9 Reflexive monitoring in action as a methodology for learning and enacting Responsible Research and Innovation

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9.1 Introduction

In recent years, a considerable amount of conceptual and practical work has been done under the umbrella term Responsible Research and Innovation (RRI). From its onset, RRI has been framed and developed in both policy arenas and academic spheres, leading to a rich variety of interpretations and approaches (Ribeiro et al., 2017). Certain actors emphasize the framing of RRI as a governance framework, whereas others frame it as actively co-shaping research and innovation (R&I) trajectories in interaction with a broad range of actors involved. In general terms, RRI is seen as an approach to align the values and purposes that drive science and innovation with the values, interests and needs of society in order to steer towards outcomes that are societally beneficial, ethically acceptable and environmentally sustainable. The conceptual work sometimes aims at tracing RRI's roots or localizing it in the geography of (like-minded) ideas, movements or disciplinary fields (Blok & Lemmens 2015; Gianni et al. 2018; Iatridis & Schroeder 2016; Oftedal 2014; Rip 2014; Van Lente et al. 2017). Although sometimes such conceptual work is rather critical of RRI – whether *dismissive* (Zwart et al. 2014) or in the sense of investigating the conditions in which RRI might be truly responsible (Grinbaum and Groves 2013) – this arguably stimulated the route RRI travelled from being a rather esoteric subject to becoming almost a household name, at least in fields pertaining to the governance and execution of R&I. In parallel to the conceptual work undertaken on and in RRI, increasing attempts were also made to *practise* RRI. Much of this work builds on older traditions of thought and action, which can be found in disciplines or fields such as (constructive) technology assessment, (applied) ethics, science communication or gender studies, and the conceptual work RRI borrows from, adds to or relates to this. Indeed, in our view one of the merits of RRI is precisely located in the fact that it brings together valuable conceptual and methodological resources that previously were dispersed across various communities.

With this merit, however, there is also an associated risk – namely, that with the ensuing complexity of RRI it becomes difficult to monitor or assess how people, institutions, companies, fields or the R&I system as a whole are influenced by RRI. In this chapter, we argue that reflexive monitoring in action (RMA), an interactive and action-oriented methodology for monitoring complex projects that aim to contribute to sustainable system innovation in the context of ‘wicked problems’, could well be used to monitor and assess RRI. As such, our approach resonates with the 2015 report by the European Commission’s (EC) Expert Group on Policy Indicators for Responsible Innovation, which emphasized the importance of experimental and reflexive learning in assessing RRI (Spaapen et al. 2015). To make our case, we build both on our experiences with formulating and using criteria for assessing RRI gained in the RRI Tools project, funded by the EC, as well as on our experiences with practising RMA during a research project in the context of a Dutch nature policy programme, Natuurpact.

9.2 Background

As we see it, the emergence of RRI as a governance framework for R&I makes immediate sense in the light of two trends. First, R&I play an increasingly important role in society (Acs et al. 2013). That is to say, in today’s knowledge economy, a growing number of people are working in R&I (Pyöriä 2005), and the fruits of such work become ever more deeply ingrained in all aspects of our lives. A large part of research efforts concern the production of so-called ‘pure’ or ‘fundamental’ knowledge with, at its core, norms of objectivity and independence. It is, however, equally true that R&I are often driven by values of applicability and making a positive societal, environmental or economic impact – working towards improvements for, as it is often put, people, planet and profit. This holds true also for research that is *not* primarily or purposively done with an eye to application or improvement, as this too can unexpectedly find its way to the market – think, for instance, of Alexander Fleming’s serendipitous discovery of penicillin (Bosenman 1988).

In parallel to the expansion of the role of scientific knowledge in developing, for instance, technical solutions, health interventions or evidence-based policy-making, so too an increase can be found in the realization that R&I can have unintended and sometimes detrimental consequences (Swierstra & Waelbers 2012). For example, X-rays can be used for diagnostic purposes, but also cause cancer; combustion engines can be used in vehicles to transport people and goods rapidly and cheaply, but at the cost of a negative impact on both the environment and human health; smartphones help connect people to each other and to the virtually endless resources the internet has on offer, but bring with them possible threats to individuals’ privacy and risks for mental health (Kawabe et al. 2016).

Arguably, this combination of trends calls for investments to ensure that R&I are imbued with societal values. Insofar as the general public is affected

by the (in)direct consequences of R&I, it arguably should have a say in how the public interests should be respected (Dewey 1927). In societies characterized by a plurality of values, the challenge is to incorporate the values of different stakeholders in the development of R&I, so as to work towards ethically acceptable, environmentally sustainable and socially desirable outcomes, products and impacts. This challenge is far from straightforward due to the often fundamental differences between stakeholders in their interests and values and therefore their framings of both problems and solutions (Blok & Lemmens 2015). RRI provides a framework for the governance of R&I that helps facilitate the development of practices in which this is addressed.

