

Inclusion as a science, technology, and innovation policy objective in high-income countries: the decoupling dilemma

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This paper scrutinizes the objective of inclusion in contemporary science, technology, and innovation (STI) policies by analyzing its manifestations within the broad STI policy language promoting a closer interaction between science and society. We contribute to the STI policy literature by revisiting current conceptualizations that primarily center on marginalized groups. By analyzing the Broader Impacts Criterion and Responsible Research and Innovation frameworks in the USA and the European Union, we show that inclusion in the context of high-income countries is partially decoupling from marginalization and increasingly being instrumentalized to serve impact agendas. Our conceptual framework synthesizing the dimensions of goal setting and agency illustrates the broadening scope of inclusive policies and the emergent decoupling dilemma that has been neglected in the literature. Future research must account for the growing ambiguity of policy language that is facing new legitimacy questions and the blurring of objectives focused on supporting marginalized groups.

Keywords: science, technology and innovation policy; inclusion; societal impact; decoupling; responsible research and innovation; broader impacts criteria.

1. Introduction

Inclusion as a policy objective has been acquiring increasing significance in science, technology and innovation (STI) policy agendas globally, and its conceptual foundations have been explored from multiple perspectives, through both individual case studies and comprehensive syntheses (e.g. Chataway, Hanlin, and Kaplinsky 2014; Heeks, Foster, and Nugroho 2014; Schillo and Robinson 2017; Mortazavi et al. 2021). Despite the rather wide-ranging debates that have taken place in recent years, current conceptualizations of inclusion do not seem to match the discursive realities of contemporary policymaking in high-income countries such as the USA and European Union (EU) member states. In the literature on inclusive innovation, the starting point of theorizing has often been to position inclusion between innovation and development studies, in contrast to “mainstream innovation,” which is associated with increasing inequalities (e.g. Chataway, Hanlin, and Kaplinsky 2014; Heeks, Foster, and Nugroho 2014; Pansera and Owen 2018). This approach conceptualizes inclusive innovation as “the inclusion within some aspect of innovation of groups who are currently marginalized” (see Foster and Heeks 2013: 335) and often focuses on “processes of innovation that specifically encompass those on the lowest incomes” (Foster and Heeks 2013: 334). However, the discussion does not focus on the other, increasingly visible approach to inclusion—namely, the inclusion of basically any actor(s) within a group, process,

or structure in the broad STI domain (e.g. Burget, Bardone, and Pedaste 2017; Lieu et al. 2023) hence decoupling from marginalization.

We see this as an important conceptual and practical dilemma that deserves closer attention. Revisiting the current conceptual approaches is necessary to bridge the gap between the theory and practice of STI policymaking. We widen the discussion from the inclusive innovation studies strand, which is situated at and draws from the development studies interface, to the broader STI policy studies umbrella. This umbrella covers not only different geographical and institutional contexts but also reflects a shift away from “initial views postulating a linear relationship between scientific research, technological development, and eventually innovation” toward a more systemic and complex understanding of innovation that provides a new theoretical basis for STI policy studies (Molas-Gallart and Davies 2006: 65; Magro, Navarro, and Zabala-Iturriagoitia 2014; Schot and Steinmuller 2018). We broaden the perspective as we hypothesize contemporary STI policy framings encompassing the diversifying meanings of inclusion that, in turn, contribute to confusing policy language around the topic. Similar to STI policies, inclusive policies are increasingly horizontal and systemic by nature, highlighting the need for a comprehensive understanding of inclusion (cf. Chataway, Hanlin, and Kaplinsky 2014) and bridging of literature strands under the broad STI policy umbrella.

STI policies have been criticized for neglecting the views of marginalized groups and carrying the risk of growing inequalities (e.g. [Harsh et al. 2018](#); [Thapa, Iakovleva, and Foss 2019](#)). There is a growing interest in understanding the links between innovation and inclusion to address the challenges in sustainable development and inclusive forms of growth ([Heeks, Foster, and Nugroho 2017](#); [Lieu et al. 2023](#)). More attention must be given to implementing these policies in different contexts ([OECD 2015](#)) and recognizing the multiple meanings and interpretations characterizing the inclusive policy landscape in high-income countries, as “particular conceptualizations will have particular implications” ([Heeks, Foster, and Nugroho 2014](#): 178; see also [Pansera and Owen 2018](#): 31). As [Flink and Kaldewey \(2018](#): 15) emphasize, “concepts are powerful not necessarily due to their analytical accuracy, but rather due to their symbolic function in STI policymaking”. Owing to the increasing significance of inclusion internationally, accompanied by growing conceptual ambiguity related to goal setting and implementation, it is necessary to scrutinize its use and symbolic role in broader STI policy language in promoting a closer interaction between science and society.

Indeed, the need to revisit existing theorizing on inclusion is also pressing because of the existing impact agenda. By this, we refer to the broader shift in academia and the STI policy domain emphasizing the societal impact of STI and its evaluation (see e.g. [McCowan 2018](#); [Kidd, Chubb, and Forstner 2021](#)). The agenda underscores the broad inclusion of diverse—often as many as possible (European Commission (EC) and Directorate-General for Research and Innovation (DG RTD) 2014: 4)—actors in science and innovation and their agency in contributing to the process (e.g. [Sengupta 2016](#)). This reflects the broadening scope of actors in policies pursuing transformative change (e.g. [Schot and Steinmuller 2018](#)). The changing and broadening meanings of inclusion are very much at the heart of this transition, yet recent developments might come with trade-offs and challenges that have not been sufficiently discussed in scientific or policy debates. In fact, the discussions so far have been surprisingly uncritical given the magnitude of change and problems identified in inclusive frameworks dealing, for example, with unequal and incomplete processes and outcomes, problems in policy framing and implementation, and the lack of competencies on several fronts (e.g. [Fressoli et al. 2014](#); [Planes-Satorra and Paunov 2017](#); [Thapa, Iakovleva, and Foss 2019](#)). As collaboration, participation and inclusion play central roles in solving complex societal challenges, reflected increasingly in the STI funding schemes, the development of inclusive frameworks should be accompanied by critical scrutiny of their short- and long-term impacts both in academia and society.

