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# Epistemic inclusion: a key challenge for global RRI

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**ABSTRACT**

Ten years after introducing the RRI concept, a reflection on its key ambitions seems called for, now that RRI enters the global arena. This paper focuses on the key challenge that RRI is currently facing: epistemic inclusion. From the beginning, there has been the awareness that RRI must be open to multiple voices and perspectives, coming from academia, and also from society at large. Besides representing impressive bodies of knowledge, academic disciplines face knowledge gaps as well and must reach out to other knowledge forms, e.g. practical, experiential, and indigenous knowledge. This paper analyses the challenges involved in epistemic inclusion while outlining viable pathways towards addressing them, based on experiences in European projects as our 'laboratory'. After discussing interdisciplinarity, participatory research, and epistemic pluralism, while also addressing the academic reward system. Special attention is given to indigenous knowledge as a case study for epistemic pluralism.

> These things indeed you have proclaimed
> To face the garment of rebellion
> With some fine colour that may please the eye
> Of fickle changelings and poor discontents,
> Which gape and rub the elbow at the news
> Of hurly-burly innovation
> (Shakespeare, Henry IV, Part I, Act V, Scene 1)

## Introduction: the challenge of epistemic inclusion

The concept 'responsible research and innovation' (RRI) was introduced a decade ago in 2011 (Owen, von Schomberg, and Macnaghten 2021) in the context of European research policy ('top-down'), but adopted and further developed by an academic RRI community ('bottom-up'), giving rise to several salient RRI accounts (Timmermans and Blok 2021). Research and research-based innovation are considered crucial to effectively address global crises such as climate change, mass extinction and emerging viral threats, but

how to ensure that innovation is responsible rather than 'hurly-burly', fostering trust in science instead of discontent? Against the backdrop of these developments and questions, this contribution focuses on what we consider as the key challenge which RRI as an evolving practice is currently facing, namely the challenge of *epistemic inclusion,* notably when addressing societal challenges on a global level. A global approach to RRI requires openness and sensitivity to epistemic tensions and differences. From the very beginning, there has been the awareness that RRI – as an 'interactive process by which societal actors and innovators become mutually responsive to each other' (von Schomberg 2011) – must entail a willingness to become sensitive to and give the floor to multiple voices and perspectives, coming from academia, but also from society at large. Yet, while RRI has recognized the importance of engaging with practices of knowledge production other than academic ones, we are just beginning to recognise the challenges this poses in a global setting, beyond Western ways of knowing.

This paper was written in response to RRI as an ongoing self-reflective discourse, but informed by practical experience, as the authors as academic scholars have been involved in an extensive series of collaborative projects funded by the European Commission. As participants in RRI practices (engaged scholars), we noticed an initial phase of conceptual development, followed by a pragmatic turn in RRI discourse, focussed on the development of concrete methods and tools. Currently, RRI is entering the global arena, as the societal challenges we are facing evolve at a global scale (from climate change and rapid loss of biodiversity up to the proliferation of surveillance technologies and viral threats). Against this backdrop, the question emerges whether the RRI ambition can be meaningful as a guiding concept on a global scale as well, not as an 'export product' (Levitt and Zwart 2009), but via mutual learning and comparative reflection. To determine which components and values of RRI should be globally articulated requires a space for dialogue between different epistemic communities and should be developed bottom-up (Doezema et al. 2019). This raises the question how to reconcile various forms of (academic and non-academic) knowledge and experience.

Epistemic inclusion rests on the premise that all types of knowledge are finite in how they portray realities and open up viable pathways for action. Epistemic inclusion implies the endorsement of proximity and immanence, analysing and assessing these transitions from within, from a position of engagement, aiming to supersede the science-society divide. Instead of seeing societal actors as an ancillary workforce mobilised on behalf of science, societal stakeholders are often uniquely positioned to study and experience societal challenges and transitions *from within* the social arena and the experiential lifeworld.

This evidently takes us beyond the deficit model, which focusses on shortcomings in public knowledge (Simis and Madden 2016). Rather, it is important to realise that, although academic disciplines represent impressive bodies of expertise, they inevitably face knowledge gaps as well, notably concerning the societal impact and uptake of their knowledge claims. We use the term knowledge gap not in a pejorative sense (as if to accuse researchers of sloppiness or narrowmindedness), but to emphasise the experience, emerging across disciplines, that the gap between the complex global challenges we are facing, and the insights provided by established research paradigms has widened. Although finitude is an inherent dimension of knowledge practices, so that adding insights from multiple disciplines will not result in 'absolute knowledge', the awareness

of the boundaries of our research practices will nonetheless inspire academics to reach out and learn from other forms of knowledge, insights, and experiences, through collaboration with other disciplines first of all, but also by seeking interactions with non–academic forms of knowledge, such as practical and existential knowledge, but also indigenous knowledges (Ludwig and Macnaghten 2020). As Valkenburg et al. (2020) argued, it is only by adopting a radically inclusive approach that the objectives of RRI can be realised. This requires the convergence and reconciliation of various forms of (academic and non-academic) knowledge, or rather: 'knowledges'.

Knowledge producers (e.g. researchers and research performing organisations) are experiencing systemic knowledge gaps when addressing global problems such as dramatic loss of biodiversity and ecological disruption. In order to address such global challenges, we have to radically broaden our epistemological scope and methodological repertoire. And this includes the ability to address antagonism and genuine epistemic difference and divergence. To supersede the traditional epistemic divide in an era of polarisation, knowledge must become more comprehensive, inclusive, and decentralised, linking established research-performing organisations with community-based knowledge sites, where epistemic inclusion not necessarily starts from the perspective of scientific knowledge, but rather from experiential knowledge and problem probing. Epistemic inclusion should not be seen as the occasional incorporation of pre-selected and carefully processed pieces of heterogeneous knowledge at the fringes of academic practices of knowledge production. As will be argued in this paper, epistemic inclusion can only live up to its concept if we adopt a committed and radical stance. Epistemic inclusion implies mutual exposure and mutual learning, a thorough innovation of the way in which research is conducted and knowledge is produced, and a willingness to question and reconsider some of the accepted concepts, methodologies and processes involved.

The design of this paper on how to address the challenges involved in epistemic inclusion is as follows. First of all, we aim to contribute to the process of self-reflection by assessing experiences in recent RRI projects where the challenge of epistemic inclusion became tangible, notably in view of what we referred to above as the global turn in RRI. Building on these experiences, in the *descriptive* part, will distinguish *three steps* in the development of RRI so far. Subsequently, in the *practice-oriented* part of our paper, we will discuss *three epistemic pathways* that could be adopted by epistemic communities at research performing organisations (RPOs) to pursue epistemic inclusion, focussed on interaction with *external* (extra-academic) perspectives. Thus, we will zoom in on (a) interdisciplinarity, (b) participatory research, and (c) epistemic pluralism respectively. Special attention will be given to challenges and opportunities involved in opening up RRI to *indigenous knowledges*, as a case study for epistemic inclusion, by exploring the possibilities and conditions for a genuine 'dialogue' (Ludwig and Macnaghten 2020, 28) between indigenous knowledges and RRI. In the conclusion, we summarize our results, but also argue that there is an *internal* dimension to epistemic inclusion in the sense that a viable transformation of knowledge production requires changes in academic practices of acknowledgement and reward.

