

³¹ Both examples under module IX is based on the interview with the Science Ombud at the University of Oslo, conducted on 02.10.2020.

5.3. Findings related to the governance theme “developing supportive environments”

Confidentiality is an important principle in the functioning of the Ombud, both to ensure that the Ombud institution remains low-threshold, and that those who contact the Ombud do not ‘risk’ anything. The Ombud can therefore not proceed with a case without the consent of the person who reports it.

The Ombud has no formal authority but has taken on a broker role at UiO. If the parties involved are willing to enter into mediation they must commit to the process, including the outcome of it. The Ombud may refer cases directly to the UiO Ethics Committee. It too has an advisory mandate only, however, the Committee sends its advice to the rector - who can decide to act on it - and in that sense has a clearer institutional connection.

One problem with the ethics committee’s handling of this type of cases is, in Ruyter view, that it is not public, neither the advice given nor the assessments.

But this work should be transparent, so that others can learn from the cases, both at the individual level and system level. It is possible to talk openly about a case, without revealing the whistleblower.

The cases that the science ombud at UiO handle are often about co-authorship (40% of the cases in 2019). But the mandate also includes issues related to other topics, although not as broad as the responsibility concept of RRI.

The ombudsman scheme can be extended to apply to other areas than it is now intended for. Ruyter points to the Science Ombud system Germany, with more than 700 local Science Ombud, as an example of an Ombud practice based on a broad mandate.

The possibility of anonymous reporting is important, in Ruyter’s view, the main reason being that *“whistleblowers will very often be subject to reprisals, of one kind or another. It is risky to be a whistleblower”*.

The ombud has solved this problem by sending notice on behalf of whistleblowers. The case reported on has been processed in the system.

How the case may feed into the ETHNA system

This case shows there is more to the making of an ethical hotline than just setting up any system. There are different ways of doing this, each with its own pro’s and con’s, so it is important to be aware of this and do well-reflected choices to achieve the intended goal.

Case 26: The role of the Office of Internal Audit at the University of Oslo’s campaign to check and promote fair “Conduct, Reporting, Editing, and Publication of Scholarly Work”, according to the Vancouver Recommendations.

In 2019, the Office of Internal Audit at the University of Oslo initiated an internal control on co-authorship. Their mandate covers the running of the organisation as a whole. Much like the Office of the Auditor General at national level no one can instruct the Office of internal Audit. The Office interpreted its mandate to cover the assessment and promotion of fair “Conduct, Reporting, Editing, and Publication of Scholarly Work”, according to the Vancouver Recommendations. In Ruyter’s opinion the Office’s mandate may also be interpreted to include not only research integrity questions such as co-authorship, but also wider questions, concerning social responsibility.



How the case may feed into the ETHNA system

This case illustrates how the same kinds of ethical committees can be implemented and operate at different levels, and that external committees can be internalised.