Then, what does that framework consist of? This question has received various answers. One important source in the field, the EC, states that RRI is ‘an inclusive approach [that] aims to better align both the process and outcomes of [R&I], with the values, needs and expectations of European society’.¹ In the UK, the Engineering and Physical Sciences Research Council (EPSRC) has instituted a framework for responsible innovation built around the process elements of anticipation, reflection, engagement and action (AREA²), and along similar lines, Wickson and Carew have proposed the following four core constituents of RRI:

- (1) a focus on addressing significant socio-ecological needs and challenges;
- (2) a commitment to actively engaging a range of stakeholders for the purpose of substantively better decision-making and mutual learning;
- (3) a dedicated attempt to anticipate potential problems, assess available alternatives and reflect on underlying values, assumptions and beliefs; and (4) a willingness among all participants to act and adapt according to these ideas.

(Wickson & Carew 2014, p. 255)

In this chapter, we propose a heuristic and analytical model of RRI that shows clear affinity with such understandings, with an additional specification of more fine-grained criteria and a methodology that can be used in applying these criteria in enacting RRI. The combination of criteria and methodology can help bring together the simultaneous practice and assessment of the rich, yet fairly abstract, prevailing understanding of RRI.

9.3 Formulating criteria for RRI – and putting them to good use

With developments towards the conceptualization and enactment of RRI, there is a need to establish whether RRI leads to the assumed outcomes. Looking beyond its good intentions, can the environmental and societal merit of RRI be proven? If so, can these proven outcomes be linked to RRI processes (i.e. can we draw lessons on what determines ‘quality’ in RRI practice)? In other words, can we validate the value of RRI? To help answer

these questions, there have been several attempts to further specify what it entails to engage in RRI (sometimes dedicated to RRI in a specific context), and to assess RRI's impact (Davis & Laas 2014; Heras & Ruiz-Mallén 2017; Kupper et al. 2015; Peter et al. 2018; Wickson & Carew 2014). In the context of the EC-funded project, RRI Tools, two of the authors contributed to the formulation of criteria for RRI.

This attempt commenced with the deceptively simple question: 'What is RRI?' Deceptively simple, because we wanted to avoid pure theory-based conceptualizations, and to steer clear of the implicit suggestion that it would be possible to 'discover' a single fixed and context-independent answer to this question. Thus, even if hypothetically it would be possible to define rules for behaving responsibly in R&I, we would still see these rules in themselves as being of little or no value. In our view, such a 'sterile' theory-driven code-book would be self-contradictory, as it would absolve those applying the model from the very kind of responsibility it seeks to instil. Rather, the burden of deciding what are responsible decisions and actions always remains with those directly or indirectly taking part in R&I processes. These actors themselves need to reflect upon what is responsible in the specific contexts of their work, and this requires careful and systematic reflection on a case-by-case basis. To give expression to this view, the criteria that emerged as our answer to the question 'What is RRI?' were eventually translated into questions inviting reflection and deliberation, rather than assertions.

To arrive at a comprehensive model of RRI and its criteria, we engaged in a process of iterative conceptual modelling (Figure 9.1, and see Klaassen et al. 2017 for a more extensive description). Central to this methodology for concept development are different and disparate forms of expertise, confronted in a series of iterative steps which, in this case, sought to answer our question 'What is RRI?'. Figure 9.1 presents the six different steps of: (1) literature review on RRI and the many disciplinary and conceptual resources RRI is built up upon; (2) expert consultation; (3) stakeholder workshops; (4) cataloguing promising RRI practices; (5) deriving RRI criteria; and (6) in-depth case-study analyses, as well as the iterations to arrive at and subsequently test and adapt our conceptualization of RRI and its associated criteria.

The starting point for any specification of ideals is to ask *why* the ideals are needed. Specifically, why would responsibility need to be introduced in the R&I environment? Or, to paraphrase a famous super-villain: *Why so responsible?* The answers to this question can be linked to two perspectives from which the need for responsibility can be approached. First, as seen by those *inside* the R&I environment, responsibility is an obligation that follows from the (social, financial and moral) power granted to those in a position to carry out or regulate R&I processes. Writing from this perspective, Owen et al. (2013) refer to responsibility as an 'imperative'. Second, from the perspective of those actors traditionally located *outside* R&I, gaining responsibility is a *right*, derived from the breadth of impacts they

Figure 9.1 The iterative conceptualization of Responsible Research and Innovation (RRI).

Source: Klaassen et al., 2017.

(may) experience as result of those processes. This second view asserts that scientists should not be isolated from society for the rather straightforward reason that the impacts of their work are not.