Serving the need for STI to have an increased societal impact—reflecting the broader normative shift (i.e. what innovation should be used for) in innovation policy ([Schot and Steinmuller 2018](#))—different frameworks and evaluation tools have been created to promote and assess this impact that also relate to enhancing inclusion. In this paper, we focus on two of them to broaden the perspective on inclusion as an STI policy objective. In Europe, the Responsible Research and Innovation (RRI) framework has gained wider importance in recent years as part of the European Framework Programmes (see e.g. [Owen, Macnaghten, and Stilgoe 2012](#); [Burget, Bardone, and Pedaste 2017](#); [Owen, von Schomberg,](#)

[and Macnaghten 2021](#)). RRI contains multiple dimensions, and although there is no consensus on its exact definition, RRI can be understood as the collaborative, anticipatory, and ethical conduct of research and STI processes ([Burget, Bardone, and Pedaste 2017](#)). After 2014, the framework consisted of six key dimensions—public engagement, gender, ethics, science education, governance, and open access ([Owen, von Schomberg, and Macnaghten 2021](#))—and it was a cross-cutting principle of Horizon 2020. In the USA, the Broader Impacts Criterion (BIC) has become a standard policy tool for the National Science Foundation (NSF) to show lawmakers and the public that it is funding useful research ([Bozeman and Youtie 2017](#); [Woodson, Hoffmann, and Boutilier \(2021\)](#)). BIC is a criterion that NSF uses alongside the Intellectual Merit Criterion in reviewing the merit of proposals. While [NSF \(2024a\)](#) is intentionally not prescriptive about what broader impacts mean, projects are expected to contribute to achieving a wider societal impact in terms of societal benefit and “desired societal outcomes.”

However, the importance and value of BIC and RRI have been questioned, for example, for being vague, and there have been difficulties in translating the general principles into specific guidelines ([Davis and Laas 2014](#); [NABI 2018](#)). In 2022, to address some of the challenges, NSF established a new Directorate for Technology, Innovation and Partnerships (TIP) for the first time in over 30 years, emphasizing use-inspired and translational research and the broad inclusion of citizens in science and innovation ([NSF 2024b](#)). These issues are also emphasized in the ongoing Horizon Europe program ([EC and DG RTD 2021](#): 5) in the extensive stakeholder co-design approach of the key strategic dimensions and strategic plans, as well as “ensuring vibrant cooperation between universities, scientific communities and industry, including small and medium enterprises, and citizens and their representatives throughout the programme.”

1.1 Research objectives, materials, and methods

In this paper, our goal is to examine the hypothesis that inclusion has more dimensions than currently captured in the literature dealing with inclusion as an STI policy objective. We argue that the broader conceptualization emphasizing the inclusion of societal actors in various STI processes and activities, for example, through processes of co-creation, is salient in the current policy frameworks of high-income countries (e.g. [Lieu et al. 2023](#)). By drawing on institutional theory regarding decoupling (e.g. [Meyer and Rowan 1977](#)), applied, for instance, to the research and development project context in the STI policy domain ([Bertello et al. 2022](#); [Jabbouri, Schneckenberg, and Truong 2022](#)), we analyze selected policy frameworks in the USA and EU to shed light on the evolving landscape of inclusion.

Hence, our twofold objective is to study the conceptualization and operationalization of inclusion in contemporary STI policy research and practice. First, we ask how inclusion manifests as an STI policy objective in the broad STI policy literature, extending beyond the development studies interface. We answer this question by synthesizing the scattered STI policy literature in a conceptual framework reflecting the pluralizing meanings of inclusion in the broad STI policy domain. The framework builds on the theoretical notion of decoupling, which primarily manifests through the divergence between

policies focusing on marginalized communities and inclusive policymaking more generally, covering diverse societal actors. Schematic divisions between the goals of inclusive policies on a means-ends axis differentiating approaches framing inclusion as an end goal from approaches framing it as a means to other ends, and approaches to passive and active forms of agency differentiating, for instance, quota-based policies from policies emphasizing active agency in processes of knowledge co-production, provide analytical leverage for a nuanced analysis of inclusion.

Second, in the empirical section, we use the framework to illustrate the decoupling meanings of inclusion by exploring how inclusion manifests as an objective in selected policy documents primarily about the RRI and BIC frameworks. We also briefly touch on recent developments in the USA regarding NSF's new TIP directorate, as well as Horizon Europe in the EU for 2021–2027 as they bring forth interesting and partially converging aspects of the evolving STI policy landscapes on both continents. We answer the above question by analyzing the manifestations of decoupling in the data, which also come forth through the auxiliary lenses of goal setting and agency. By STI policy, we refer to broad national and supranational policy umbrellas promoting STI recently increasingly toward transformative change (e.g. [Schot and Steinmuller 2018](#)). In the individual frameworks, selected for empirical analysis, the emphases vary: whereas BIC focuses on research and its dissemination, RRI promotes fundamental changes in the processes of research and innovation ([Davis and Laas 2014](#))—a direction that is also now accentuated in TIP in the USA.

The empirical analysis was done by coding selected policy documents and relevant publications using the NVivo program according to their different manifestations of inclusion as well as goal setting and considerations of agency. The aim was not to quantify the existence of different orientations but to scrutinize the meanings of inclusive policies and instruments in this regard in the context of high-income countries. The focus was on conducting a qualitative analysis and understanding the differences and similarities in approaches to inclusion between the EU and the USA, which we illustrate and discuss in depth using selected examples. The document analysis was based on the principles of theory-driven qualitative content analysis (e.g. [Bengtsson 2016](#)). Document analysis, as a qualitative research method, can be seen containing traits of both content analysis and thematic analysis ([Bowen 2009](#)). The document analysis followed the steps identified by [Bowen \(2009\)](#): “skimming (superficial examination), reading (thorough examination), and interpretation.” Documents were first read superficially to determine their suitability for this study. They were then thoroughly examined and coded. Finally, interpretations could be made from the coded material.

The data consist of key policy and evaluation documents and publications related to the frameworks. The full list of analyzed documents is available in [Appendix 1](#). The documents were extracted from essential websites, such as the NSF homepage and document library, and the Publications Office of the EU. Document selection was based on the relevance to the topic of this study with an emphasis on gathering the same number of relevant publications about both BIC and RRI. In addition, the time frame was kept as equal as possible, even though BIC was deployed much earlier (1997) than the official introduction of RRI, which became a central

concept during the Horizon 2020 program launched in 2014 after gaining some visibility in the previous FP7 program. Some documents contained a disclosure statement indicating that they do not necessarily present the official views of these organizations, yet they were included if they described work related to these frameworks and were available through the host organizations.

2. Theoretical framework: Decoupling meanings of inclusion within the STI policy domain

Inclusion is a pivotal concept in contemporary STI policies promoting the societal impact of research and innovation (R&I). It has received quite extensive scrutiny from scholars in the STI policy field, especially in innovation studies (e.g. [Chataway, Hanlin, and Kaplinsky 2014](#); [Heeks, Foster, and Nugroho 2014](#); [Schillo and Robinson 2017](#); [Mortazavi et al. 2021](#)). Yet its use has not been subjected to a thorough analytical investigation regarding the changing roles of inclusion in the current systemic and complex STI policy domain (e.g. [Magro, Navarro, and Zabala-Iturriagoitia 2014](#)), especially in regard to the increasing emphasis on the societal impact of R&I that further accentuates the role of inclusion and participants' active agency in the impact agendas (e.g. [Lieu et al. 2023](#)).