Table 2: Overview of best practice cases

Governance themes	Modules	Best practice cases
Quality of interaction	Inclusion	<p>Case 1: The Norwegian Board of Technology's (NBT) public engagement practice <i>The case illustrates how the process requirement of inclusion can be understood as a question of methodological approach with respect to whether, who and how to include, depending on the case at hand, rather than representing an absolute requirement.</i></p> <p>Case 2: The place of stakeholder involvement in the Norwegian Research Council's (NRC) governance structure <i>The case illustrates how the requirement of inclusion can be met at system level by involving stakeholders in the organisation's governance structures; at the same time, the requirement of inclusion is developed as a working method for the entire organisation by drawing on knowledge generated in projects that the organisation partakes in.</i></p> <p>Case 3: Stakeholder involvement in Danish priority-setting for strategic research: the RESEARCH2015 project <i>The official evaluation of the project concluded that even though it had an impact on the exercise of policy-making, it “did not bring anything new to the table”; as such the case illustrates that there is no necessary link between inclusion and influence, and that “a more thorough and systematic inclusion of new actors that gave them a clear understanding of the different ways to affect the process could have potentially given more weight to novel suggestions for strategic research” (Ibid, pp. 87, 88). A final lesson to draw from the project is that steering, in the form of structuring the hearing of actors in an efficient manner, is necessary “to create a reasonable balance between top-down structuring and room to maneuver for the participants” (Ibid, p. 88). The Res-A-Gora project's ten principle responsibility framework proposes procedures that should be in place in order to structure the hearing of actors in this manner.</i></p> <p>Case 4: Co-creation in the Public Health Alliance, Central Norway <i>The Public Health Alliance is an example of self-governance of research and innovation through networks that have resulted in an institutionalisation of practices of inclusion of stakeholders, and to some extent lay citizens, in R&I processes, resulting to a degree of co-construction of the issues to be researched. It is unclear, though, to what extent this development also involves reflexive deliberation on the ethical dimensions of medical and health research, or whether the ethics of the medical and health research projects that follow from these processes are subject to traditional ethics review only.</i></p>
	Deliberation	<p>Case 5: Practicing ‘Hanging out’ with stakeholders in Stroud, UK <i>The case may serve as an example of deliberative processes secured by making a particular form of deliberation - that of hanging out with research object in their everyday life habitat - an integral part of the research methodology.</i></p> <p>Case 6: Community ethics committee at Harvard medical School, the USA <i>The committee constitutes a permanent forum for stakeholder engagement in matters related to the ethics of medical and health related research. It is unclear, however, to what extent researchers engage in dialogue with the committee, and hence to what degree the committees' contribution to ethical debates in general, and ethics assessment in particular, has an influence on R&I processes. The case may nonetheless serve as an example of the institutional shape that a forum of the type called for in the quote by Mattias Kaiser above may take; that is, a permanent, transdisciplinary forum with a view to “value mapping and value deliberation, where the values that are otherwise implicit are presented and debated in a context, that is, in light of concrete issues”.</i></p> <p>Case 7: The Urban Lab neighborhood development initiative at Karlsruhe Institute of Technology, Germany <i>The ‘lab’ may serve as an example of a network-based approach to managing semi-permanent, project-based forums for transdisciplinary deliberation. In this case the core team of scientists, which is responsible for project management, supervision, moderation and mediation, can be seen to have taken the role of a meta-governing entity, which serves to bind the sub-projects together, by setting the rules of the game and providing a shared purpose (in this case contribute to sustainable urban development).</i></p>



5.3. Findings related to the governance theme “developing supportive environments”

Governance themes	Modules	Best practice cases
Quality of interaction	Moderation	Case 8: Platforms for transdisciplinary dialogue and cooperation under NTNU Oceans strategic area <i>The case illustrates how the moderation of processes of inclusion and deliberation can be loosely governed by a handful of staff centrally placed within the organisation, through the facilitation and coordination of networks, the creation of temporary meeting places, the use of strategic funds as incentives for collaboration, and by advocating the scientific advantages of transdisciplinary cooperation, including broad stakeholder involvement, to selected disciplinary fields.</i>
		Case 9: The management unit for the facilitation and coordination of RRI and other cross-cutting issues in biotechnology under Digital Life Norway (DLN) <i>The case is similar to the case preceding it. However, it illustrates more clearly the meta-governing role that an entity placed at the systemic level within an organisation, yet at the level below the top management, can take with respect to steering R&I networks in the direction of RRI, mainly through the moderation of interdisciplinary dialogue and collaboration. It also demonstrates the importance of dedicated support staff that can contribute to constantly nudging the networks in the direction of RRI.</i>
		Case 10: The facilitation and coordination of citizen science managed by the Fundación Ibercivis; a not-for-profit foundation under the University of Zaragoza, Institute for Biocomputation and Complex systems Physics <i>The case illustrates how the moderation of processes of inclusion and deliberation can be governed by setting up an entity outside the main organisation dedicated to citizen science.</i>
Positioning and orchestration	Modularity and flexibility	Case 11: The discipline specific codes of conducts of the National Research Ethics Committees, Norway <i>The case illustrates how an ethics committee that is originally built on the model of a traditional, top-down committee system can be combined with more distributed governing mechanisms aimed at setting the rules of the game and encouraging and facilitating reflection, through disciplinary specific national guidelines, and the creation of temporary national fora for debate on issues of general interest, which raise ethical questions and dilemmas. The case also may also serve to illustrate, however, the shortcomings of these committee systems, with respect to accommodating dialogue on ethical questions related to broader, societal issues.</i>
		Case 12: The RRI-oriented Code of Conduct at “Applied Nanoparticles <i>The case is an example of a code of conduct which arguably is in line with principles of deliberative ethics, both with respect to the process through which it was formed, and its final content. The code not only integrates principles of RRI, but the staff and other relevant stakeholders – in this case shareholders – were involved in the process of shaping the code of conduct in question, which in turn sets the rule of the game for the activities within the company. In this sense, the code can be seen as a self-regulatory mechanism of governance.</i>
		Case 13: The Engaged University Steering Group and the Public Engagement Team at the research center BrisSynBio, University of Bristol, UK <i>The case illustrates an approach to governance that mixes top-down mechanisms with facilitation and coordination, economic incentives, and a communication strategy “to cultivate a culture of RI (responsible innovation)” throughout the organisation.</i>
		Case 14: The discipline-specific ethics committee system at the University of Twente, the Netherlands - modelled on the findings in the SIENNA project <i>The case brings out nicely how a comprehensive and quite rigid ethics committee system can be set up in a way that is effective and dynamic by having stratified process criteria that make the assessment process tailored to the needs of every case.</i>
		Case 15: The Ethics and Social Responsibility Committee at UJI <i>The case is an inspiration to the ETHNA system project, by including three of the main elements envisioned for the ETHNA system: an ethical code, an ethics committee, and an ethical hotline.</i>