In a European context, these ideas have been integrated in research policy, and resonate with what are known as the seven grand social challenges (Klaassen et al. 2018; Lund Declaration 2009) – although it is now more usual to refer to the sustainable development goals (SDGs) adopted by the United Nations. As we interpret them, the grand challenges or SDGs are not so much research topics, but rather points of intersection between science and society (Cummings et al. 2018). Indeed, these challenges can *also* function as the abstract, but palpable, purposes for RRI.³

Taking challenges or the SDGs as long-term purposes, in order to achieve them, we need to think of more concrete products that can function as intermediate stepping stones on our journey. Through our discussions with experts and laypersons alike, we have discovered that, in pursuing responsibility, the associated learning is as important as the results of R&I. We thus make a distinction between R&I products (i.e. the artefacts created through R&I) and learning products (i.e. the skills acquired and practices established in creating R&I products). Responsibility, we maintain, is to be equally sought in both types of products: it is simultaneously a dimension of the products of R&I, and of the hard and soft institutions thereby brought to life. If solving the seven grand challenges can be compared to crossing a

river, then R&I products are stepping stones and learning products are the skills needed to discover and jump from one stepping stone to the other. If we have the former and not the latter, we might end up stranded in the middle of the river with little idea of what to do next. In brief, if responsibility is to be ‘fostered’, the cultural by-products of R&I activities are as important as the activities themselves.

To take an example: if transgenic crops are an R&I-driven solution supporting the second grand challenge (food security, sustainable agriculture and forestry), then the practices institutionalized in the process of researching transgenic crops responsibly are as important as the actual crops. The two might affect technological progress in different timespans, R&I products having a direct and immediate impact while learning products have an indirect and a delayed one – but the two are of equal importance. The questions are ‘Do genetically modified organisms (GMOs) constitute a step towards the second grand challenge?’, and ‘How can research into GMOs be carried out responsibly and how can we instil this responsibility in the future?’

Having delineated the destinations of RRI, we can reason backwards to clarify the processes needed to reach them. The conceptualization of RRI in terms of four process dimensions was arrived at, much in line with much-cited sources on RRI such as Owen et al. (2012) and Stilgoe et al. (2013). Thus, *anticipation and reflection, openness and transparency, diversity and inclusion and responsiveness and adaptive change* were identified as core elements in the process of doing R&I responsibly. These dimensions were then further specified in terms of criteria and sub-criteria, and ultimately one or more inviting questions. To emphasize: we refer to these questions as *inviting questions* to highlight their intended status as points of departure for various forms of reflection and deliberation, rather than as an instrument of accounting. To illustrate what this has reaped, Table 9.1 presents criteria, sub-criteria and inviting questions for the process dimension of anticipation and reflection (and for the other three dimensions, see Kupper et al. 2015). Criteria for RRI can be used beforehand both by researchers and innovators in designing R&I responsibly or by funding organizations for assessing proposals, as well as afterwards for assessing to what degree R&I have been undertaken responsibly, and whether desired outcomes and impacts have been achieved. Such criteria can also be used during the execution of R&I projects or programmes, as a means to monitor and continuously improve them. Arguably, the latter constitutes a way of assessing (attempts at) RRI that is most in line with the earlier description of RRI, especially in relation to RRI’s intrinsic openness and connection with experimental learning. A complex new field of its own might appear to open up with this entrance into the realm of evaluation of R&I, but we in fact enter a field in which there is significantly more scholarly experience than in the world of RRI alone.

Depending on the prevailing needs and intentions, evaluators of R&I projects or programmes can choose a method from a wide variety of available (theoretical) approaches. Traditionally, evaluations function as a

Table 9.1 Criteria, sub-criteria and inviting questions for the Responsible Research and Innovation (RRI) process dimension of reflection and anticipation

<i>Criteria</i>	<i>Specification</i>	
	<i>Sub-criteria</i>	<i>Inviting questions</i>
Analysis of the background, current situation and context of the (planned) research or innovation. (Nordmann, 2014)	Up-to-date information	Has content research been done on relevant background knowledge and up-to-date information?
	Influence other R&I	Has the influence of other innovations/ research on the course of this practice been taken into consideration (e.g. alternative and complementary R&I)?
	Actor analysis	Did an actor analysis take place, identifying on whom the practice might have an impact or who might have an interest in, and might have relevant expertise for, the practice – and identifying how these actors relate to each other?
	Diverging problem definitions	Have efforts been made to address potentially diverging definitions of the problem at stake in the practice?
Envisioning of plausible futures (Nordmann, 2014)	Societal role in problem definition and course of practice	Have efforts been made to give a role to societal values, perceptions and interests in defining the problem addressed in the practice and the further course of the practice?
	Variety of future parameters and impacts	Is there active identification and consideration of immediate, mid-term impacts? Are long-term social, environmental and economic impacts and consequences of the practice – intended and unintended – identified?
	Variety of established methods	Did a well-considered selection and implementation of the methods for anticipation take place (based on previous experience) (e.g. scenario development, real-time technology assessment)?
Variety of impacts	Variety of R&I trajectories	Have alternative R&I trajectories been considered (process of R&I)?
	Ethics	Are ethical aspects and impacts of the practice sufficiently addressed? For example, are research ethics honoured, by protecting the subjects of research, approval from an ethical committee and documented compliance with research ethics and voluntary codes of conduct – in which for example fraud and plagiarism are prohibited (Wickson & Carew 2014)?