Overall, the concept remains ambiguous and scattered in policy and research circles. This, we hypothesize, can be explained by the double meaning of inclusion. The [Oxford Dictionary of English, MOT \(2024\)](#) defines inclusion as either (1) “the action or state of including or of being included within a group or structure, or a person or thing that is included within a whole” or (2) “the practice or policy of providing equal access to opportunities and resources for people who might otherwise be excluded or marginalized, such as those who have physical or mental disabilities and members of other minority groups.” We argue that these two very different aspects of the definition are clearly present in science and innovation studies, policies, and practices, underlining the need to synthesize the scattered knowledge relating to these different approaches. On the one hand, inclusive policies are primarily associated with marginalized communities; on the other hand, they are increasingly referring to contexts that have very little to do with marginalization. This creates space for policy divergence, which we discuss at the end of this section through the theoretical lens of decoupling (e.g. [Bromley and Powell 2012](#); [Graafland and Smid 2019](#)).

Many well-known works on inclusive innovation have taken the perspective of marginalized communities as their starting point (e.g. [Foster and Heeks 2013](#); [Heeks, Foster, and Nugroho 2014](#)). Marginalized communities refer to those excluded from mainstream social, economic, educational, and/or cultural life, including (but not limited to) groups excluded due to race, religion, gender identity, sexual orientation, age, physical ability, language, and/or immigration status (e.g. [Baah, Teitelman, and Riegel 2019](#)). The main focus has been on the poor ([Heeks, Foster, and Nugroho 2014](#); [Pansera and Owen 2018](#)). In their paper on inclusive innovation, [Heeks et al. \(2013, 2014\)](#) present a “ladder of inclusive innovation,” identifying six levels of inclusion, with each one gradually deepening and/or broadening the perspective of the

previous step (Heeks, Foster, and Nugroho 2014: 177–178): “Level 1/Intention: an innovation is inclusive if the intention of that innovation is to address the needs or wants or problems of the excluded group; Level 2/Consumption: an innovation is inclusive if it is adopted and used by the excluded group; Level 3/Impact: an innovation is inclusive if it has a positive impact on the livelihoods of the excluded group; Level 4/Process: an innovation is inclusive if the excluded group is involved in the development of the innovation; Level 5/Structure: an innovation is inclusive if it is created within a structure that is itself inclusive; and Level 6/Post-Structure: an innovation is inclusive if it is created within a frame of knowledge and discourse that is itself inclusive.”

In the present paper, we build on these well-known conceptualizations and we focus next on two aspects—goal setting and agency—that are present in their diverse explicit and implicit manifestation in contemporary STI policy debates and agendas. At the end of the theoretical section, we synthesize these dimensions in a conceptual framework building on the notion of decoupling.

2.1 Goal setting: inclusion as an end goal in itself vs. a means to impact

In this section, we differentiate between approaches framing inclusion as an end goal in itself and approaches framing it as a means to other ends. For the purposes of our analysis, we are primarily interested in the different conceptualizations of inclusion and hence its framings as an STI policy goal on the means–ends axis. According to Heeks, Foster and Nugroho (2014: 177), the main contrast in the inclusive innovation debate “is between those who think exclusion can be addressed simply in terms of innovation outputs vs. those who think marginalized groups must be included in innovation processes.” In addition, Chataway, Hanlin, and Kaplinsky (2014) discuss the difference between product and process innovation in the context of the inclusive innovation agenda and highlight the need for a holistic understanding of the innovation cycle and its various components that must each be considered separately on a path to more inclusive innovation.

Aligning with the ladder of inclusive innovation (Heeks, Foster, and Nugroho 2014), Fressoli *et al.* (2014: 277; see also Schillo and Robinson 2017) note that inclusive innovation can advance inclusion either through process-, outcome-, or structure-based means, for example, by fostering participation in the design of technology (process), providing services for marginalized groups (outcome), or enabling broad and diverse participation in the shaping and priority-setting of STI policies and institutions (structure). In these discussions, the outcome-based view generally refers to targeting products or services to marginalized communities or covering certain minority groups as objects of policies, for instance, through quota-based approaches to inclusion (e.g. Hughes, Paxton, and Krook 2017). In our reading, these approaches represent policies framing inclusion as an end goal in itself rather than a means to other ends.

When considering the goals of the impact agenda, the process-based view has recently been accentuated as societal impact has been increasingly conceptualized in relation to interaction, referring to the alignment of interests and mutually beneficial learning processes between researchers and stakeholders for the benefit of societal development (e.g.

Kalliomäki, Ruoppila, and Airaksinen 2021). With an emphasis on interactions with various stakeholders, concepts such as impact pathways (e.g. Muhonen, Benneworth, and Olmos-Peñuela 2020) have been introduced recently to direct attention to the process-based view of impact creation instead of a linear view emphasizing impact as a policy outcome. This understanding of impact through interaction and reciprocity is also an important premise for our analysis of inclusion as an STI policy objective. In this context, it refers to impact creation processes and their broad inclusiveness in terms of stakeholder engagement (e.g. Owen, Macnaghten, and Stilgoe 2012; OECD 2015; Lieu *et al.* 2023). However, this might have very little to do with marginalized communities and be accompanied by a blurring of boundaries between policies promoting inclusion and participation (cf. Quick and Feldman 2011). From this perspective, inclusion appears to be a tool of the broader impact agenda, supporting the goal to better connect R&I to versatile societal problems and needs.

2.2 Agency: inclusion of active subjects vs. passive objects

Another dimension of our analytical framework deals with agency, which we argue has been thus far neglected in discussions on inclusion as an STI policy objective (see Sengupta 2016). In particular, policies focusing mainly on inclusion as an outcome have often treated those to be included as rather passive objects of inclusion, for instance, when certain recruitment quotas have been met for marginalized groups. Over the past 20 years, these policies have gained in popularity to help marginalized groups (Hughes, Paxton, and Krook 2017). For example, gender balance among teams and leadership was an evaluated indicator in Horizon 2020 (EC 2019).

The viewpoint of agency directs attention to the active role of those who are included. The previously discussed process-based view emphasizes active agency in contributing to R&I processes, which is needed to leverage the impact of inclusive processes (e.g. Owen, Macnaghten, and Stilgoe 2012) and build impact pathways (Muhonen, Benneworth, and Olmos-Peñuela 2020). Furthermore, the active agency of included actors and groups is necessary in contributing to agenda setting in STI policies (Fressoli *et al.* 2014). Hence, the agency perspective, especially in the context of marginalized communities, necessitates paying attention to broader questions of governance (e.g. Schillo and Robinson 2017) as inclusion does not automatically guarantee equal participation, possibility to influence or respect. Therefore, it should not be confused with quota-based inclusion policies, which do not emphasize agency and possibilities of participation (see Sengupta 2016: 13). Sengupta (2016) draws attention to the interface between inclusion and governance as participatory democratic governance mechanisms are needed to enable active participation: “It is important to understand inclusion not merely as presence but as active participation of maximum members of marginalized communities, classes and groups.”