## Epistemic inclusion and the global turn

Although the challenge of epistemic inclusion is inherent in the concept of RRI, zooming in becomes even more pressing as RRI is currently entering the global arena. Here we

may build on experiences in EC-funded projects, seeing such projects as RRI 'laboratories'. One example is a recently completed EC-funded project named RRING (*Responsible Research and Innovation Networked Globally*) which aimed to extrapolate the RRI approach to a global level, but we may also benefit from experiences in a range of other RRI projects. Our assessment therefore starts with a reflection 'from within'. As indicated, the co-authors of this paper are and have been involved a range of EU funded RRI projects (NewHoRRIzon, RIconfigure, RRING, GRRIP, RRI Practice, NERRI, Joinus4Health, etc.), and contributed to the academic discourse that shaped it conceptuality from the outset. These participatory experiences serve as point of departure.

The RRING project aimed to develop RRI globally via mutual learning and comparative research.[1] The overall project aim was to bring RRI into the linked-up global world through mutual learning. An important objective was to assess the global state of the art of responsible research and innovation in five global regions, as defined by the United Nations and UNESCO.[2] Starting point was the conviction that, as these regions are facing comparable grand challenges, they will be moving in similar directions (Doezema et al. 2019). Important key aspects of RRI (ethics, science education, gender equality and diversity, open access and public engagement) are issues of concern across the globe (Zwart et al. 2021). At the same time, as RRI originated in Europe and has mostly resonated within Europe and North America (Ludwig and Macnaghten 2020; Macnaghten et al. 2014; Van der Molen et al. 2019), some of the premises assumed by RRI frameworks (e.g. democratic processes of legitimization and market economies) may not be present in all world regions, at least not in similar ways (Blok and Inigo 2020; Macnaghten et al. 2014; Owen, Macnaghten, and Stilgoe 2012). Therefore, although the process of moving towards more inclusive and responsible forms of research may not be a typically European aim, these developments take place in various contexts under different socio-economic, cultural and political circumstances, and may not evolve everywhere at the same pace or in the same manner. Therefore, heterogeneity and non-simultaneity rather than convergence may be the rule (Zwart 2020a). And this again emphasises that epistemic inclusion must open up to alternative options and perspectives.

Building on these experiences, we may distinguish three steps or moments in the recent history of RRI as an evolving concept. Initially, the focus was on changing the ways in which research was being conducted and research-based innovation was being designed, eventually resulting in the AIRR concept, indicating *anticipation*, *inclusion*, *reflexivity* and *responsiveness* as key components of the *process* dimension of RRI (Stilgoe, Owen, and Macnaghten 2013). The AIRR framework exemplified how RRI, after having been initiated in the context of European research policy ('top-down'), was adopted and further developed by the academic SSH community ('bottom-up').

The second step identified *particular pillars* of RRI, notably in the form of the five RRI keys (gender, ethics, open science, public engagement and science education), to which *governance* as a sixth key is sometimes added (Zwart et al. 2021). Via these keys, European funding policy actors aspired to *re-appropriate* the RRI concept as it were. Thus, while the AIRR concept (focussing on process) conveyed the perspective of participating academic scholars, the keys approach aimed to reaffirm a more top-down research governance perspective. This dialectical interaction between top-down governance

**Table 1.** three moments in the development of RRI.

- First moment (conceptual): developing the concept and ambitions of RRI, resulting in the AIRR concept (anticipation, inclusion, reflexivity, and responsiveness) as process dimensions.
- Second moment (pragmatical): defining the keys (or 'pillars') of RRI (gender, ethics, open science, public engagement and science education, governance), while developing *concrete* tools and indicators for practicing, implementing, monitoring, and evaluating RRI.
- Third moment (global): addressing the *global relevance* of RRI via mutual learning.

initiatives and bottom-up scholarly responses has been an important dimension of the dynamics of RRI from the very outset (Zwart and Landeweerd 2014). The second step also entailed a focuss on the development of *concrete tools* for practicing, implementing, monitoring, and evaluating RRI (RRI Practice project, RRI Tools project, MORRI project, Super MORRI project, etc.). Therefore, the second step can be considered as the pragmatic or *implementation turn* in RRI discourse.

In this paper we argue that, building on these previous developments, RRI is currently entering a third moment, namely: to assess and foster the *global* relevance of RRI. Since the challenges we are facing are global challenges, the question inevitably emerges whether the RRI ambition can be meaningful as a guiding concept on a global scale as well, not as an 'export product' (Levitt and Zwart 2009), as we already argued, but via mutual learning and comparative reflection. Whereas many contributors take a micro perspective (implementation, evaluation and management of RRI in particular contexts), which is legitimate and relevant in itself, we want to focus on the macro perspective, contributing to an agenda for future RRI research (Table 1).

Although much of the RRI vocabulary is unknown beyond the arena of European research funding programmes, one of the findings of the RRING project was that key elements of RRI are recognisable and relevant in other global regions as well (Zwart et al. 2021), although in particular regions RRI may be driven by different motivations and structures than in others (Wakunuma et al. 2021). Yet, the RRING experience and similar experiences in other projects (e.g. Joinus4health) also identified epistemic inclusion as a key challenge, i.e. the question how to include and incorporate multiple forms of knowledge whose contexts of discovery and justification may widely differ. In efforts to address emerging global challenges, the substantial knowledge deficits of standardised ways of knowledge production call for a willingness to reach out to other knowledge forms, both inside and outside academia.

The fluidity and adaptability of the RRI concept could be seen both as a weakness and as a strength. While it could 'hinder a proper understanding by those who are supposed to use it' (Novitzky et al. 2020, 41), there is also the threat that the label can be appropriated by various practices which may actually prove incompatible with RRI's core objectives. Building on previous self-assessments (Blok and Lemmens 2015; Zwart and Landeweerd 2014), some basic commitments have to be made to achieve genuine inclusiveness. One potential risk is that RRI gives rise to a self-serving community of RRI 'experts', implementing RRI in a top-down fashion. To forego this, endorsing epistemic pluralism and mutual learning are crucial, seeing RRI as a global learning endeavour. This goes far beyond the traditional goal of serving society by conducting research, because genuine participation, engagement and inclusion of extra-academic voices and perspectives will often be 'interruptive' (Blok 2019), revealing antagonism rather than alignment concerning societal challenges and their solution.