Table 9.1 (Cont.)

Criteria	Specification	
	Sub-criteria	Inviting questions
Facilitating deliberation on values, perceptions, needs, interests, choices and definition of the problem at issue in the practice	Legislation	Are legal aspects and impacts of the practice sufficiently addressed? For example, is there documented compliance with highest-level governance requirements Wickson & Carew 2014)?
	Society	Are social aspects and impacts of the practice sufficiently addressed?
	Environment	Are environmental aspects and impacts of the practice sufficiently addressed?
	Grand challenges	Are one or more of the grand challenges set by the European Commission addressed in the practice?
	Integrated reflection and deliberation	Has room for reflection and deliberation on e.g. impacts, alternatives, possibly changing social values, perceptions and needs/ interests and choices made during the practice been built in (Stilgoe et al. 2013)?
	Deliberating values	Do the actors involved regularly engage in a critical analysis of the values, perceptions, needs, interests, choices and definition of the problem at issue underlying their practice?
Addressing roles in RI trajectories	Awareness of differences	Do the actors involved develop an awareness of their own assumptions, values and purposes in relation to the perspectives of others?
	Awareness of responsibilities	Are involved actors aware of and open to reflection on their role responsibilities and accountability (Stilgoe et al. 2013)?

Note: R&I, research and innovation; RI, responsible innovation.

Source: Adapted from Kupper et al. (2015).

type of disciplined inquiry to assess whether a programme or project has contributed to its designated purposes. From an instrumental perspective, this approach primarily serves the needs of project funders in terms of accountability (also understood as upwards accountability; Ebrahim 2005). Especially, for instance, large-scale innovation and research projects that depend on private-sector investments are prone to evaluation focused on accountability based on criteria set by investors. Such criteria tend to spring from a technical-economic perspective, narrowing down the set of interpretations of a project's success to a matter of pre-defined deliverables.

Academic evaluation based on output criteria is also a familiar practice, for instance through quantitative metrics meant to capture the (academic) impact of publications. For example, the Centre for Science and Technology Studies at Leiden University is invested in the development of bibliometrics, and evaluates academic impact through the analysis of citation patterns of different research groups. Through this approach they also attempt to determine the use and value of publications for marketable applications, public policy development or other ways of attaining public value. However, although they offer some insights, the metrics produced have limited use in informing action to improve research practices. This is a known argument against evaluation approaches that focus solely on accountability. Although a legitimate approach, it tends to assume rather linear input–output relations, and the evaluation findings are seldom suitable to feed back into the practice of those actors who implemented the project to help them improve their work. The recognition that *learning* by those actors is required to improve a project’s conduct and increase the likelihood of achieving the designated purposes contributed to the emergence of so-called ‘learning-oriented’ evaluation approaches. In such approaches, evaluations are designed to focus on the understandings, concerns and learning needs of actors and stakeholders involved in or surrounding the project or programme in question.⁴ Arguably, this type of perspective also inspired the ‘Leiden manifesto for research metrics’,⁵ which proclaims that the scope of research metrics should be extended beyond output criteria alone, by developing more ‘meaningful metrics’ in order to inform research performance (Hicks et al. 2015). These two functions of evaluation (i.e. accountability and learning) and their supposed irreconcilability have received considerable attention in the recent scholarly literature in evaluation studies (Adelle & Weiland 2012; Guijt 2010; Kunseler & Vasileiadou 2016; Owens et al. 2004; Regeer et al. 2016).

For, while learning through evaluation is generally professed to be important, evaluation for accountability still predominates. This is especially problematic for long-term R&I projects that search to address complex societal problems that are of a more goal-seeking and emergent nature, and for which the societal impacts and technological advancements weigh heavily but are difficult to predict. Such research projects very rarely take the shape of a linear process of problem formulation, project design and implementation, as they tend to unfold as dynamic and experimental interactions between multiple actors from multiple levels or domains – academic, industrial, societal, policy – during which mutual learning is essential in order to produce the types of responsible outcomes that are sought (i.e. outcomes contributing to the SDGs or grand challenges, that are for instance ethically and socially acceptable and environmentally sustainable) (Regeer et al. 2009). As such projects progress, greater insights and developments in their institutional and societal context may require the reformulation of the project’s goals and, subsequently, the research design. Adaptive capacity

is required for the project team to be able to anticipate and accommodate such changes. From this perspective, evaluating for accountability based on pre-defined criteria becomes meaningless. Simultaneously, evaluation that focuses solely on learning without considering the developments in institutional and societal contexts might improve specific procedures, but would lose sight of a project's greater ambitions of achieving societal impact. For complex R&I projects, there is a call for evaluation approaches that reconcile the dual purpose of accountability and learning (Lehtonen 2014; Regeer et al. 2016). More specifically, there is a call for evaluation approaches that allow assessment of R&I projects' progress towards their greater ambitions, *while* learning – about goals, strategies, actions and contexts – is promoted (Klerkx et al. 2010). By creating space for learning processes, the project team and other stakeholders may build their adaptive capacities and abilities to inform adaptive change, in light of new insights and a changing environment. The evaluation approach that is adopted should be as flexible as the project itself.