Indeed, one important yet fuzzy divergence from the perspective of societal agency is the division between inclusion and participation, which Quick and Feldman (2011: 272) define as follows: “Participation practices entail efforts to increase public input oriented primarily to the content of programs and policies. Inclusion practices entail continuously creating a community involved in coproducing processes, policies, and programs for defining and addressing public

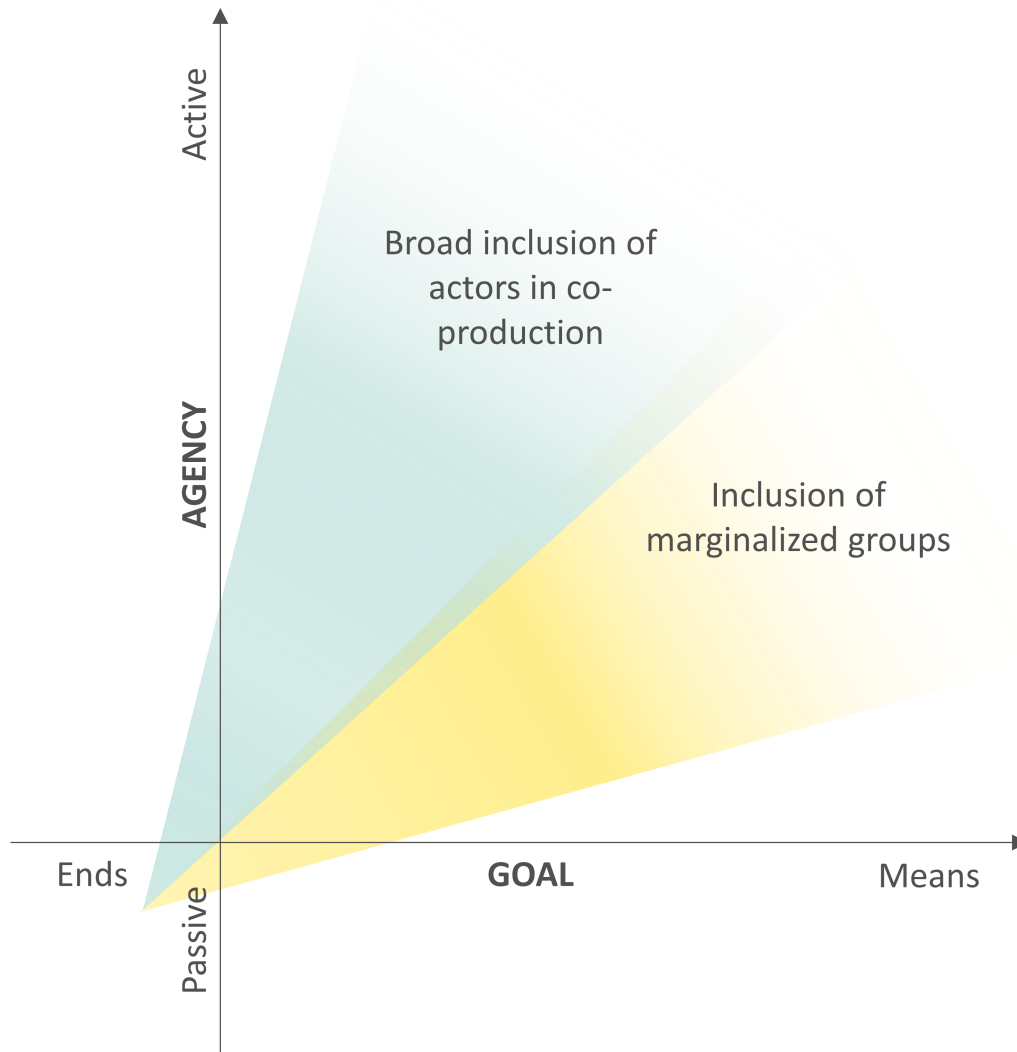


Figure 2. Conceptual framework for decoupling meanings of inclusion as an STI policy objective.

to provide additional analytical leverage to the analysis of inclusion.

3. Insights from policy frameworks promoting inclusion in the EU and the USA

According to [Davis and Laas \(2014\)](#), there are similarities between RRI and BIC regarding the search for science and innovation that serve society and the promotion of inclusive R&I processes with various societal stakeholders. However, inclusion as a policy objective is also approached differently in the two frameworks.

RRI emphasizes collaborative processes, partnerships, and interactive R&I throughout the process as well as ethics and R&I processes that are responsible, anticipatory, and reflexive (e.g. [Owen, von Schomberg, and Macnaghten 2021](#)). Social inclusiveness in Europe is guided by, for example, Article 21 of the Charter of Fundamental Rights of the European Union that connects inclusion to overall basic rights that must be assured in all policy domains. Inclusion is embedded in RRI in diverse ways: through the encouragement of quadruple helix collaboration and emphases on open science, gender equality,

citizen science (e.g. B3; B4; B9), and social inclusion (e.g. B5; B9; B11). The Horizon Europe strategic plan for the years 2021–2024 (B11, 79) discusses multiple forms of inclusion, such as social inclusion, inclusive growth, inclusive citizenship, inclusive “mobility systems for people and goods” and inclusive food systems.

BIC is embedded in the operations of NSF through section 526 of the America COMPETES Reauthorization Act, where the criterion is defined. BIC aims at “the achievement of specific, desired societal outcomes...through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to the project” (A8, II–11). These processes should bring value to the society through direct benefits, and applicants may take diverse pathways to confront various societal and scientific challenges. Within BIC, broadening the participation of women, underrepresented minorities, and persons with disabilities in science, technology, engineering, and mathematics (STEM) improving science education and developing a diverse STEM workforce represents the diverse dimensions of inclusion (e.g. A1; A8, II–11).

In the following sub-sections of the paper, we present the results, demonstrating the decoupling meanings of inclusion as an STI policy objective in the EU and the USA. The analysis combines existing research on the frameworks and an empirical analysis of the documents, which are referenced with the codes listed in [Appendix 1](#).

3.1 Objectives concerning the inclusion of marginalized groups

Broadening the participation of underrepresented groups in R&I and especially STEM fields is a strong focus of NSF, and it has been reinforced by legislative directions, of which the CHIPS and Science Act is a recent example. In the Horizon 2020 program, instead, gender equality was a cross-cutting issue alongside RRI. For illustrative purposes, we examine these policies against the dimensions of the theoretical framework, shedding light on the various nuances of agency and goal setting in the framing of policies for marginalized groups.