In the upcoming sections, we will discuss a number of pathways for fostering epistemic inclusion. In addition, we contend that these pathways can only be successful if supported by concomitant changes in the way research is assessed and rewarded, so that epistemic inclusion is fostered from within by acknowledgement of the importance of the efforts required (an importance insight from RRI Practice, Joiuns4health and other projects). All these aspects are interrelated (Forsberg et al. 2018). Building on interdisciplinarity (e.g. intra-academic inclusion and collaboration) while involving extra-academic partners in the research process, we not only encounter the challenge of extra-academic forms of knowledge, but we will also become aware of the internal organisational recoil of such a process in the sense that, in order to make it work, we must reconsider our assessment mechanisms of academic roles and careers (which used to be oriented towards publish or perish). In other words, genuine RRI requires a change from RRI as an expert field (consisting of publishing and / or perishing RRI experts) to RRI as an inclusive and collaborative learning community.

## Interdisciplinarity and beyond

Many contributors to RRI discourse have argued that addressing emerging global challenges requires fostering interdisciplinarity among research fields, notably collaboration between technoscience on the one hand and the social sciences and humanities (SSH) on the other. As enriching as the process may be, interdisciplinarity is not a goal in itself. Starting point is the awareness that existing knowledge practices are experiencing knowledge gaps when it comes to addressing global challenges, which necessitate a broadening of the scope through methodological pluralism. Rather than striving for absolute knowledge, this entails a process of mutual learning concerning the value of knowledge practices which tend to be ignored. When confronted with the epistemic finitude of standardised knowledge perspectives, epistemic otherness may reveal the questionability of implicit biases inherent in knowledge practices. And rather than privileging particular research fields at the expense of others, this entails recognising the importance of multiple knowledge systems and diversity in research. Think of the COVID–19 crisis, for instance, which is not only about vaccines and viral research, but also about culture, behaviour, values, power inequalities, global infrastructures, governance, sustainability, environmental concerns, and many other important dimensions of preparedness (Zwart 2020a, 2020b). Moreover, interdisciplinarity by itself does not suffice to promote knowledge co-production. Rather than merely combining disciplinary approaches, adopting a comprehensive (holistic) framework means reaching out to extra-academic knowledge sites and knowledge forms as well. Many research performing organisations still tend to be organised in disciplinary silos, where each discipline analyses a restricted slice of reality through a hyper-specialised perspective, and this may hamper collaboration with perspectives from other disciplines on the level of intensity that is required. Fostering interdisciplinarity means dismounting the (literal and figurative) barriers between these silos by organising research according to integrative, impact-driven frameworks that focus on addressing societal challenges rather than using different and segregated perspectives. Urgent societal challenges may catalyse this process. This entails a shift from interdisciplinary (intra-academic collaboration) to transdisciplinary approaches (reaching out to extra-academic knowledge resources).

Rather than adding the extra-academic perspectives to our toolbox, this learning process will reveal tensions and contradictions on the level of worldviews, value-systems and practices of validation. Trans-disciplinarity requires a radicalisation of the knowledge production process, via integrative dialogue, learning and collaboration not only between academic disciplines but also beyond academia, with a plurality of knowledge systems. This implies broadening the scope, reaching out to society to address challenges of current research approaches and to offer opportunities to unlock the potential of public intelligence and social knowledge (Stengers 2013). In other words, we are already moving beyond interdisciplinarity towards more radical forms of epistemic inclusion.

Inclusiveness towards extra-academic knowledge entails a shift from existing to emerging, and from internal to external challenges, e.g. from interdisciplinarity to trans-disciplinarity, which requires a careful methodological consideration concerning the question how to interact with views and perspectives which seem incompatible with validated knowledge procedures. One way of opening-up to society is a cluster of existing (albeit evolving) approaches known as citizen science, involving strengths and challenges as well, and building on a long tradition of exchange.

## From citizen science to participatory research

The term 'scientist' was coined in the early nineteenth century by William Whewell (1794–1866), who wanted to demarcate empirical research in the natural sciences from other forms of knowledge (Ross 1962). The epithet 'scientist' pertained exclusively to what he referred to as 'inductive science', setting it apart from other knowledge practices (e.g. social sciences and the humanities, but also practical and experiential knowledge), precisely the divide which transdisciplinary research nowadays aims to supersede. At the same time, Whewell was well aware that the work of the 'scientist' needed a supplement in the form of 'citizen science', allowing scientific experts to involve large numbers of volunteers for collecting measurements, in research areas such as meteorology, ornithology and tidal research. Whewell was practically involved in organising this, launching the first citizen science project in history by mobilising hundreds of volunteers internationally to study ocean tides. In the classical approach, citizen scientists are considered as an auxiliary work-force, whose standardised methodologies and assignments are determined (or even dictated) by scientific experts ('top-down') and whose results are incorporated in academic output.

This inherent challenge becomes even more pertinent now that societies are evolving into living laboratories (Tercanli and Jongbloed 2022). All the world is becoming a laboratory as it were, and all citizens are becoming research subjects, supporting global knowledge networks in measuring and tracking 'everything', however trivial or irrelevant it may seem. Participatory research is in vogue and currently emerging under various closely related labels. Yet, this ambition to open up (turning the world into a global living laboratory) will not result in more inclusive research practices by definition and may even have the opposite effect. Instead of making research truly participatory and inclusive, it may also mean extrapolating power relationships (between researchers and research subjects, whose daily behaviour and existence is now captured in algorithms) to the outside world. Rather than empowerment, it may result in large–scale

mobilisation and recruitment of citizens as data providers. As will be argued in more detail below, mobilising citizens to share data may result in 'data colonialism' if it does not involve genuine participation, for instance through co–constructive agenda setting of research (Sadowski 2019; Vegter, Landeweerd, and Zwart 2022). In other words, for participatory research to be truly inclusive, a fundamental reflection on epistemic power and epistemic justice is required.

Thus, a shared experience of European projects is that participatory research is both a pathway for change and a challenge. Often, participation remains marginal. To the extent that it becomes more genuine and intense, the dynamics of inclusion and exclusion, defining which views and perspectives are given the floor and which are not (e.g. conspiracy theories), becomes an exacting concern (Blok 2019). Moreover, wicked challenges do not allow for unifying solutions, but rather affect various stakeholders in incompatible ways.

In short, whereas the neologism 'scientist' was introduced to exclude not only lay knowledge, but also humanities ('Geisteswissenschaften') from the arena of scientific research, there has always been an awareness that a complementary approach was needed to make science work, especially when facing complex issues (from understanding ocean dynamics to human health).