From different fields – including development studies, system innovation, transdisciplinary research, transition management and RRI – scholars have argued that the answer lies in evaluation approaches geared towards enhancing *reflexivity* (Arkesteijn et al. 2015; Botha et al. 2017). Reflexivity is a capacity that allows projects' participants to act in greater accordance with, and are responsive to, their institutional and societal context, in line with their understanding(s) of a project's success (Elzen et al. 2017). Indeed, reflexive approaches seek to encourage participants' adaptive capacities. Reflexive evaluation occurs during a project's course and is ideally integral to it, as part of iterative cycles of defining, implementing and adjusting its design in order to move towards responsible research outcomes (Regeer et al. 2009). As such, reflexive evaluation methods simultaneously function as promoters for and assessors of learning processes to achieve environmentally sustainable and socially acceptable goals. Table 9.2 shows the three conceptualizations of evaluation approaches and their characteristics, which we have discussed here.

In this chapter, we further focus on one specific reflexive approach that has proliferated in various domains and explore its value for RRI projects: RMA. RMA is an interactive, action-oriented monitoring and evaluation method, originally developed to support projects with ambitions to make system innovations and which require major institutional and social change (Van Mierlo et al. 2010). As for most reflexive approaches, RMA is intended to increase a project's reflexivity – its ability to affect and interact with the context within which it operates – by encouraging its participants' collective learning processes, through which institutional and societal barriers to system innovation are identified and overcome. As Arkesteijn et al. (2015) explain, RMA builds on the premise that, while the contribution of a single system innovation project to the overarching, complex system innovation processes cannot be assessed, it is possible to understand and work (and

Table 9.2 Three ideal–typical conceptualizations of evaluation approaches

	<i>Evaluation approaches for accountability</i>	<i>Learning-oriented approaches</i>	<i>Reflexive evaluation approaches</i>
<i>Evaluation purpose</i>	Evaluation as mechanism for accountability assurance, assessing a project's performance	Evaluation as mechanism to enhance learning processes for improved (research) practice (procedures, processes)	Evaluation as mechanism to enhance reflexivity through monitoring of and reflection on goals, strategies, actions, institutional and social contexts
<i>Characteristics of evaluand</i>	Simple project: mostly linear causal chain of inputs, outputs and outcomes	Complicated project: multi-actor interactions with complicated multi-directional causal mechanisms	Complex project: multi-actor, multi-level governance constellations with unclear/ unknowable and uncertain causal mechanisms
<i>Evaluation criteria</i>	Pre-defined deliverables (technical–economic; (cost) efficiency, effectiveness)	Learning needs of project team in light of their own practice	Learning needs in light of jointly determined goals and principles (e.g. ethics, inclusion, responsiveness)
<i>Evaluation design</i>	Technical–analytical evaluation design by evaluators	Deliberative evaluation design in concert between evaluators and project team	Deliberative–analytical, emergent and responsive evaluation design in concert between evaluators, project team and other relevant stakeholders
<i>Role of evaluator</i>	Distant observer, judge	Facilitator of learning processes	Facilitator, mediator, observer: 'critical friend'
<i>Time aspect</i>	Evaluation takes place prior or after the project	Evaluation occurs parallel to the project	Evaluation is an integral part of the project

Source: Adapted from Kunseler & Vasileiadou (2016).

document!) towards a project's design and outcomes in terms of relevance to long-term ambitions of system innovation. Key to the methodology is recurrent reflection on the institutional and societal context of a project in relation to its long-term ambitions, and its concrete project design and

effects (i.e. on the theory of change on which a project's design is founded). We argue that this holds merit for the evaluation of RRI. While a project's societal impact cannot be foreseen or anticipated in full, what *is* possible is to guide action along the RRI criteria framework, as described above. RMA methodology may help to enhance the reflexivity of a project team and build its capacity to enact RRI criteria. As a result, one has worked towards responsible R&I outcomes, while simultaneously the process towards these becomes more responsible.

