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List of Abbreviations

CBPR	Community-based participatory research
CBR	Community-based research
CER	Community-engaged research
EU	European Union
HEI	Higher education institution
NCCPE	National Co-ordinating Centre for Public Engagement
NGO	Non-governmental organization
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RRI	Responsible Research and Innovation
SC	Citizen Science
SER	Socially engaged research
SwafS	Science with and for Society
TDA	Transdisciplinary approaches

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Glossary

- **Citizen science (CS):** CS describes the engagement of people from civil society who are not tied to research institutions in scientific processes. Participation can range from a short-term collection of data to intensive immersion into a research topic (categorising, transcribing, analysing scientific, co-creating, volunteering, etc.), at any stage of the research process (Wiggins & Crowston, 2012; Hacklay, 2015; Bonn et al., 2022; Brockhage et al., 2022).
- **Community:** The term "community" is diverse, when related to research, there is no consensus on the definition. It may refer to groups of places (geography), identities (demography), or interests (experiences). In some cases, the term refers only to civil society organisations and, in others, it may include public authorities, businesses, schools, and citizens in general. In this document, the term community refers to businesses, the public sector, and civil society (Mulligan, 2015; Farnell, 2020).
- **Community-based participatory research (CBPR) / Community-based research (CBR):** CBPR is an approach that develops research in partnership with communities, allowing stakeholders to understand and address issues that benefit and advance knowledge in a mutually beneficial way. CBPR emphasizes participation from the community in all phases of the process and acknowledges the strengths that communities bring to research (Belansky et al., 2011; Belone et al., 2016; Greer, 2021; Nelson et al., 2022).
- **Community-engaged research (CER):** CER describes a wide range of research approaches, strategies and activities that share the interest in engaging collaboratively with the community / civil society and aim to understand an issue of public interest and address societal challenges. CER is implemented with community partners rather than for them (AICBR, 2012; CampusEngage et al., 2019; UCD Dublin, 2021; Thomas & Cassidy, 2022).
- **Engagement in higher education:** Engagement in higher education implies undertaking education, research and third mission aligned with society and business needs to deliver a wide range of contributions, benefits and impacts. Engaged HEIs are influential organisations within the wider ecosystem, city and region and work with societal stakeholders as strategic partners in their governance and core functions (AICBR, 2012; Lebeau & Bennion 2014; Barker, 2015; ACEEU, 2016).
- **Engaged research:** engaged research comprehends diverse strategies to meaningfully interact with social stakeholders over one or several stages of the research process. Engaged research is characterized for interdisciplinarity and has direct application to broader public issues. (Holliman et al., 2015; CampusEngage et al., 2019; UCD Dublin, 2021; Thomas & Cassidy, 2022).
- **Interdisciplinarity:** Interdisciplinarity or interdisciplinary studies involve the combination of different academic disciplines that integrate their knowledge, use methodologies and skills from diverse fields of study and link diverse frameworks to generate new knowledge and theory focused on a common research goal (Villeneuve et al., 2019; Ferguson et al., 2022).