5.3. Findings related to the governance theme “developing supportive environments”

Governance themes	Modules	Best practice cases
Positioning and orchestration	Modularity and flexibility	Case 16: The Real Time assessment and anticipation platform at the research center Synbiochem at the University of Manchester, UK <i>The case shows how the fundamental RRI elements of inclusivity, participation, anticipation, social desirability, and ethical acceptability all can be made an integral part of all projects of a research institution. Like in the DLN case (case 9 of this report), this case illustrates the use of a dedicated RRI unit to constantly uphold, guide, and improve the RRI work of an institution.</i>
		Case 17: The Ethics Management Team, Ethics advisory Board and Ethics Rapporteurs in the Human Brain Project <i>This case is especially interesting because of the highly developed ethics hotline system, both regarding the rapport and request system for insiders and outsiders, and regarding the system for dealing with the incoming requests and issues raised. In addition, the case exhibits the active involvement of the public in the discussion of RRI aspects of research projects.</i>
	Adaptation	Case 18: The Gender equality programme FRONT at the University of Oslo (UiO), Norway <i>This case shows the importance of working and anchoring at all organisational levels, but to start at the top. It also points out that efforts of institutional change in research organisation ideally should happen in a research-based way. In other words: research activity should integrate RRI-practices, but RRI-practices should also integrate research activity.</i>
		Case 19: The Equality Office at KTH, Sweden <i>This case emphasises the point of the previous case that it is important to base institutional change on research activity and results. The close connection between value-based activities and research, however, makes it both hard and vital to do unbiased research. This case also suggests that different policy agendas are intertwined and should be promoted together.</i>
Developing supportive environments	Individual capabilities	Case 20: Action plan for science education as a strategic RRI tool at the University of Bern, Germany <i>This case highlights the importance of training programmes to enable researchers to integrate RRI in their activities. It also demonstrates how RRI training programmes can be anchored within the organisation through a process of co-construction of the training programme modules, thereby also increasing the motivation among the staff to follow the programme.</i>
		Case 21: The Midstream Modulation approach at the Technical University of Delft, the Netherlands <i>This case exemplifies the direct involvement of humanists and social scientists in natural science projects, in an ELSA manner. It shows that there are different ways of accomplishing RRI reflection and interdisciplinarity, both by integral and more interventional models.</i>
	Institutional capabilities	Case 22: The incentive structure for public communication at OsloMet, Norway <i>This case shows how different institutions and fields of study have different traditions, practices and challenges concerning public outreach and involvement. It is vital to be aware of this to avoid inefficient one-size-fits-all solutions that is insensitive to context.</i>
		Case 23: Focal points for action focused on different RRI keys at Universitat Autònoma Barcelona (UAB), Spain <i>This case shows how RRI can be integrated without the need for dedicated permanent staff to organise and monitor the realisation of RRI-based research.</i>
	Institutional conditions for (RRI) change-agents: the role of top-level leadership	Case 24: The role of change agents in the process of creating an open access infrastructure at OsloMet, Norway <i>This example reiterates and emphasises a lesson learned in case 18: the importance of working with and anchoring institutional change at all organisational levels, but that it is crucial to have the top level onboard in order to speed up the process instead of slowing it down.</i>