The actual monitoring activities of RMA are integral to the project, and are usually guided by an appointed reflexive monitor. The monitor observes moments of interaction (like team meetings) and focuses on whether learning and actions towards the intended purposes take place, assisting such processes by making use of a range of reflexive monitoring tool activities (see Van Mierlo et al. 2010). As such, the reflexive monitor is not merely an observer, but rather a facilitator or 'critical friend'; close enough to fully understand the issues encountered, but with sufficient distance to legitimately and critically reflect on the process. What it is that needs to be learned, or by whom, is not a given in this method, but rather something that itself needs to be recurrently assessed and reviewed. RMA does not provide a blueprint or a strictly structured action plan, but should rather be seen as a flexible methodology that can be customized to support any endeavour that aspires to contribute to sustainable development and societal change.

9.4 Illustrating RMA's value as an RRI way of assessing RRI

We will now illustrate the added value of integrating the RMA methodology in research and (system) innovation projects to simultaneously promote and assess RRI. The case we present is the first period (2014–2017) of the *Natuurpact* project. This large-scale transdisciplinary research project took place in the context of a Dutch nature policy programme (PBL & WUR 2017). In 2013, the Dutch government, together with governments of the 12 Dutch provinces⁶ and a range of social organizations, signed the so-called *Natuurpact agreement*. In this pact, all parties agreed on a joint approach to achieve national, long-term ambitions to improve the conservation and resilience of Dutch nature by 2027. The years prior to the pact had been characterized by the reduction of biodiversity, low levels of societal engagement with nature and disputes over the value and function of nature, specifically between the agricultural and economic domain on the one hand and nature conservation advocacy groups on the other. To achieve the pact's ambitions, it was argued, innovative policy strategies were required and, in support of this, the parties decided upon the *Natuurpact* project, to study and simultaneously support the innovation of policy strategies responsibly. The project was intended to be inclusive and responsive to all relevant policy actors and geared towards mutual learning through deliberation and experimentation, to overcome the value

Figure 9.2 Schematic overview of the Natuurpact research project.

disputes and encourage social engagement with nature. The project ran in parallel to regional policy processes of development and implementation, in order to directly inform policy practice with socially robust findings from a multitude of scientific disciplines pertinent to environmental policy. It was expected that as outcomes of this approach there would be societally acceptable and environmentally sustainable findings that could inform policy practice, thereby enhancing the likelihood of attaining the ambitions recorded in the Natuurpact.

The Natuurpact project was led by a multi-institutional and interdisciplinary project team, which we will refer to as ‘the researchers’. The researchers collaborated with relevant policy actors during roughly four different phases of the research, such as the joint formulation of research questions, joint data collection, shared analyses and interpretation, and drawing joint conclusions and dissemination (Figure 9.2). This, for instance, occurred during diverse research activities in each phase, such as workshops and sessions, but also through bilateral interactions (such as interviews) between regional policy actors and members of the research team. The first period of the Natuurpact project was concluded in 2017. Two of this chapter’s authors were part of the research team in the role of ‘reflexive monitors’; their task was to simultaneously promote and assess the reflexivity of the Natuurpact project while it was conducted, to enhance the enactment of its RRI ideal throughout the project.

Concretely, this meant they took part in project team meetings and simultaneously monitored research progress during other research activities. During the meetings, they would ask inviting questions to reflect on RRI criteria and how they might be enacted during the Natuurpact project. For example, when planning the first workshops at the start of the project, they facilitated the researchers to make a stakeholder analysis for the project.

While doing so, they encouraged deliberation on stakeholder diversity and inclusion: who to include, why, how to encourage participation, and what type of participation would be pertinent? An important part of their role as reflexive monitors was to help the researchers make explicit the challenges that they perceived with stakeholder inclusion, and formulate actions to overcome these. For instance, the researchers anticipated minor conflicts between some of the stakeholder groups and were concerned this would obstruct an open and constructive dialogue during the workshop. The project leader retrospectively reflected:

We had a lot of discussion on who to invite during which workshops. We reasoned that the conflict between regional and national government was already so significant that also bringing in societal organizations too early in the project would only work against our purpose of deliberation.

In response, it was decided to first hold a few smaller parallel workshops with individual stakeholder groups (e.g. regional policy actors) before a larger heterogeneous session attended by multiple groups. This, it was reasoned, would enable the different actors to become accustomed to the idea of collaborating on a research project, spurring their willingness to work together.

In a similar fashion, as reflexive monitors they invited reflection on how to ensure criteria such as openness and transparency towards the participating actors would be achieved throughout the project. For example, during the third phase of data analysis and interpretation, the researchers found being open and transparent about their research process quite unnerving. They felt vulnerable to the critiques of the participation policy actors: would their expertise be questioned? Making this discomfort explicit made it possible to expose the underlying concern, which allowed for action to be formulated to address it. In discussing this matter of openness, a member of the research team explained:

We realized, I think, we were asked to do the same thing we asked of the participating policy actors: to open up our ways of working to the eyes of others to benefit mutual understanding and sense-making. That is scary. But if we asked it from them, we had to also do it ourselves.