Regarding BIC, broadening participation can mean, for example, the involvement, recruitment, and mentoring of underrepresented individuals and groups in STI education and research (e.g. A1; A5; A7). According to NSF's strategic plan for 2006–2011 (cited by A2, 11), “Broadly Inclusive: Seeking and accommodating contributions from all sources while reaching out especially to groups that have been underrepresented” is a core value of NSF and in achieving this, BIC has had a central role. It highlights the potential contributions of underrepresented groups. Although this is valuable in itself, it gives little weight to the agency of these groups, and inclusion appears more as participation aimed at increasing inputs (cf. [Quick and Feldman 2011](#)). The latest NSF strategic plan for 2022–2026 (A7) takes a market-based approach to increasing wellbeing in society and advancing national goals (cf. [Pansera and Owen 2018](#)), highlighting the active agency and empowerment of marginalized individuals so they can participate in the STEM workforce: “NSF has long invested in efforts to broaden participation in STEM, it is more important now than ever to underscore that the inclusion of all people in STEM is vital to the nation's health, security and global leadership” (A7, 3). Here, inclusion serves as a strategic tool for reaching these national goals alongside the aspiration for societal equity.

BIC, however, has been under discussion due to its ambiguities (e.g. [NABI 2018](#)). Determining broader impacts is the responsibility of the applicants within the given BIC guidelines. It is possible to satisfy the criterion without addressing the specific issue of broadening the participation of underrepresented individuals. Previously, BIC had five distinct categories among which the broadening participation of underrepresented groups was one, but it was modified in 2013, following a review process, to a more open-ended description (A3). Yet the challenge of achieving and reporting inclusion and broader impacts for underrepresented groups has been confirmed to persist ([Woodson and Boutilier 2023](#)). This indicates the need to assess the objectives related to inclusion and the depth of participation, where the assessment of agency might contribute to a more comprehensive understanding. Some documents discuss longitudinal and qualitative metrics not only for recruitment but also, for example, for the success and retention of underrepresented groups (e.g. women) in STEM education and participant satisfaction, which may

aid in measuring the outcomes of changes through inclusive practices (e.g. A2; A5).

In RRI, gender equality “has two dimensions: promoting the equal participation of men and women in research activities (the human capital dimension); and the inclusion and integration of gender perspectives in R&I content” (B5, 26). The viewpoint on integrating gender equality and perspectives across all activities suggests inclusion as a means to increase impact, whereas the explicit objective of gender-equal participation directs attention to inclusion as an end goal and a tool for increasing research and the STI talent pool (B9). The integration of gender and sex dimensions in R&I may result in broader impacts through inclusion in terms of, for instance, the gender-specific relevance of outcomes, contributing to heightened scientific quality and the improved adoption and significance of new innovations (B5). Considering the agency of women in STI endeavors might open up new possibilities to assess the different dimensions of inclusion beyond the mere statistical coverage of women in diverse STI policy domains.

Considering agency and outcomes, a new approach to BIC was proposed in 2021 in the context of social, behavioral, and economic (SBE) sciences, where project applicants are encouraged to consider “Who Can the Scientific Opportunities and Communicative Products Empower?” and “Whose Quality of Life Can the Empowerment Improve?” (A6, 3). Regarding the first question, applicants are encouraged to consider “who is empowered.” The second question focuses on “who benefits from that empowerment” (A6, 3). This allows applicants to consider if those being included or targeted are the ones being empowered or whether their input or presence in scientific endeavors empowers somebody else through the results, as well as the impact of their actions on various groups. Empowering people suggests an emphasis on active agency and is also a central theme in the current NSF strategic plan as “Empower STEM talent to fully participate in science and engineering” is the first of four strategic goals (A7, 28).

The institutional approach to inclusion, reflecting broader changes in social structures ([Heeks, Foster, and Nugroho 2014](#): 179), seems to be gaining increasing attention as several publications related to RRI and BIC have highlighted institutional changes and capacity-building for institutions as central for systemic and continual change. For BIC, discussions on institutional change and impact (A2) are increasingly emphasized in newer documents (A5; A7). For example, one document discusses BIC in the context of university culture and as an important component of STEM enterprises rather than as an add-on activity (A4, 5): “The America COMPETES Reauthorization Act of 2010 rearmend the importance of the broader impacts criterion and encouraged institutions of higher education and nonprofit organizations to take an institutional approach towards achieving the societal benefits championed via broader impacts.” (A4: 1). The goal of programs such as NSF INCLUDES (Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science) is to foster “institutional transformation within research and educational organizations so the nation can capitalize on the talents and ideas of all segments of the population” (A7, 30; see also A5).

On the one hand, this can be seen as reflecting the instrumental, market-based view on inclusion, harnessing all segments of the population for the benefit of national goals

(cf. [Pansera and Owen 2018](#)); on the other hand, a broader approach is visible in attempts to promote inclusion as a system-level goal. NSF INCLUDES highlights that “developing intentional collaboration and networks that are committed to common agendas and systemic approaches to solving specific STEM-inclusion challenges at a national scale” is pivotal (A5, 5). Systemic change is also mentioned in the latest NSF strategy to get the “missing millions” to join STEM fields “by catalyzing systemic changes in organizations, such as the development of more inclusive and welcoming research environments” (A7, 19).

Concerning RRI, institutional changes have been especially central in Science with and for Society (SwafS), part 16 of the Work Programme (B9), in which the number of institutional changes for RRI is a key performance indicator. Institutional change is defined as “a change (with meaningful impact) in terms of how a beneficiary governs or structures itself in relation to any of the RRI dimensions [...] and lasts beyond the lifetime of project funding” (B8, 6). These institutional changes were first piloted with Gender Equality Plans (GEPs) in the previous FP7 work program and were further employed by both Horizon programs, again suggesting more structure-based emphasis in policy framing. Sets of indicators of and for RRI and its six key dimensions, including gender equality, were developed within the MoRRI project (B7; [EC et al. 2018](#)) and by an expert group in 2015 (B5). The expert group proposed that while indicators and statistics, such as She-Figures, provide a relevant overview of gender balance in participation, “they do not seem to provide insight into the cultural issues associated with gender inequality [...] nor do they offer much insight into institutional arrangements and mechanisms for promoting gender balance” (B5, 26). They concluded “that the main focus should be on processes of institutional change to see whether these general ambitions are translated into concrete forms of action” (B5, 6).

The expert group also proposed indicators for evaluating inclusion and social justice in RRI. For example, they proposed measuring if applicants consider the impacts of their research and possible outcomes on social justice ([Lieu et al. 2023](#)), which could include, for example, “poverty prevention, access to education, labour market inclusion, social cohesion and non-discrimination, health and intergenerational justice” (B5, 39). However, this dimension is not included in the MoRRI indicators, as it followed the structure where RRI is understood through the six keys.