Currently, however, we notice the need for a more radical approach. A basic difference between citizen science as it was initially envisioned and emerging practices of participatory research is that, traditionally, scientists were still evidently in charge, while citizens provided input in accordance with standardised formats. In order to address the global challenges we are facing, we must opt for a more radical form of inclusiveness, where participants are not only invited to share their data, but also their questions, criticism, suggestions and concerns. Technoscientific laboratories must be complemented by arenas for deliberation where citizens identify and address ethical questions regarding (medical) technology from the perspective of citizens and patients rather than medical or ethical experts, thereby producing complementary instances of knowledge.[3] We are not only interested in social science data from questionnaires etc. (third person perspective), but first and foremost aim to involve experiential knowledge from a first-person perspective, more akin to the perspective of the humanities, where multiple perspectives are given the floor including first–hand experience. Spaces must be created to allow for knowledge-making to be initiated, involving participants from outside academia and traditional research performing organisations on an equal footing, where science can offer methodological frameworks to initiate the process, but scientific knowledge is not necessarily the starting point.

Instead of seeing citizens (or societal actors more broadly) as an ancillary workforce mobilised on behalf of science (as in Whewell's case), citizen scientists are now seen as uniquely positioned to study and experience societal challenges and transitions *from within*. Whereas traditional citizen science reinforces the idea of scientists studying society from an external (objectifying) position, thereby putting science and society at a distance from each other, epistemic inclusion implies the endorsement of proximity and immanence, analysing and assessing these transitions from a position of engagement (science *in* society), thereby superseding the internal / external divide. A one-directional orientation (from academia to society) gives way to a participatory mutual learning process.

To open up to society presupposes the awareness that there are other relevant sources of experience and insight and other knowledge practices besides academic ones. We must endorse epistemic pluralism, not in the sense that anything goes or that there is no value in expertise, but in the sense that multiple practices may result in valuable insights challenging and enriching one another, so that processes of mutual learning may take research towards a more comprehensive level, able to meaningfully address the global challenges we are facing, involving citizens in the process of research and innovation from the very start and on a global scale. Entering the global arena implies that basic presuppositions of academic research may become questionable, i.e. the focus of neo-liberalism on egocentric individuals striving to maximize their benefits, moving towards community-oriented and value-based approaches which emphasise the mutual dependence of individuals, on each other and on the quality of their collective ecosystem.

## Epistemic pluralism and epistemic inclusion

RRI evolved in the context of the 'Science with and for society (SWAFS)' programme, the title of the H2020 RRI programme by which the RRING and Joinus4health projects (among others) are funded.[4] The SWAFS acronym outlines the two basic dimensions of RRI. On the one hand, RRI means science *for* society ('product-oriented RRI', focussed on strengthening social desirability of research outcomes). On the other hand, RRI means science *with* society' ('process-oriented RRI', focussed on strengthening inclusiveness of research). And the latter entails both *social* inclusion (e.g. public participation, involving societal actors in the process of agenda setting) and *epistemic* inclusion (i.e. involving various forms of knowledge), especially knowledge 'out there', practical, everyday knowledge, outside academic quarters (Koch 2020; Valkenburg et al. 2020). An important challenge of epistemic inclusion is how to reconcile various forms of (academic and non-academic) knowledge and experience? Starting point of epistemic inclusiveness is the concept of ubiquitous expertise (Collins 2014; Zwart and Brenninkmeijer 2017). Rather than disavowing the importance of scientific expertise, the concept of ubiquitous knowledge claims that, also for scientific experts, mutual learning is a more enriching experience than mere communication ('popularisation') or implementation ('valorisation') of research, whilst social participants learn more from active dialogue compared to more passive forms of public involvement. Mutual learning means that multiple forms of relevant expertise are taken into account and given the floor. The focus is not only on the expertise of experts, but even more so on our knowledge gaps: on the uncertainties, controversies, unknowns and blind spots involved in transformative innovation. Mutual learning does not presuppose that other types of knowledge need to be validated using scientific knowledge as a standard, but rather that by comparing and contrasting knowns and unknowns in different knowledge systems, we can produce a more robust picture of the realities these knowledge systems attempt to describe (Tengö et al. 2014). Therefore, the engagement with other voices and perspectives is not primarily aimed at 'consensus', at defining a common ground, but rather at using the stances and perspectives of others to discern our own blind spots and questionable preconceptions (Blok 2019).

RRI concerns wicked problems revealing our epistemic insufficiency (the incompleteness of our knowledge claims). In the case of radical innovations like synthetic biology or

digital technologies, we just do not and cannot know the future impacts involved (Blok and Lemmens 2015; Zwart 2023). A fruitful engagement with indigenous knowledges might be expected, precisely because indigenous knowledges tend to embrace an embodied and relational approach. As indicated, there are two core dimensions to RRI, namely 'science *for* society' ('product-oriented RRI', i.e. social desirability) and 'science *with* society' ('product-oriented RRI', i.e. inclusiveness), while the latter is not only about *social* inclusion (public participation, involving societal actors in the process of agenda setting) but also about 'epistemic inclusion' (involving various forms of knowledge, especially knowledge 'out there', outside academic quarters). Moreover, whereas *responsibility* primarily entails a social relation (contributing to the common good, etc.: the social dimension), the term *responsiveness* rather refers to openness and sensitivity to different or even contrasting views (the epistemic dimension). And whereas in the past innovation progressed at the expense of other knowledge forms, and even resulted in 'epistemicide', i.e. the active liquidation and elimination of other (e.g. traditional and indigenous) knowledge systems (Hall and Tandon 2017), time has come to counteract this trend through participatory research, knowledge democracy and mutual learning. This does not mean raising suspicion concerning the validity and importance of technoscientific expertise, but rather involving expert knowledge in a public agora of dialogue and interaction, recognising the importance, validity and added value of other types of knowledge as well. Mutual learning aims to bring together various groups of stakeholders (researchers, potential users, intermediaries, professionals, students, media, broader publics) to facilitate an interactive learning process through mutual exposure of views and experiences, expectations and concerns (Zwart et al. 2017). In terms of knowledge production, it aims to supersede the divide between researcher and research subject or respondent. And in terms of communication, in contrast to more traditional forms of deliberation (such as lectures, panel discussions or question-and-answer sessions before a relatively large audience), innovative methods are developed to encourage in-depth dialogues, taking us beyond traditional 'experts vs. lay audience' forms of exchange, thereby allowing participants to mutually probe and question each other's views. We are all experts to some extent (Collins 2014). In other words, in society as a living laboratory, expertise has become ubiquitous. Besides a wealth of insights and knowledge, there are many knowledge deficits as well, notably in the sense that the future is open and indeterminate and it is difficult to predict how technologies will evolve and how the life-world will be affected.

Knowledge is finite, fallible and incomplete, and all academics have their blind spots, as was paradigmatically demonstrated by the restricted perspective of scientists involved in GM technologies, insufficiently attuned to public values and concerns, resulting in an entrenchment of public debates. As indicated, the engagement with other voices and stakeholder perspectives is not primarily aimed at 'consensus', at defining a common ground, but rather: using the stances and perspectives of others to discern our own blind spots and questionable preconceptions. Many of the views and perspective we encounter, especially on a global scale, will prove difficult to incorporate into an overarching view, but at this stage of the dialectical process that is not the goal. Rather, the goal is to assess the strengths and weaknesses of our positions via exposure to other possible interpretations of the situation (Zwart 1993; 2001).