5.3. Findings related to the governance theme “developing supportive environments”

Governance themes	Modules	Best practice cases
Developing supportive environments	Culture of transparency, tolerance and rule of law	<p>Case 25: The science Ombud at the University of Oslo, Norway</p> <p><i>This case shows the there is more to the making of an ethical hotline than just setting up any system. There are different ways of doing this, each with its own pro’s and con’s, so it is important to be aware of this and do well-reflected choices to achieve the intended goal.</i></p>
		<p>Case 26: The role of the Office of Internal Audit at the University of Oslo’s campaign to check and promote fair “Conduct, Reporting, Editing, and Publication of Scholarly Work”, according to the Vancouver Recommendations</p> <p><i>This case illustrates how the same kinds of ethical committees can be implemented and operate at different levels, and that external committees can be internalised.</i></p>

Summary

6

The report provides a comprehensive overview of governance theory and practices in the R&I sector related to the concept of RRI. The report is based on findings from a review of the RRI literature, with a particular focus on the governance of research and innovation processes, and interviews with 22 European-based experts on R&I governance in the area of RRI, or RRI-related topics. The purpose of the report has been to present some of the governance options - or building blocks - available when constructing the ETHNA system, both conceptually and practically speaking.

The selection of examples of governance practices in the R&I sector related to RRI has been guided by Arie Rip's conception of de facto governance, which proposes that governance is constituted to a large degree "by bottom-up actions, strategies and interactions ... [that] add up to outcomes at the collective level which function as governance arrangements" (Rip, 2019, p. 75).

Following this approach, the consortium identified a broad variety of governance practices. Applying the governance framework of the EC-funded project Res-A-Gora, the identified cases were organised under the following ten governance modules (which in the Res-A-Gora framework are referred to as principles): Inclusion, deliberation, and moderation; modularity and flexibility, subsidiarity, and adaptation; individual capabilities, institutional capacities, institutional conditions for change agents, and culture of transparency, tolerance and rule of law.

The concept of governance modules was chosen to articulate the idea that the governance themes can be understood as building blocks, which one can pick and choose from when constructing the ETHNA governance system. The cases organised under each module were chosen to illustrate how a module could be designed institutionally, and thus adapted to a given institutional context.

We suggested that when selecting practices to inform the design of the elements – or modules – of the ETHNA system, the overarching quality criteria for good governance in the R&I sector that underpin the ETHNA project - ethical and effective – could guide the choice.

Informed by Habermas' theory of communicative action (Habermas, 1981), an ethical governance system was defined as one that promotes and facilitates (i) the inclusion of those immediately affected by it (i.e. R&I actors) in processes of discursive justification of the way in which the governance system is organised, and (ii) the inclusion of stakeholders (citizens, end-users, non-governmental organisations, business representatives, policy makers) in processes of critical examination and discursive justification of possible scenarios and potential impacts generated by research and innovation processes.

In addition to being ethical, the ETHNA project holds that to qualify as good an R&I governance structure must also be *effective*. Informed by governance theory on public innovation, an effective governance structure in this context refers to one that accommodates and facilitates the form that R&I activities often take, namely the form of diverse, complex and dynamic networks.