This insight led the researchers to decide to open up the 'black box' of their analyses and explain their work in a way that allowed for mutual understanding, including the use of visualizations and steering clear of using research jargon. In essence, the work of reflexive monitors for promoting core research principles or elements – such as diversity and inclusion, openness and transparency, and responsiveness and adaptive change – encompasses facilitating recurring and systematic reflection on these elements.

As part of promoting RRI elements, they simultaneously monitored how the participating actors appreciated the responsible approach adopted by

the Natuurpact project team during research activities, to oversee whether the actions taken indeed led to the intended outcomes of socially acceptable and environmentally sustainable findings, and knowledge-enriched policy practice. In addition, they conducted ten in-depth interviews with selected participants (from national and regional government, and societal organizations) and a focus group session with another 12 (primarily representatives from regional governments) after the project was finalized to assess the different ways the Natuurpact project had been of value to their policy practice.⁷ The findings demonstrated that (participating with) the Natuurpact project manifested five different types of policy value (Verwoerd et al. 2017), which were much in line with other conceptualizations of social effects of transdisciplinary research projects (e.g. Walter et al. 2007; Wiek et al. 2014). Importantly, these value types were found to occur both at the regional level and across tiers of government. Table 9.3 presents the value types, including some examples from our empirical experience. To start with, the research was found to have *network value* to most of its participants, including network expansion, the strengthening of existing relationships, and building trust between stakeholder groups. Second, it was established that the project effected *affective value*, comprised of a sense of relief and reassurance to see other policy actors encountering similar challenges, and a sense of togetherness and belonging to a community. Third, the project proved to have significant *cognitive value*, as it generated new knowledge and increased understanding of the workings of nature policy strategies and contributed to conceptual coherence in terms of a shared language and frame of reference among the participants. Fourth, the project had *instrumental value*, which was visible in the direct uptake of new insights into policy development and implementation. Finally, the Natuurpact project was shown to have *strategic value*, as it contributed to policy agenda-setting, societal support for nature policy and legitimizing certain policy decisions. In their role as reflexive monitors during the Natuurpact project they found that inviting deliberation and reflection on responsible research criteria encouraged the reflexivity of the project team. More specifically, their ‘sensitivity’ (Sarkki et al. 2013) was found to increase their attention towards the diverse needs and perspectives of stakeholders involved with the research, and the capacity to act on this knowledge (Verwoerd et al. 2017). Furthering this concept of researcher sensitivity, throughout the project the researchers built and drew from what we have termed ‘reflexive capacities’ to ensure the research sufficiently enacted RRI core elements. For example, to enact stakeholder diversity and inclusivity, the researchers built the capacity of *developing shared ownership* of the participants over the research. This included their growing understanding of complex power dynamics between stakeholder groups and the building of robust and trustworthy relationships. To enact openness and transparency, the researchers built the reflexive capacity of interacting with participants through a *mode of humility*. This meant they organized a safe space for deliberations: the

Table 9.3 Overview of five value types manifest at different government levels, with illustrative quotes

Value type	Government level at which value type was manifest	Quotes from interviews with regional policy actors who participated in the Natuurpact research
Network value	Regional level	Network expansion: <i>'It was during this workshop on agriculture when I learned Campina [Dutch dairy cooperation] was also employing nature-inclusive agricultural methods. Then I thought, well, perhaps we should also get in touch with them'</i>
	Across government tiers	Strengthening existing professional relationships: <i>'You now also have a face and a name, you know who you are dealing with or who to get in touch with [within national government]'</i>
Affective value	Regional level	Relief and reassurance: <i>'As a result of all the workshop sessions and also the final report I think "well, we are not doing too bad as a province". Earlier I was afraid we had missed opportunities, but now I feel quite relieved'</i>
	Across government tiers	Sense of togetherness: <i>'[Participating with the Natuurpact project] creates a sense of "we're in this together". It makes you aware that you share a responsibility'</i> Building of trust across government tiers: <i>'Last year I also spoke with [representative of national government]. And you notice that – on the base of increased trust – there's more openness in discussion compared to five years ago'</i>
Cognitive value	Regional level	New knowledge and increased understanding of the workings of and perspectives on nature policy strategies: <i>'Private parties commented on aspects they run into with nature policy that I had never considered. So [the Natuurpact project] provided a different lens than just the administrative one'</i>
	Across government tiers	Conceptual coherence, shared language, shared ambitions: <i>'The benefit of working together during this project is that you learn to speak the same language and can more easily connect'</i>
Instrumental value	Regional level	Informing of regional policy formulation: <i>'In parallel to the Natuurpact research, we were writing our "Nature Vision" [regional nature policy]. [...] In our final version we have integrated the recommendations of the research, it was a valuable addition to our policy'</i>

(continued)

Table 9.3 (Cont.)