It is here that interdisciplinarity (collaboration across academic disciplines) passes over into trans-disciplinarity, where novel challenges are encountered, for it means superseding a dichotomy which goes back to Plato (Zwart 2022), namely the segregation of validated knowledge (ἐπιστήμη) from opinion (δόξα). It means taking public views and practical experiences seriously, engaging with them, even when, or especially when, they seem at odds with prominent consensus views of established discourse. Academics now must engage with convictions previously deemed and discarded as 'irrational', e.g. conspiracy theories. Rather than ignoring or deriding them, we must negate this negation by envisioning their moment of truth, e.g. the existence of influential global networks of power and knowledge exempted from democratic decision-making. Not in the sense that anything goes, but in the sense that we have to learn to determine which of these challenging knowledge claims allow us to recognise our biases and blind spots, which of these instances of negativity and recoil allow us to supersede the traditional epistemic divide without jeopardising the integrity of the process, – for instance when the process becomes paralysed by forms of polarisation that are pushed to the extreme, so that dialogues and interactions become trapped in negativity.

In terms of method, this involves a mutual learning process rather than the development of rigid protocols. Although terms like 'method' and 'methodology' are often identified with rigid research protocols, notably of the experimental type, the literal (etymological) meaning of 'method' rather suggests that it is something that is developed *along the way* (μετ'+ὁδός in Greek, where ὁδός means 'road'). From an etymological viewpoint, method means openness, a willingness to reconsider the path we have explored (Zwart 2022). In the next section, the challenges of epistemic inclusion will be explored more in depth with the help of a case study that is especially relevant in the context of the aim to turn RRI into a concept of global relevance, namely the need to incorporate indigenous knowledges in responsible, responsive and value-driven research.

## From epistemic pluralism to epistemic justice: the case of indigenous knowledge

Efforts towards inclusion within RRI methodologies may reproduce epistemic injustices by centring on western scientific epistemologies (Valkenburg et al. 2020). Epistemic injustice occurs for instance when the credibility or trustworthiness of participants are questioned (Fricker 2007). Inclusion aims to mitigate epistemic injustice, but this remains a challenge when academic institutions for knowledge production initiate the process from a centre-stage position. When scientific knowledge is taken as point of departure, and universities and research institutes are positioned as coordinating institutions, alternative epistemologies have to validate their knowledge through comparison with scientific ways of knowledge production. As a rule, non-Western onto-epistemologies are not offered the same level of credibility as actors that prioritise academic scientific knowledge. Boaventura de Sousa Santos (2018) even argues that there is an epistemic abyss between two epistemic realities: metropolitan knowledge (which roughly equals Western scientific knowledge in the era of globalisation) and knowledge practices emerging in the Global South. This abyss, going back to colonialism, prevents European science to learn from a plurality of knowledge practices, he argues. At the same time,

efforts to initiate interactions between multiple knowledge forms may undermine rather than acknowledge the credibility of alternative knowledge practices (Tuck and Yang 2014), or use them to serve the interest of dominant knowers (Posholi 2020). 'Pernicious inclusion' can be performed in a way that inclusivity is reduced to a mere box-ticking exercise, or in worst case scenarios to tokenism and oppression, placing a burden on marginalised knowers (Cooke and Kothari 2001).

An important objective of modern science has been to disentangle scientific evidence from collaborative knowledge practices, often closely entangled with comprehensive worldviews and to segregate knowledge from the traditional socio-cultural matrices from which these knowledge practices initially emerged. Although we already notice this in the work of Plato, for instance where a particular knowledge practice.

(ἐπιστήμη) is distinguished from mere opinion (δόξα), this distinction became radicalised in modern science (Zwart 2022). As French philosopher of science Gaston Bachelard argued in multiple studies, modern science requires a 'conversion' from its practitioners, a radical change of mind-set, notably brought about by exposure to laboratory research and its rigid methodologies (Bachelard 1938; Zwart 2020). Traditional knowledge resources became disqualified as ideology, superstition, mythology, witchcraft, astrology, folk knowledge, etc., in short: as practices which constituted an *epistemological obstacle* to scientific progress and Enlightenment. From the perspective of science and Enlightenment, the realm of traditional and practical knowledge suffered from biases and knowledge deficits. Therefore, including different types of knowledge is not enough to address these epistemic injustices per se. In the history of knowledge production by universities, epistemicide is the basic tendency rather than the exception (Hall and Tandon 2017) and therefore achieving epistemic justice through inclusion without questioning and reimagining the system itself is not possible. The ambition to open up science by turning the world into a global living laboratory will not result in more inclusive research practices by definition and may even have the opposite effect. Instead of making research truly participatory and inclusive, it may also mean extrapolating power relationships (between researchers and research subjects, whose daily behaviour and existence is now captured in algorithms) to the outside world. Rather than empowerment, it may result in large–scale mobilisation and recruitment of citizens as data providers. As argued above, mobilising citizens to share data may result in 'data colonialism' if it does not involve genuine participation, for instance through co–constructive agenda setting of research (Sadowski 2019; Vegter, Landeweerd, and Zwart 2022). For participatory research to be truly inclusive, the epistemic divide between academic and 'other' knowledge practices must be effectively addressed and superseded rather than reinforced.

As argued, RRI's aim to strengthen its global relevance requires an inclusive reconsideration of the relationship of academic expertise towards other forms of knowledge, and this notably applies to indigenous knowledges. More specifically: how to decolonialise the attitude of academic expert knowledge towards indigenous knowledges? This becomes especially relevant in an era of environmental crisis and loss of biodiversity (rapid extinction). Indigenous people manage 28% of the world's land surface and are the *de facto* guardians of 80% of global biodiversity (IFAD 2016; Yap and Watene 2019). Therefore, debates about the inclusion of indigenous knowledges tend to focus on its contribution to the sustainable management of natural eco-systems (Ludwig and Macnaghten 2020, 26). As farmers, fishers, pastoralists and forest-dwellers, indigenous peoples apply traditional

methods of land management and food production which have evolved over centuries and thus have demonstrated their sustainability and resilience, although the pace of climate change, destruction of vulnerable ecosystems, loss of biodiversity and erosion of epistemic resources of traditional communities threaten their ability to adapt to these disruptive developments (Ludwig and Macnaghten 2020, 27). Besides human rights and socio–economic equality issues, epistemic justice is an important dimension. Indigenous peoples are curators of epistemic resources. Increasingly, the global community is becoming aware, not only of the detrimental impact of globalisation on indigenous culture, but also of the unique value represented by indigenous knowledge, as an intellectual and moral resource for addressing environmental and socio-political crises.