3.2 Objectives concerning the broad inclusion of actors in co-production

Within NSF and Horizon 2020, community consultation has been used as a tool to shape and develop policy goals (e.g. A9; B6, 6; B10, 47). This can be aimed primarily at the research community, or stakeholders outside academia, or it can be open to the wider public, including citizens. Consultation is seen as a valuable tool for participatory agenda setting, and today’s digital tools allow for reaching a large number of participants to reflect the opinions and values of the public. These consultations can be seen as resembling input-based participation ([Quick and Feldman 2011](#)), which is also often connected to the broader frames of citizen and stakeholder engagement. In light of our framework, consultations

assume the participants’ active agency but narrow participation to active individuals and groups. Inclusion in consultation is often considered the end goal in itself, where consultation input serves as a tool to enable stakeholders to take part in formulating policies, sometimes with no further power to influence the process (cf. [Quick and Feldman 2011](#)).

Co-creation and similar cooperation approaches with stakeholders and citizens are not new, but they have been gaining momentum in the last decade. For example, the SwafS program built an extensive knowledge base on such activities ([Robinson, Simone, and Mazzonetto 2021](#): B8; B9). The importance of stakeholder and citizen engagement and working together is highlighted in several documents. B4 (1) calls for “all stakeholders including civil society” to be “responsive to each other and take shared responsibility for the processes and outcomes of research and innovation,” explained as working together, for instance, in setting the research agenda, conducting the research, and adhering to open access principles. It is also highlighted that “the grand societal challenges that lie before us will have a far better chance of being tackled if all societal actors are fully engaged in the co-construction of innovative solutions, products and services” (B3, 1). Actors are thus described as active agents throughout the processes in which inclusion acts as means to generate impact. In the current Horizon Europe program, this view is further accentuated with a co-design approach to the strategic plan, citizen science, user-led R&I and other forms of public engagement, missions and open innovation 2.0 and an increased emphasis on open science, which has become part of the evaluation criteria of research proposals (B11; [Owen, von Schomberg, and Macnaghten 2021](#); [Robinson, Simone, and Mazzonetto 2021](#)). For example, it is noted that in order to foster “ambitious investments in new knowledge and its diffusion into relevant industries and society as a whole. [...] in a responsible and inclusive way, we will need even more collaboration – across borders and across disciplines and actors” (B11, 4). The latest NSF strategic plan refers to this phenomenon as “growth in the co-production of knowledge, a participatory, solution-oriented approach to research that is often interdisciplinary. This concept is characterized by meaningful interaction between producers and users of knowledge” (A7, 19).

Overall, the relevance of citizen, user, beneficiary, and stakeholder inputs is evidently on the rise in the shaping of STI policies and formulation of research agendas. NSF’s new TIP directorate aims at “catalyzing a paradigm expansion” (A9), where societal needs inform R&I agendas and the scope expands from a traditional supply push to activities informed by the market demand (A9). More opportunities are being created to bring inventions from the lab to society, and vice versa, to yield greater research impacts. The goal is to involve societal actors in shaping and conducting research and capturing the benefits (A9). Furthermore, within TIP programs, investments are being made to foster “inclusive innovation ecosystems,” for example, in the Enabling Partnerships to Increase Innovation Capacity (EPIIC) program, where partners are “working together in support of use-inspired research; the translation of such research to practise or commercial application; and the development of a skilled workforce” ([NSF 2024c](#)).

Summing up the key similarities, new approaches in TIP in terms of an emphasis on active agency in inclusive frameworks

Table 1. Key differences between the studied frameworks in their approaches to inclusion.

Key differences regarding inclusion of marginalized groups	
<p>RRI is a comprehensive approach adopted in H2020 processes for responsible conduct of R&I.</p> <p>“RRI cuts across Horizon 2020, engaging society, integrating the gender and ethical dimensions, ensuring access to research outcomes, and encouraging formal and informal science education.” (B9, 8)</p> <p>“[...] gender equality is promoted in all parts of Horizon 2020 including gender balance at all levels of personnel involved in projects.” (B6, 14)</p> <p>There are prerequisites for projects, such as being as gender balanced as possible. Multifaceted themes of societal engagement are present from the outset to the end of the process and beyond.</p>	<p>BIC is a criterion NSF uses to evaluate the broader impacts and societal benefits of research proposals.</p> <p>“NSF strongly promotes and expects that all individuals, including those from groups that are underrepresented and/or underserved in STEM are treated equitably and inclusively in the Foundation’s proposal and award process.” (A8, viii)</p> <p>Benefit and impact can arise from any phase of the project e.g. process, outcomes and/or deliverables. The fulfilment of each impact example is not required, yet there is a clear focus on increasing the participation of underrepresented minorities, as well as diversifying STEM through inclusion.</p>
Key differences in broad inclusion of actors in knowledge co-production	
<p>Being open and operating in inclusive multi-stakeholder collaborations, as well as answering to society’s expectations and values, is at the heart of RRI.</p> <p>“RRI is an ambitious challenge for the creation of research and innovation policy driven by the needs of society and engaging all societal actors via inclusive participatory approaches.” (B3, 1)</p> <p>“Citizens and businesses expect the Union to lead on the transformation pathways in a transparent, effective and inclusive way.” (B11, 3)</p>	<p>Alongside the traditional view on inclusion of marginalized groups and individuals, new forms of inclusion have emerged and suggest new possible ways of satisfying the BIC.</p> <p>“Broadly Inclusive: Seeking and accommodating contributions from all sources while reaching out especially to groups that have been underrepresented; serving scientists, engineers, educators, students and the public across the nation; and exploring every opportunity for partnerships, both nationally and internationally.” (cited by A2, 11)</p> <p>“...what we’d like to do more of is bring users, beneficiaries, consumers to the table to help shape the research agenda” (A9, 14:55)</p>

and the co-production of knowledge for broader impacts have many similarities with the goals of Horizon 2020 and Horizon Europe. Furthermore, the increasing emphasis on spatial equity and geographical inclusion through regional innovation policy in many ways resembles the innovation policy emphasis in the EU. Both sets of documents, especially those concerning RRI, present multiple meanings of inclusion as an STI policy objective, such as the involvement of diverse stakeholders in R&I processes (A9; B1: 57), equal access to science education pathways (B8: 36; A9), engaging with citizens “irrespective of their age, gender, ethnicity and socio-economic background” and broadening participation (B9: 36; A1; A2; A8) or responsive and open quadruple helix collaboration (B8, 19; B9, 35–36), and therefore point toward the need for their analytical scrutiny in terms of the possibilities and challenges related to broadening policy meanings. We undertake this task next and attempt to draw lessons for both the theory and practice of inclusive STI policymaking.