- **Multidisciplinarity:** Multidisciplinarity or multidisciplinary studies involves diverse disciplinary actors working on a shared goal with different disciplinary objectives (Knapp et al., 2019; Ferguson et al., 2022).
- **Open science:** Open science is a change in the way research stakeholders create, conduct, store, share and deliver research outputs, moving towards increased transparency, collaboration, open dissemination and participation in the production of knowledge (open access, open data, open participation). This change is expected to enable higher levels of transparency, accountability, collaboration, integrity, and quality (Smith et al., 2016; LERU, 2018; European Commission, 2019).
- **Responsible Research and Innovation (RRI):** RRI is a framework for research and innovation processes involving societal actors (researchers, citizens, policymakers, companies and civil society organisations) working together to better align the process and outcomes of research and innovation with the values, needs and expectations of society (Artheau et al., 2013; UCD Dublin, 2021).
- **Society:** According to the definition of the quadruple helix of innovation, society refers to community groups, non-governmental organisations, labour unions, indigenous groups, charitable organisations, faith-based organisations, professional associations, and foundations, among others. In some cases, the term includes, public authorities, businesses, educational institutions, civil society and citizens (WEF, 2013; Farnell, 2020; Roman et al., 2020).
- **Socially engaged research (SER):** SER is a strategic approach to the definition, planning, management, and execution of a research agenda in which there are meaningful interactions among the quadruple helix stakeholders: science (academia), policy (public sector), industry (businesses and SMEs) and civil society (NGOs and other community organizations), to address societal challenges.
- **Transdisciplinarity:** Research approach that merges different disciplines and works with non-academic partners to create new knowledge and theories to address specific shared questions. It aims to integrate diverse bodies of knowledge to produce context-tailored solutions that are both scientifically sound and socially relevant (Knapp et al., 2019; Ferguson et al., 2022; Sattler et al., 2022).
- **Transdisciplinary approaches (TDA):** TDA is a research strategy that brings together diverse knowledge holders from scientific disciplines and practice domains (public, private, and civil society), shares power within the process of research, and arrives at different outcomes including research knowledge and, implementable, solution-oriented knowledge (de Vries, 2019; Knapp et al., 2019; Ferguson et al., 2022).

Executive summary

This report on the status quo of socially engaged research defines the key terms and sets the scene for developing the project Bringing Excellence to Transformative Socially Engaged Research in Life Sciences through Integrated Digital Centres (BETTER Life). BETTER Life aims to establish a European Digital Centre of Excellence to foster Socially Engaged Research in Life Sciences. The BETTER Life Digital Centre of Excellence will be an inter-institutional support structure for enhancing capacities, strengthening networks of higher education institutions and cooperating with regional ecosystems in the field of life sciences. By developing these capacities, BETTER Life will contribute to tackling societal challenges in diverse regions while consolidating itself as a reference for planning, supporting, and implementing socially engaged research in the life sciences.

This report defines socially engaged research as a strategic approach to the definition, planning, management, and execution of a research agenda in which there is meaningful interaction between diverse societal stakeholders. Socially engaged research aims to address relevant societal challenges to increase research accountability, responsibility, contribution, quality, relevance, and positive impacts on society at the regional, national, and international levels. This approach to research is rooted in mode 3 of knowledge production, which emphasises the coexistence of diverse modes of conducting research and innovation with diverse academic and non-academic stakeholders.

At the policy level, diverse organisations have actively promoted socially engaged research as a mechanism to enhance innovation, tackle ecosystem needs, and advance the development of knowledge economies. Funding programs, capacity building, implementation of frameworks and indicators, and policies that incentivise engagement are among some of the strategies used to embed socially engaged research at the international, national and institutional levels. These mechanisms aim to positively impact the economy, environment, health and well-being, policies, product development, professional and public services, society and culture, internationalisation, and the availability of capacities.

The supporting mechanisms to embed socially engaged research at the systemic level are funding schemes for projects as well as policy guidelines agreed upon among diverse institutions. Additionally, diverse international platforms and networks have emerged to support the implementation, development and dissemination of socially engaged research specifically emphasising citizen science projects. At the institutional level, higher education institutions are implementing support units such as science shops, labs, internal platforms, institutional strategies and plans, mentoring programmes, competitive funds, up-skilling mechanisms, and stakeholder maps, or embedding these functions in existing knowledge transfer offices. These mechanisms are key to supporting the involvement of external stakeholders, which can be categorised as those who have local know-how, those traditionally marginalised from science, and those affected by a problem.

The methods and approaches used in socially engaged research involve a diverse range of research traditions including qualitative, quantitative and mixed methods, with a clear tendency toward transdisciplinary research. From an engaged perspective, even traditional research approaches could involve stakeholders at any stage of the research process. Nevertheless, institutions need to provide necessary inputs as strategic approaches to SER (frameworks, guidelines, and policies) and develop a high level of maturity with regional partners to build mutual trust. Socially engaged research implies that institutions must develop strategies to measure the effects and impacts of their engagement with diverse stakeholders over time. These effects and impacts may be economic, social and cultural, in health and well-being, professional and public services, international, and available capacity.