<i>Value type</i>	<i>Government level at which value type was manifest</i>	<i>Quotes from interviews with regional policy actors who participated in the Natuurpact research</i>
Strategic value	Across government tiers	Policy alignment/coordination: <i>‘The findings show where national and regional policy enforce or work against each other’</i>
	Regional level	Regional policy agenda-setting, societal support for regional nature policy, legitimization of regional policy decisions: <i>‘In talking with societal partners it is highly useful to have a report that backs up our decisions. It justifies some of our work’</i>
	Across government tiers	National policy agenda-setting, legitimization of decentralization: <i>‘The research pinpoints areas in nature policy that need a lot of work. The report has created collective urgency to focus on these’</i>

researchers positioned themselves on equal footing with the participating policy actors and, from there, invited and gave constructive feedback on nature policy research and practice, respectively. This benefited knowledge integration.

Finally, to enact responsiveness and adaptive change, the researchers built the capacity of *purposeful responsiveness to emergent research needs*. This meant that, while the researchers sought to be responsive to all policy research needs of the participating policy actors, they also kept in mind the feasibility of these research needs as regards the project's budgetary limitations. In sum, the researchers' ability to conduct more responsible research, and to operationalize and enact responsible research criteria, grew. Here, the role of reflexive monitors should be modestly assessed: we cannot claim the efforts of the monitors were entirely responsible for the development of these reflexive capacities. The researchers have likely already had these abilities – as reflexive monitors our main task was to organize reflection and deliberation to help them advance. Indeed, the assumption was that, as the researchers' reflexive skills grew, the reflexive monitors would eventually become dispensable to the Natuurpact research project.

Although this case demonstrates how RMA encouraged researchers' reflexive capacities and contributed to a variety of responsible, societal effects, this is not to say that everything went as planned. For instance, there were times when the reflexive monitors were unsuccessful in ensuring time for reflection or encouraging a 'reflective mindset' of the researchers, especially when the project's workload intensified towards the end. Despite efforts to make their work integral to theirs and to encourage ownership, the authors' presence as monitors of the responsibility of the research process and outcomes at times rather seemed to encourage externalization and absolving of responsibility – precisely the opposite of what was intended. To address this issue, for the following Natuurpact research period (2018–2020) it was decided to formally record allocated time and resources to process monitoring within the project proposal. This has led to a formal sub-project in which researchers, together with reflexive monitors, have been appointed with the task of monitoring the responsibility of their own project. Although the results of this novel approach are yet to be assessed, it would be interesting to see if and what generalizable lessons can be drawn from this for RRI monitoring practices.

9.5 Discussion and conclusion

Recent years have seen much conceptual and practical work geared towards opening up research to society and aimed at redirecting science and innovation towards offering societally beneficial, ethically acceptable and environmentally sustainable outcomes. Under the label of RRI, an increasingly comprehensive framework is emerging to guide the governance and execution of responsible R&I. In this chapter we have shared our understanding of what such a framework should look like. Comprised of process dimensions that

can be operationalized in the form criteria, sub-criteria and inviting questions, the framework is rooted in a philosophy that simultaneously underlines the importance of producing responsible R&I outcomes, as well as of a responsible research process towards these. In our view, the framework is most useful when adopted by actors who take part in R&I processes to carefully and systematically reflect on what *responsible* means in their given situation. In doing so, we emphasize, researchers and innovators learn to act in a more responsible manner. We have illustrated the potential role that a specific methodology for reflexive monitoring, RMA, can play to promote such learning. At the heart of this is RMA methodology's encouragement of the responsibility of actors involved with R&I, through seeking to increase these actors' reflexivity.

Most experience with RMA so far has primarily been geared towards supporting action-oriented, transdisciplinary projects that aspire to contribute to system innovations. In these contexts, RMA has become a proven methodology for reflexive evaluation that promotes learning and reflexivity through precisely those values that are also central to the process dimensions of RRI: reflection, anticipation, openness and responsiveness. It will be interesting to see whether RMA can make a similarly significant contribution to learning for responsibility in the context of other types of R&I. The outlooks for this are bright, given the close alignment of RMA with general features of RRI and the potential to use it simultaneously to assess the degree to which R&I projects or programmes can be seen as RRI, to contribute to learning in or on RRI, and, hence, to promote RRI in these projects or programmes.

Notes

- 1 <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/science-and-society>
- 2 See <https://epsr.ukri.org/research/framework/area/>.
- 3 Perhaps needless to add: such purposes will always remain up for discussion, and their concrete interpretation should be left to those taking responsibility for pursuing one purpose or the other.
- 4 This type of evaluation can be understood as part of the 'fourth-generation evaluation' paradigm proposed by Guba and Lincoln (1989).
- 5 See www.leidenmanifesto.org.
- 6 From now on, we will refer to the governmental level of the provinces as the regional level.
- 7 To this end, we involved colleagues who were not previously involved with the Natuurpact project to mitigate the risk of biased insights due to our investment in the project.

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