References

- Aars, J., Fimreite, A. L., & Homme, A. (2004). Styrt fragmentering og fragmentert styring–Nettverkspolitikk i norske kommuner. In: Rapport, Rokkansenteret.
- Arthur, W. B. (1989). Competing technologies, increasing returns, and lock-in by historical events. *The economic journal*, 99(394), 116-131.
- Beck, U., Lash, S., & Wynne, B. (1992). *Risk society: Towards a new modernity* (Vol. 17): sage.
- Braun, R., & Griessler, E. (2018). More democratic research and innovation. *Journal of Science Communication*, 17(3).
- Burget, M., Bardone, E., & Pedaste, M. (2017). Definitions and conceptual dimensions of responsible research and innovation: A literature review. *Science and engineering ethics*, 23(1), 1-19.
- Cane, P. (2002). *Responsibility in law and morality*. Oxford: Hart.
- Collingridge, D. (1980). *The Social Control of Technology*: Frances Pinter.
- d'Andrea, L., Maresa, & Marta, F. (2018). Fostering improved training tools for responsible research and innvation: Benchmarking report. D.1.2.
- Dawson, M. (2016). *New Modes of Governance. A Companion to European Union Law and International Law*, 119.
- Declich, A. (2019). RRI implementation in bioscience organisations. In: Uppsala University.
- Eisagirre, A. (2017). *Investigação e inovação responsáveis: desafios teóricos e políticos*. *Sociologia, Problemas e Práticas*(83), 99-116.
- European Commission. (2001). *European Governance: A White Paper*. COM (2001) 428.
- Felt, U., Michel Callon, Maria Eduarda Gonçalves, Sheila Jasanoff, Maria Jepsen, Pierre-Benoît Joly, Zdenek Konopasek, Stefan May, Claudia Neubauer, Arie Rip, Karen Siune, Andy Stirling, Mariachiara Tallacchini. (2007). *Taking European knowledge society seriously: Report of the Expert Group on Science and Governance to the Science, Economy and Society Directorate, Directorate-General for Research, European Commission*. Retrieved from https://ec.europa.eu/research/science-society/document_library/pdf_06/european-knowledge-society_en.pdf
- Forsberg, E.-M., Quaglio, G., O'Kane, H., Karapiperis, T., Van Woensel, L., & Arnaldi, S. (2015). Assessment of science and technologies: Advising for and with responsibility. *Technology in society*, 42, 21-27.
- Guston, D. H. (2010). The anticipatory governance of emerging technologies. *Applied Science and Convergence Technology*, 19(6), 432-441.
- Guston, D. H. (2014). Understanding 'anticipatory governance'. *Social studies of science*, 44(2), 218-242.

- Guston, D. H., & Keniston, K. (1994). *The fragile contract: University science and the federal government*: Mit Press.
- Guston, D. H., & Sarewitz, D. (2002). Real-time technology assessment. *Technology in society*, 24(1-2), 93-109.
- Habermas, J. (1981). *Theorie des kommunikativen Handelns* [Theory of communicative action]. Frankfurt: Suhrkamp.
- Hart, H. L. A. (1968). *Punishment and responsibility : essays in the philosophy of law*. Oxford: Clarendon Press.
- Honoré, T. (1999). *Responsibility and fault : Tony Honoré*. Oxford: Hart.
- Jasanoff, S. (2007). Technologies of humility. *Nature*, 450(7166), 33-33.
- Jessop, B. (1998). The rise of governance and the risks of failure: the case of economic development. *International Social Science Journal*, 50(155), 29-45.
- Jessop, B. (2002). Governance and meta-governance in the face of complexity: On the roles of requisite variety, reflexive observation, and romantic irony in participatory governance. In *Participatory governance in multi-level context* (pp. 33-58): Springer.
- Jonas, H. (1984). *The imperative of responsibility : in search of an ethics for the technological age*. Chicago: University of Chicago Press.
- Kooiman, J. (1999). Social-political governance: overview, reflections and design. *Public Management an international journal of research and theory*, 1(1), 67-92.
- Kooiman, J., & Jentoft, S. (2009). Meta-governance: values, norms and principles, and the making of hard choices. *Public administration*, 87(4), 818-836.
- Krause, E. A. (1999). *Death of the Guilds: Professions, States, and the Advance of Capitalism, 1930 to the Present*: Yale University Press.
- Lindner, R., Edler, J., Matamoros, H. G. O., Randles, S., Walhout, B., Gough, C., & Kuhlmann, S. (2016). *Responsibility navigator: ResAGorA*.
- Kuhlmann, S., Stegmaier, P., & Konrad, K. (2019). The tentative governance of emerging science and technology—A conceptual introduction. *Research Policy*, 48(5), 1091-1097.
- Kupper, F., Klaassen, P., Rijnen, M., Vermeulen, S., & Broerse, J. (2015). *Report on the quality criteria of Good Practice Standards in RRI*. Amsterdam: RRI Tools.
- Kupper, F., Klaassen, P., Rijnen, M., Vermeulen, S., Woertman, R., & Broerse, J. (2015). *A catalogue of good RRI practices*. Deliverable 1.4, RRI Tools project.