4. Discussion

Despite certain similarities identified between the EU and the USA regarding, for instance, increasing emphases on knowledge co-production and geographical inclusivity, the studied frameworks also have different emphases regarding the objective of inclusion (Table 1). The findings thus present different approaches to the conceptualization and operationalization of inclusion as an STI policy objective, with RRI taking a more process-oriented and BIC an outcome-oriented approach to inclusion. Yet recent changes accompanying the introduction of NSF’s new TIP directorate indicate that the scope of inclusive policy rhetoric is also broadening in the USA. The differences matter, as an emphasis in one area of inclusion may create blind spots and exclusion in another (Koch 2020). This was recently noted in an expert report in Europe emphasizing the need to better recognize the diverse European population in mission-driven R&I (Mazzucato 2019: 7).

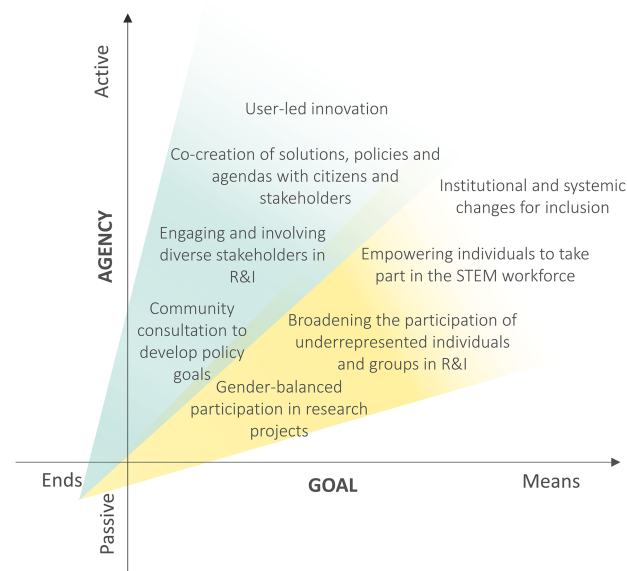


Figure 3. Examples of decoupling meanings of inclusion.

The analysis demonstrates that in the selected frameworks in the EU and the USA, inclusion refers to the inclusion of both those who might otherwise be excluded or marginalized and basically any relevant actors to the research, innovation, and diffusion processes—a dual meaning also recognized in the Oxford Dictionary (2024) definition. This decoupling—primarily discussed here as policy divergence (Graafland and Smid 2019)—becomes visible in the emphases of the analyzed frameworks and examples drawn from the data (Fig. 3).

In a complex, globalized world order, decoupling is also expected (cf. Graafland and Smid 2019: 232). On the one hand, inclusion, as a conceptual metaphor reflecting broader societal values, can be a powerful policy concept in promoting the societal impact of R&I while addressing the

needs of marginalized groups and communities through its “connection-building features” (Quick and Feldman 2011: 282). Ideally, with increased attention to the governance of inclusive policymaking (cf. Schillo and Robinson 2017) and concerted effort (George *et al.* 2019; Robinson, Simone, and Mazzonetto 2021), the co-existence of both recognized paths improves the inclusivity of STI activities in a comprehensive manner, building inclusive frames of knowledge for STI policy at a systemic level (cf. Heeks, Foster, and Nugroho 2014; Lieu *et al.* 2023). There is no simple, right or wrong approach here (Heeks, Foster, and Nugroho 2014: 178), yet one must understand what types of goals are pursued as they carry different implications, for instance, for evaluation. For example, the MoRRI project, which developed indicators for and of RRI to be used, for example, in the SwafS program, in its summary report, differentiates between inclusion and pluralization (EC *et al.* 2018). Enhanced inclusiveness (as opposed to e.g. input-based participation) can, at best, lead to greater satisfaction and the increased legitimacy of STI policymaking (cf. Quick and Feldman 2011). Broader approaches to inclusion are increasingly enabling the active agency of participants, empowering them and challenging persistent power dynamics, as reflected in the upper steps of the inclusion ladder regarding system-level change or philosophical and discursive change in the way society as a whole considers inclusion (Heeks, Foster, and Nugroho 2014). Increasingly visible also in policies pursuing transformative change (e.g. Schot and Steinmuller 2018), endeavors such as use-inspired research and co-creation appear to present opportunities to create an impact and address the needs of society in addition to economic growth (Robinson, Simone and Mazzonetto 2021), including people, for example, with low socioeconomic status.

However, increasing legitimacy pressures can result in “ceremonial conformity” and different forms of decoupling (Meyer and Rowan 1977: 341; Graafland and Smid 2019), although the symbolic adoption of inclusion might be restrained by a growing emphasis on its evaluation (Jabbouri, Schneckenberg, and Truong 2022). Symbolic function (Flink and Kaldewey 2018) can also come with trade-offs, as rapidly increasing policy rhetoric regarding inclusion, partially approached as a societal mandate (cf. Bertello *et al.* 2022), can paradoxically contribute to the discursive exclusion of alternative policy framings (cf. Pansera and Owen 2018, 32). Moreover, the costs and benefits of citizen science are increasingly being debated due to the unclear beneficiaries (Robinson, Simone, and Mazzonetto 2021: 213) and impacts on science and society (B9, 40–41). Furthermore, costs related to inclusion might conflict with efficiency demands (cf. Graafland and Smid 2019: 232; Bertello *et al.* 2022), and means-ends decoupling diverts resources from core goals (Bromley and Powell 2012).

5. Conclusions and directions for future research

By examining the conceptualization and operationalization of inclusion as an STI policy objective in high-income countries, the present paper contributes to the STI policy literature by shedding light on the emergent decoupling dilemma that has been neglected in literature discussing inclusion from diverse yet disconnected perspectives. Combining the literature on

inclusive innovation and broader STI policy studies, which are increasingly discussing the societal impact of R&I, enabled us to tap into a broader perspective on inclusion that is decoupling from marginalization (cf. Quick and Feldman 2011). In both recognized meanings of inclusive STI policies—the inclusion of marginalized groups and the broad inclusion of actors in co-production—the analysis also unveils an increasing emphasis on active agency and the instrumental value of inclusion in contemporary STI policy. In addition to inclusion being instrumentalized to serve economic interests (cf. Pansera and Owen 2018), the analysis sheds light on the instrumental role of inclusion in the impact agenda.

Future research must account for the growing complexity and ambiguity of policy language regarding inclusion. Our conceptual framework can be used and developed further as an analytical tool to structure and stimulate research, policy, and practice debates in the broad STI policy field related, for instance, to the need to consider agency in inclusive policy frameworks that increasingly emphasize the empowerment of those included. In practice, the recognized dimensions overlap and are more fluid in nature, yet for analytical purposes, it is useful to make the distinction. Differentiating between means and ends is useful especially in light of the STI policies’ emphasis on the societal impact of R&I that has recently promoted the process-based view on inclusion (e.g. Owen, Macnaghten, and Stilgoe 2012), manifested, for instance, in processes of co-creation, perhaps adding to the conceptual ambiguity. In addition, a more nuanced analysis of the diverse forms of decoupling is still needed (e.g. Bromley and Powell 2012; Jabbouri, Schneckenberg, and Truong 2022) within STI policy domain as well, which is faced with novel questions and demands for legitimacy (Flink and Kaldewey 2018) arising from the decoupling meanings and intertwining of policy goals. Increasingly detached from marginalization, the broadening and, at times, vague use of inclusion can lead to the blurring of policies and original goals focused on improving the conditions and agency of marginalized groups. If inclusion is increasingly appearing everywhere in the STI policy rhetoric, it might end up nowhere in practice.