This call for a critical reconsideration of the relationship between scientific expertise and indigenous knowledges emerges against the backdrop of a broad range of efforts by feminist and post–colonialist scholars to question the dominance of allegedly value–free Western knowledge, notably by revealing the intimate entanglement of modern science with the rise of Western colonialism and imperialism (Harding 1998). Thus, epistemic inclusion means superseding the binary logic entailed in the concept of 'scientist' as coined by Whewell in the nineteenth century, during the heydays of colonialism. If science is knowledge systematically gained by observing the world around us, Krystal Tsosie and Katrina Claw (2019) convincingly argue, indigenous people have always been scientists, while their ways of knowing tend to be embodied, practical, experiential and relational. And rather than seeing scientific and indigenous knowledge and antithetical, both sides may gain from developing a more comprehensive view. Science can gain by adopting an ethos of stewardship while indigenous knowledges can gain by replacing marginalisation by empowerment.

Currently, we are noticing a reset. First of all, knowledge producers (e.g. researchers and research performing organisations) are experiencing systemic knowledge gaps especially when addressing wicked global problems such as dramatic loss of biodiversity and ecological disruption. Although technoscientific knowledge is remarkably sophisticated and precise, we become increasingly aware of inherent biases and blind spots as well. In order to address wicked global challenges, we have to radically broaden our epistemological scope and methodological repertoire. And this includes the ability to address antagonism and genuine divergence. By superseding the traditional epistemic divide in an era of polarisation, knowledge may become more comprehensive and inclusive. This inevitably entails a rehabilitation of indigenous knowledges. Last but not least, indigenous peoples themselves are becoming more vocal in recognising the value of their knowledge and emphasising their epistemic rights. Therefore, the conviction is spreading, also within RPOs, that we must indigenize and / or decolonize our knowledge production systems. In psychology, to take just one example, Joseph Henrich and colleagues have argued (Henrich, Heine, and Norenzayan 2010) that 96% of the research subjects participating in psychological research samples are 'Western, educated, industrialized, rich and democratic', i.e. WEIRD, and very often psychology students. Therefore, experimental psychology only reflects 12% of the world's population. Unfortunately, despite these narrow and non-inclusive samples, behavioural scientists often draw inferences about human behaviour in general. Even worse, there seems to be a considerable lack of interest in assessing how well results from WEIRD samples can be extrapolated to the global population. Yet, it is clear that, in psychology and other social sciences,

decolonisation will have an significant impact on education, research, governance, nursing and counselling (Hall and Tandon 2017).

Thus, we notice a growing aspiration to move from exclusion towards inclusion, also concerning indigenous knowledges, but the question of course is how to engage real diversity. As David Ludwig and Phil Macnaghten convincingly argued (2020, p. 34), an abstract commitment to inclusion is not sufficient. Instead, meaningful inclusion requires practices of genuine responsiveness. Established frameworks of responsible innovation, and in particular the AIRR framework, should be extended to incorporate a focus on social justice. RRI began as a euro-centric notion. Innovation is often considered a Western value, closely connected with individualism, entrepreneurship and competition. The AIRR framework focussed on process dimensions such as participation and anticipation, but remained silent on normative challenges and ethics. And yet, ethical issues are evidently involved, raising questions such as: what is wrong with stability, or with more collective and communitarian forms of innovation? These questions inevitably emerge when we aim to foster RRI on a global level via mutual learning. It is against this backdrop that a focus on indigenous epistemic rights becomes an urgent task. Epistemic pluralism not only entails a willingness to respect indigenous knowledge systems instead of eliminating them, but also the awareness that we *need* epistemic inclusion to address current knowledge deficits and make research and innovation more sustainable.

## Conclusion

To realise and live up to its aspirations, RRI requires a drastic innovation of the ways in which research is being conducted. This transitional process is already on-going, engendered by the challenges which many research performing organisations (RPOs) face in their efforts to combine academic quality with impact-driven approaches. In the early twenty-first century, science is experiencing radical changes, and the RRI concept articulates and contributes to this. In order to meet urgent and complex societal challenges of today, research must become participatory and inclusive. We consider epistemic inclusion as the key challenge to realise this goal. Validated research practices experience significant knowledge deficits concerning the way scientific and technological innovation affect societies, especially on a global scale, and to address these, RPOs must reach out to other knowledge forms, e.g. practical, experiential and indigenous knowledge, superseding the divide which goes back to Plato but was reaffirmed in the nineteenth century when the neologism 'scientist' was introduced. Epistemic inclusion requires a process of mutual learning and dialogue. Besides incorporating complementary knowledge forms into a more comprehensive view, the exposure to alterity also triggers awareness of the blind spots and questionable presuppositions of established knowledge producing practices. To contribute to a more sustainable future, research must become collaborative, value-driven and impact-driven, rather than a self-serving, ego-centric and competitive enterprise. In terms of the concrete internal and external challenges discussed in this paper, interdisciplinarity (although valuable in itself) is part of a broader transition towards trans-disciplinarity, reaching out to extra-academic styles of thinking about and interacting with society *from within*, i.e. from a position of societal immanence. And whereas citizen science offers a starting point, we must move away from traditional

formats, where citizens were often seen as an auxiliary work-force, instructed by academics in a top-down manner, towards participatory research in the genuine sense, where academics and non-academics contribute to the knowledge process on an equal footing. Producing knowledge that is genuinely beneficial 'for' society requires that knowledge is produced 'with' society, so that epistemicide (discarding non-academic knowledge as deficient, as mere opinion, etc.) gives way to an understanding of how extra-academic knowledge forms have their own practices of validation and assessment. In the current era of ecological disruption, the incorporation of indigenous knowledges requires special attention, emphasising how knowledge should be part of a broader comprehensive, planetary view concerning the place, responsibility for and dependence of humans on planet earth as a global eco-systemic environment.

Last but not least, there is an internal dimension to RRI, which means that the demanding and time-consuming efforts to make research more participatory and responsive should be duly acknowledged and rewarded. Epistemic inclusion through mutual learning is not an easy objective to achieve. Various hurdles and barriers have been identified. Stakeholder engagement, actively involving societal partners as participants in the process, tends to be quite demanding. At the same time, much can be learned from past experience, for instance the wealth of experience in the context participatory action research (Freire 1970; Freire 1998; Orlowski 2019). One important hurdle is the lack of sufficient acknowledgement and reward for embracing RRI in a research culture which still tends to be based on competition and short-term contracts (Pain 2017). Today's academic research culture is not conducive to RRI, as competition, secrecy, temporary contracts and time pressure are unfavourable conditions for responsible research, while engaging in RRI is not sufficiently rewarded when research performance is assessed (Pain 2017; Stengers 2013). Thus, for RRI to work, internal (organisational) challenges must be addressed, affecting the way in which research is conducted and appraised, shifting the focus towards collaborative and impact-driven modes of working. RRI activities should not be seen as one-time events, but rather as directed at developing long-term relationships with societal environments. Also, transparent information about the objectives and challenges of RPOs is important. Finally, it must be clearly explained how the results of participatory activities will be used and integrated in the research process. It only works if there is a clear commitment to become more responsive and inclusive. Participatory activities that live up to their concept are not cosmetic, but arise from a genuine concern to strengthen the external validity and societal embedding of research.