- Landeweerd, L., Townend, D., Mesman, J., & Van Hoyweghen, I. (2015). Reflections on different governance styles in regulating science: a contribution to 'Responsible Research and Innovation'. *Life sciences, society and policy*, 11(1), 8.
- Mazzucato, M. (2019). Governing missions in the European Union. Independent Expert Report.
- McNelis, N. (2000). EU communication on the precautionary principle. *J. Int'l Econ. L.*, 3, 545.
- Mejlgaard, N., Christensen, M. V., Strand, R., Buljan, I., Carrió, M., i Giral, M. C., . . . Revuelta, G. (2019). Teaching responsible research and innovation: A phronetic perspective. *Science and engineering ethics*, 25(2), 597-615.
- Molas-Gallart, J., & Tang, P. (2011). Tracing 'productive interactions' to identify social impacts: an example from the social sciences. *Research evaluation*, 20(3), 219-226.
- Monsonís-Payá, I., García-Melón, M., & Lozano, J.-F. (2017). Indicators for responsible research and innovation: A methodological proposal for context-based weighting. *Sustainability*, 9(12), 2168.
- Nowotny, H. (1999). The place of people in our knowledge. *European Review*, 7(2), 247-262.
- Owen, R., Macnaghten, P., & Stilgoe, J. (2012). Responsible research and innovation: From science in society to science for society, with society. *Science and public policy*, 39(6), 751-760.
- Owen, R., Stilgoe, J., Macnaghten, P., Gorman, M., Fisher, E., & Guston, D. (2013). A framework for responsible innovation. *Responsible innovation: managing the responsible emergence of science and innovation in society*, 31, 27-50.
- Pansera, M., Owen, R., Meacham, D., & Kuh, V. (2020). Embedding responsible innovation within synthetic biology research and innovation: insights from a UK multi-disciplinary research centre. *Journal of Responsible Innovation*, 1-26.
- Ravetz, J. (1975). ... et augebitur scientia. In R. Harré (Ed.), *Problems of scientific revolution: Progress and obstacles to progress in the sciences* (pp. 42-57). Oxford: Clarendon Press.
- Rip, A. (2018a). De facto governance of nanotechnologies. In *Futures of Science and Technology in Society* (pp. 75-96): Springer.
- Rip, A. (2018b). The Past and Future of RRI. In *Futures of Science and Technology in Society* (pp. 115-133): Springer.
- Rip, A., Misa, T. J., & Schot, J. (1995). *Managing technology in society*: Pinter Publishers London.
- Rip, A., & Shelley Egan, C. (2010). Positions and responsibilities in the 'real'world of nanotechnology. *Understanding public debate on nanotechnologies: options for framing public policies. A Report from the European Commission Services*, 31-38.
- Rowe, G., & Frewer, L. J. (2000). Public participation methods: A framework for evaluation. *Science, technology, & human values*, 25(1), 3-29.

Spaapen, J., & Van Drooge, L. (2011). Introducing 'productive interactions' in social impact assessment. *Research evaluation*, 20(3), 211-218.

Stahl, B. C., Obach, M., Yaghmaei, E., Ikonen, V., Chatfield, K., & Brem, A. (2017). The responsible research and innovation (RRI) maturity model: Linking theory and practice. *Sustainability*, 9(6), 1036.

Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*, 42(9), 1568-1580.

Stilgoe, J., Owen, R., Macnaghten, P., Gorman, M., Fisher, E., & Guston, D. (2013). A framework for responsible innovation. *Responsible innovation: managing the responsible emergence of science and innovation in society*, 31, 27-50.

Stirling, A. (2008). "Opening up" and "closing down" power, participation, and pluralism in the social appraisal of technology. *Science, technology, & human values*, 33(2), 262-294.

Stirling, A., Renn, O., & Zwanenberg, P. v. (2006). A Framework for the Precautionary Governance of Food Safety: integrating science and participation in the social appraisal of risk. In E. Fisher, J. Jones, & R. v. Schomberg (Eds.), *Implementing the Precautionary Principle: Perspectives and prospects*. (pp. 284-315). Cheltenham

Edward Elga.

Strand, R. (2019). Striving for reflexive science. *Review Journal for Research and Technology Policy Evaluation*(48), 56-61.

Sørensen, E. (2014). The metagovernance of public innovation in governance networks. Paper presented at the Policy and Politics Conference in Bristol.

Sørensen, E., & Torfing, J. (2009). Making governance networks effective and democratic through metagovernance. *Public administration*, 87(2), 234-258.

Sørensen, E., & Torfing, J. (2016). *Theories of democratic network governance*: Springer.

Tancoigne, E., Randles, S., & Joly, P. B. (2016). Evolution of a concept: a scientometric analysis of RRI. In L. e. al. (Ed.), *Navigating towards shared responsibility in Research and innovation: Approach, Process and Results of the Res-A-Gora project* (pp. 38-44).

Ulrike Felt, Fochler, M., Müller, A., & Strassnig, M. (2009). Unruly ethics: on the difficulties of a bottom-up approach to ethics in the field of genomics. *Public Understanding of Science*, 18(3), 354-371.

Van den Hoven, J., Lokhorst, G.-J., & Van de Poel, I. (2012). Engineering and the problem of moral overload. *Science and engineering ethics*, 18(1), 143-155.

Von Schomberg, R. (2011). Towards responsible research and innovation in the information and communication technologies and security technologies fields. Available at SSRN 2436399.

Von Schomberg, R. (2012). Prospects for technology assessment in a framework of responsible research and innovation. In *Technikfolgen abschätzen lehren* (pp. 39-61): Springer.

von Schomberg, R. (2013). A Vision of Responsible Research and Innovation. In J. B. R. Owen, & M. Heintz (Ed.), *Responsible Innovation : Managing the Responsible Emergence of Science and Innovation in Society* (pp. pp. 51–74): John Wiley & Sons Inc.

Von Schomberg, R. (2013). A vision of responsible research and innovation. *Responsible innovation: managing the responsible emergence of science and innovation in society*, 51-74.

Wittrock, C., & Forsberg, E. (2019). Handbook for organisations aimed at strengthening Responsible Research and Innovation. In: European Commission. URL: <https://www.rri-practice.eu/wp-content/uploads/...>

Wynne, B. (2002). Risk and environment as legitimacy discourses of technology: reflexivity inside out? *Current sociology*, 50(3), 459-477.

Young, I. M. (2007). *Global challenges : war, self-determination and responsibility for justice*. Cambridge: Polity Press.

Imprint

Author

Marit Hovdal Moan

Norwegian University of Science and Technology (NTNU, Norway)

Contributing authors

Lars Ursin (NTNU, Norway), Elsa González-Esteban (UJI, Spain), Rosana Sanahuja-Sanahuja (UJI, Spain), Ramón Feenstra (UJI-Spain), Patrici Calvo (UJI, Spain), Santiago García-Campa (UJI, Spain) and Martha Rodriguez (Fundación ETNOR, Spain)

January 2021

Edited by

Uta Mommert, BIOCOM AG, Berlin

Design

Michaela Reblin, BIOCOM AG, Berlin

Photo credits

Cover picture: JEGAS RA/Adobe Stock Photo

p. 9: Powerup – Freepik.com

p. 41: Pixabay

www.ethnasystem.eu