In this paper, we were only able to scratch the surface in comparing EU and US policy frameworks regarding their wider policy contexts, cultural realities, and legislative differences. In addition, while NSF, through BIC, supports research projects, the relevant EU directorate supports projects in R&I. Reflecting upon recent developments in the new TIP directorate enabled us to broaden the scope of analysis concerning the USA as well, but future research should dive deeper into the different emphases. Differences also remain a topic for future research offering a deeper comparative examination of discursive meanings related to inclusion that are visible in the changing policy rhetoric reflecting an increasing emphasis on active agency, and extending beyond the empirical settings of the examined high-income countries and frameworks. Discourse analysis could be used to deepen such an analysis.

Finally, besides the growing interest in understanding the links between innovation and inclusion (Heeks, Foster, and Nugroho 2017), this paper directs attention to the link between inclusion and impact. This link seems to be at the heart of contemporary policy language promoting responsiveness and knowledge co-production also for improved legitimacy, dubbed as a “paradigm expansion” in NSF’s new TIP directorate emphasizing the engagement of users and

beneficiaries, multi-sector teams, and societal problem-driven research (A9). Inclusion and impact have not been analytically discussed in relation to each other regarding the broadening meanings of inclusion in contemporary STI policy. This paper takes a step in this direction, but there is a need to continue on this integrative conceptual and empirical avenue in future work. Furthermore, although the inclusive innovation research community certainly still has work to do at the development studies interface (Heeks, Foster, and Nugroho 2014: 183), STI policy researchers should pay critical attention to other disciplinary connections and pathways emerging in the field of inclusive R&I due to the blurring of policy goals and related challenges to democratic legitimacy and sustainability.

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Data availability statement

The data underlying this article are listed in [Appendix 1](#).

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Appendix 1.

List of analyzed documents from oldest to most recent

NSF documents		EU documents	
A1	National Science Foundation (2002). Merit Review Broader Impacts Criterion: Representative Activities. https://www.nsf.gov/pubs/2002/nsf022/bicexamples.pdf	B1	European Commission, Directorate-General for Research and Innovation, <i>Options for strengthening responsible research and innovation: report of the Expert Group on the State of Art in Europe on Responsible Research and Innovation</i> , Publications Office, 2013, https://data.europa.eu/doi/10.2777/46253
A2	Clewell, B. & Fortenberry, N. (Eds.). (30 June 2009). Framework for Evaluating Impacts of Broadening Participation Projects.	B2	European Commission (2014). Horizon 2020 Work Programme 2014–2015. Table of Contents and 1. General Introduction. Revised. European Commission Decision C(2014)4995 of 22 July 2014.
A3	National Science Board (2011). National Science Foundation's 3 (NSB/MR-11-22)* http://www.nsf.gov/nsb/publications/2011/meritreviewcriteria.pdf	B3	European Commission, Directorate-General for Research and Innovation, <i>Responsible research and innovation: Europe's ability to respond to societal challenges</i> , Publications Office, 2014 https://op.europa.eu/s/yX8X
A4	National Science Foundation (2014). Perspectives on Broader Impacts (NSF 15–008). https://nsf.gov/resources/nsf.gov/2022-09/Broader_Impacts_0.pdf	B4	Rome Declaration on Responsible Research and Innovation in Europe. 21 November 2014.
A5	NSF INCLUDES (2020). Special Report to the Nation II—Building Connections. Shared Vision, Partnerships, Goals and Metrics, Leadership and Communication, Expansion, Sustainability and Scale.	B5	European Commission, Directorate-General for Research and Innovation, <i>Indicators for promoting and monitoring responsible research and innovation: report from the Expert Group on policy indicators for responsible research and innovation</i> , Publications Office, 2015, https://data.europa.eu/doi/10.2777/9742
A6	National Science Foundation (2021). Dear Colleague Letter: A Broader Impacts Framework for Proposals Submitted to NSF's Social, Behavioral, and Economic Sciences Directorate (NSF 21–059). Arthur Lupia, Assistant Director Directorate for Social, Behavioral and Economic Sciences. https://www.nsf.gov/pubs/2021/nsf21059/nsf21059.pdf	B6	European Commission (2017). Horizon 2020 Work Programme 2016–2017. Table of Contents and 1. General Introduction. European Commission Decision C(2017)2468 of 24 April 2017.
A7	U.S. National Science Foundation. Leading the World in Discovery and Innovation, STEM Talent Development and the Delivery of Benefits from Research. NSF Strategic Plan for Fiscal Years 2022–2026. https://www.nsf.gov/pubs/2022/nsf22068/nsf22068.pdf	B7	European Commission, Directorate-General for Research and Innovation, Stilgoe, J., <i>Monitoring the evolution and benefits of responsible Research and Innovation</i> , Publications Office, 2018, https://data.europa.eu/doi/10.2777/285467
A8	National Science Foundation (2023). Proposal & Award Policies & Procedures Guide (PAPP) (NSF 22–1). 30 January 2023. https://nsf.gov/resources/nsf.gov/2022-10/nsf23_1.pdf?VersionId=7yfheI.bNrekBK7F5cKu9riXFbi1YjRX	B8	European Commission, Directorate-General for Research and Innovation, Delaney, N., Iagher, R., Tornasi, Z., <i>Institutional changes towards responsible research and innovation: achievements in Horizon 2020 and recommendations on the way forward</i> , Publications Office, 2020, https://data.europa.eu/doi/10.2777/682661
A9	National Science Foundation TIP. Recorded Webinar: TIP Updates. 2 June 2023. https://www.youtube.com/watch?v=T3W6Tr-5MLE	B9	European Commission (2020).. Horizon 2020 Work Programme 2018–2020. 16. Science with and for Society. European Commission Decision C(2020)6320 of 17 September 2020.
		B10	European Commission (2020). Horizon 2020 Work Programme 2018–2020. 1. General Introduction. European Commission Decision C(2020)6320 of 17 September 2020.
		B11	European Commission, Directorate-General for Research and Innovation, <i>Horizon Europe—Strategic plan 2021–2024</i> , Publications Office of the European Union, 2021, https://data.europa.eu/doi/10.2777/083753

*Pp. 1–16, 25–26, appendixes excluded except for Appendix B: Section 526 of the America COMPETES Reauthorization Act.

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