## Notes

1. https://rring.eu
2. http://www.unesco.org/new/en/unesco/worldwide/regions-and-countries/
3. https://joinus4health.eu/about/for-researchers/
4. https://ec.europa.eu/research/swafs/index.cfm

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## References

Bachelard, Gaston. 1938. *La formation de l'esprit scientifique: contribution à une psychanalyse de la connaissance objective*. Paris: Vrin.

Blok, Vincent. 2019. "From Participation to Interruption: Toward an Ethics of Stakeholder Engagement, Participation and Partnership in Corporate Social Responsibility and Responsible Innovation." In *International Handbook on Responsible Innovation: A Global Resource*, edited by René Von Schomberg, and Jonathan Hankins Jonathan, 243–258. Cheltenham: Edward Elgar.

Blok, Vincent, and Edurne Inigo. 2020. *Recommendations for the development of a competitive advantage based on RRI*. RRING Deliverable D5.1.

Blok, Vincent, Pieter Lemmens, et al. 2015. "The Emerging Concept of Responsible Innovation. Three Reasons why it is Questionable and Calls for a Radical Transformation of the Concept of Innovation." In *Responsible Innovation 2: Concepts, Approaches and Applications*, edited by Bert-Jaap Koops, 19–35. New York: Springer.

Collins, Harry. 2014. *Are we all Scientific Experts now?* Cambridge: Polity Press.

Cooke, Bill, and Uma Kothari. 2001. *Participation: The new Tyranny?* London: Zed Books.

Doezema, Tess, David Ludwig, Phil Macnaghten, Claire Shelley-Egan, and Ellen Marie Forsberg. 2019. "Translation, Transduction, and Transformation: Expanding Practices of Responsibility Across Borders." *Journal of Responsible Innovation* 6 (3): 323–331. https://doi.org/10.1080/23299460.2019.1653155.

Forsberg, Ellen Marie, Claire Shelley-Egan, Miltos Ladikas, and Richard Owen. 2018. *Implementing Responsible Research and Innovation in Research Funding and Research Conducting Organisations—What Have We Learned so Far? Governance and Sustainability of Responsible Research and Innovation Processes*. London: Springer Briefs in Research and Innovation Governance.

Freire, Paulo. 1970. *Pedagogy of the Oppressed*. New York: Continuum.

Freire, Paulo. 1998. *Pedagogy of Freedom: Ethics, Democracy, and Civic Courage*. Oxford: Rowman and Littlefield.

Fricker, Miranda. 2007. *Epistemic Injustice*. Oxford: Oxford Academic. https://doi.org/10.1093/acprof:oso/9780198237907.001.0001

Hall, Budd, and Rajesh Tandon. 2017. "Decolonization of Knowledge, Epistemicide, Participatory Research and Higher Education." *Research for All* 1 (1): 6–19. DOI: 10.18546/RFA.01.1.02

Harding, Sandra. 1998. *Is Science Multicultural? Postcolonialisms, Feminisms and Epistemologies*. Bloomington: Indiana University Press.

Henrich, Joseph, Steven Heine, and Ara Norenzayan. 2010. "The Weirdest People in the World?" *Behavioral Brain Science* 33 (2–3): 61–83. https://doi.org/10.1017/S0140525X0999152X.

IFAD. 2016. Rural Development Report 2016: Spotlight 8." https://www.ifad.org/documents/30600024/30604601/Spotlight_8.pdf/dc7b754d-667d-4da9-8f00-c9a5049640fe.

Koch, Susanne. 2020. "Responsible Research, Inequality in Science and Epistemic Injustice: An Attempt to Open up Thinking About Inclusiveness in the Context of RI/RRI." *Journal of Responsible Innovation* 7 (3): 672–679. https://doi.org/10.1080/23299460.2020.1780094.

Levitt, Mairi, and Hub Zwart. 2009. "Bioethics: An Export Product? Reflections on Hands-On Involvement in Exploring the "External" Validity of International Bioethical Declarations." *Journal of Bioethical Inquiry* 6: 367–377. https://doi.org/10.1007/s11673-009-9168-z.

Ludwig, David, and Phil Macnaghten. 2020. "Traditional Ecological Knowledge in Innovation Governance: A Framework for Responsible and Just Innovation." *Journal of Responsible Innovation* 7 (1): 26–44. https://doi.org/10.1080/23299460.2019.1676686.

Macnaghten, P., R. Owen, J. Stilgoe, B. Wynne, A. Azevedo, A. de Campos, J. Chilvers, et al. 2014. "Responsible Innovation Across Borders: Tensions, Paradoxes and Possibilities." *Journal of Responsible Innovation* 1 (2): 191–199. https://doi.org/10.1080/23299460.2014.922249.

Novitzky, Peter, Michael Bernstein, Vincent Blok, Robert Braun, Tung Chan, Wout Lamers, Anne Loeber, Ingeborg Meijer, Ralf Lindner, and Erich Griessler. 2020. "Improve Alignment of Research Policy and Societal Values." *Science* 369 (6499): 39–41.

Orlowski, Paul. 2019. "Freirean Conceptions of Participatory Action Research and Teaching for Social Justice – Same Struggle, Different Fronts." *The Canadian Journal of Action Research* 20 (1): 30–51. https://doi.org/10.33524/cjar.v20i1.445.

Owen, Richard, Phil Macnaghten, and Jack Stilgoe. 2012. "Responsible Research and Innovation: From Science in Society to Science for Society, with Society." *Science and Public Policy* 39 (6): 751–760. https://doi.org/10.1093/scipol/scs093.

Owen, Richard, René von Schomberg, and Phil Macnaghten. 2021. "An Unfinished Journey? Reflections on a Decade of Responsible Research and Innovation." *Journal of Responsible Innovation* 8 (2): 217–233. https://doi.org/10.1080/23299460.2021.1948789.

Pain, Elisabeth. 2017. To be a responsible researcher, reach out and listen. *Science*.

Posholi, Lerato. 2020. "Epistemic Decolonization as Overcoming the Hermeneutical Injustice of Eurocentrism." *Philosophical Papers* 49 (2): 279–304. https://doi.org/10.1080/05568641.2020.1779604.

Ross, Sidney. 1962. "*Scientist*:The Story of a Word." *Annals of Science* 18 (2): 65–85. https://doi.org/10.1080/00033796200202722.

Sadowski, Jathan. 2019. "Manufacturing Process Data Analysis Pipelines: A Requirements Analysis and Survey." *Journal of Big Data* 6 (1): 1–12. https://doi.org/10.1186/s40537-018-0162-3.

Santos, Boaventure de Sousa. 2018. *The end of the Cognitive Empire: The Coming of age of Epistemologies of the South*. Durham: Duke University Press.

von Schomberg, René. 2011. "Prospects for Technology Assessment in a Framework of Responsible Research and Innovation." In *Technikfolgen abschätzen lehren. Bildungspotenziale transdisziplinärer Methoden*, edited by M. Dusseldorp and R. Beecroft, 39–61. Dordrecht: Springer.

Simis, M., and H. Madden. 2016. "The Lure of Rationality: Why Does the Deficit Model Persist in Science Communication?" *Public Understanding of Science* 25 (4): 400–414. https://doi.org/10.1177/0963662516629749.

Stengers, Isabelle. 2013. *Une Autre Science est Possible! Manifeste Pour un Ralentissement des Sciences*. Paris: La découverte.

Stilgoe, Jack, Richard Owen, and Phil Macnaghten. 2013. "Developing a Framework for Responsible Innovation." *Research Policy* 42 (9): 1568–1580. https://doi.org/10.1016/j.respol.2013.05.008.

Tengö, Maria, Eduardo Brondizio, Thomas Elmqvist, Pernilla Malmer, and Marja Spierenburg. 2014. "Connecting Diverse Knowledge Systems for Enhanced Ecosystem Governance: The Multiple Evidence Base Approach." *AMBIO* 43 (5): 579–591. https://doi.org/10.1007/s13280-014-0501-3.

Tercanli, Hacer, and Ben Jongbloed. 2022. "A Systematic Review of the Literature on Living Labs in Higher Education Institutions: Potentials and Constraints." *Sustainability* 14: 12234. https://doi.org/10.3390/su141912234.

Timmermans, Job, and Vincent Blok. 2021. "A Critical Hermeneutic Reflection on the Paradigm-Level Assumptions Underlying Responsible Innovation." *Synthese* 198 (19): 4635–4666. https://doi.org/10.1007/s11229-018-1839-z.

Tsosie, Krystal, and Katrina Claw. 2019. "Indigenizing Science and Reasserting Indigeneity in Research." *Human Biology* 91 (3): 137–140. https://doi.org/10.13110/humanbiology.91.3.02.

Tuck, Eve, and Wayne Yang. 2014. "R-words: Refusing Research." In *In: Humanizing Research: Decolonizing Qualitative Inquiry with Youth and Communities*, edited by Django Paris, and Maisha Winn, 223–248. London: Sage.

Valkenburg, Govert, Annapurna Mamidipudi, Pandey Poonam, and Wiebe Bijker. 2020. "Responsible Innovation as Empowering Ways of Knowing." *Journal of Responsible Innovation* 7 (1): 6–25. https://doi.org/10.1080/23299460.2019.1647087.

Van der Molen, Franke, David Ludwig, Luca Consoli, and Hub Zwart. 2019. "Global Challenges, Dutch Solutions? The Shape of Responsibility in Dutch Science and Technology Policies." *Journal of Responsible Innovation* 6 (3): 1–6. DOI: 10.1080/23299460.2019.1603569.

Vegter, Mira, Laurens Landeweerd, and Hub Zwart. 2022. "N = Many Me's: Self-Surveillance for Precision Public Health." *Biosocieties* 17: 78–98. https://doi.org/10.1057/s41292-020-00202-8.

Wakunuma, K., F. de Castro, T. Jiya, E. A. Inigo, V. Blok, and V. Bryce. 2021. "Reconceptualising Responsible Research and Innovation from a Global South Perspective." *Journal of Responsible Innovation* 8: 267–291.

Yap, Mandy Li-Ming, and Krushil Watene. 2019. "The Sustainable Development Goals (SDGs) and Indigenous Peoples: Another Missed Opportunity?" *Journal of Human Development and Capabilities* 20 (4): 451–467. https://doi.org/10.1080/19452829.2019.1574725.

Zwart, Hub. 1993. *Ethische Consensus in een Pluralistische Samenleving. De Gezondheidsethiek als Casus*. Amsterdam: Thesis Publishers.

Zwart, Hub. 2001. "Consensus Formation as a Basic Strategy in Ethics." In *Bioethics in a European Perspective*, edited by Henk Ten Have and Bert Gordijn, 281–288. Amsterdam: Kluwer Academic Press.

Zwart, Hub. 2020a. "Emerging Viral Threats and the Simultaneity of the non-Simultaneous: Zooming out in Times of Corona." *Medicine, Health Care and Philosophy* 23: 589–602. https://doi.org/10.1007/s11019-020-09970-3.

Zwart, Hub. 2020b. "Science and Suspicion." Maxim Gorky's Children of the Sun as a Critical Mirror in Times of COVID-19." *Law, Culture and the Humanities*. https://doi.org/10.1177/1743872120968053.

Zwart, Hub. 2022. *Continental Philosophy of Technoscience. Series: Philosophy of Engineering and Technology*. London: Springer.

Zwart, Hub. 2023. "The Bioethics of Synthetic Cells." *Nature Reviews Molecular Cell Biology* 25 (3): 157–158. https://doi.org/10.1038/s41580-023-00693-w.

Zwart, Hub, J. Brenninkmeijer, et al. 2017a. "Reflection as a Deliberative and Distributed Practice: Assessing Neuro-Enhancement Technologies via Mutual Learning Exercises (MLEs)." *Nanoethics* 11 (2): 127–138. https://doi.org/10.1007/s11569-017-0287-4.

Zwart, Hub, Jonna Brenninkmeijer, Peter Eduard, Lotte Krabbenborg, Sheena Laursen, Gema Revuelta, and Winnie Toonders. 2017b. "Reflection as a Deliberative and Distributed Practice: Assessing Neuro-Enhancement Technologies via Mutual Learning Exercises (MLEs)." *NanoEthics* 11 (2): 127–138. https://doi.org/10.1007/s11569-017-0287-4.

Zwart, Hub, and Laurens Landeweerd. 2014. "Adapt or Perish? Assessing the Recent Shift in the European Research Funding Arena from 'ELSA' to 'RRI'." *Life Sciences, Society and Policy* 10 (1): 11. https://doi.org/10.1186/s40504-014-0011-x.

Zwart, Hub, Xiaoyue Tan, Uduak Archibong, Cyril Eshareturi, Kingsley Utam, Chukwudi Paul Agu, Andrew Adams, Achim Rosemann, Kutoma Wakunuma, Aurelija Novelskaitė, Raminta Pučˇėtaitė, Eric Jensen, Lars Lorenz, Chris Foulds, Emmet Fox, Rihab Khalid, and Vincent Blok. (2021) "Report on RRI Best Practices and Learning Opportunities." https://rring.eu/wp-content/uploads/2021/07/D4.1.pdf