Finally, the report highlights the elements that require further development to advance socially engaged research:

1. From a scientific perspective, developing and enhancing data standards, quality assurance, metrics for assessing social impact, social involvement in assessment processes, and scientific reputation and recognition systems.
2. From a policy perspective, defining and measuring the social impact, what types of impacts are generated, who benefits from them, and what variables are linked to intermediate- and long-term outcomes.
3. From an institutional perspective, defining the level of institutional commitment, strategies, goals, support mechanisms, academic career incentives, capacity-building strategies, and encouragement systems.
4. From the research process perspective, moving beyond the passive role of citizens as data collectors to improve the inclusivity, accessibility, and applicability of research, as well as mechanisms to ensure the qual
5. From the communication of science perspective, developing clarity, consistency, and innovative strategies in the communication of engaged research agendas to researchers, support staff, and non-academic stakeholders at both the institutional and regional levels.

In sum, this report presents the panorama of socially engaged research and the key elements that need to be addressed to ensure that socially engaged research has a meaningful and lasting impact on society and can effectively communicate its impact to the broader society and the scientific community.

INTRODUCTION

1. Introduction

This report aims at identifying and defining the key elements that set the scene for developing the project Bringing Excellence to Transformative Socially Engaged Research in Life Sciences through Integrated Digital Centres (BETTER Life). It maps the state of the art through a systematic literature review complemented by additional selected documents to offer a comprehensive picture of socially engaged research (SER) from the perspective of life sciences. This report presents the theoretical frameworks of SER, definition of key terms, enabling mechanisms, key elements to implement it, opportunities and implications.

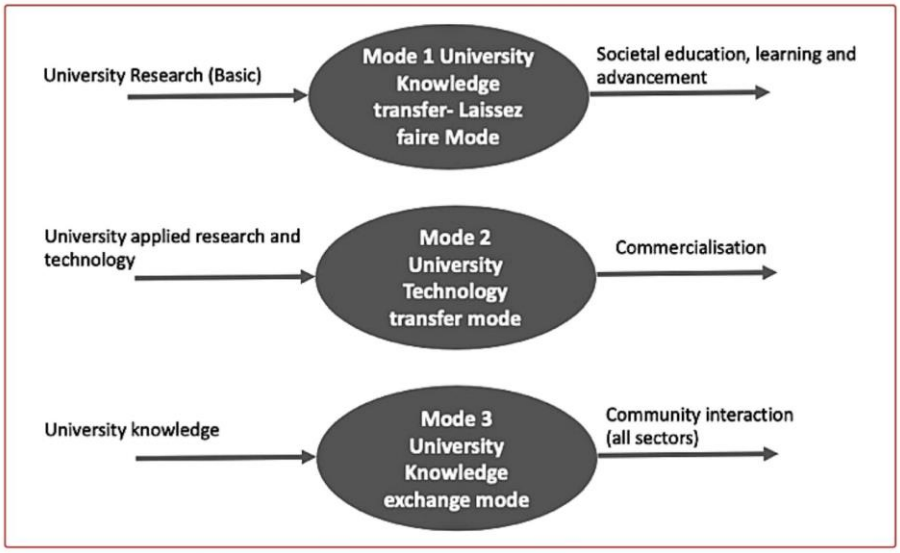
Socially engaged research (SER) is a strategic approach to the definition, planning, management, and execution of a research agenda in which there is meaningful interaction between diverse societal stakeholders. SER focuses on research in which there is societal involvement in any or all stages of a process: idea formulation, research design, proposal development, research development, data collection, data analysis, knowledge production, dissemination of results, and evaluation. SER refers to the stakeholders framed in the quadruple helix model of research and innovation, in which there is interaction between science (academia), policy (public sector), industry (businesses and SMEs) and civil society (NGOs and other community organisations). The aim of SER is to address relevant societal challenges to increase research accountability, responsibility, contribution, quality, relevance, and positive impact on society at the regional, national, and international levels.

Collaboration between academia, industry, government and civil society allows for the inclusion of non-traditional research paths related to non-technological improvements, service creation, social entrepreneurship, and creativity exploitation (Carayannis & Campbell, 2009; European Committee of the Regions et al., 2016). The quadruple helix model reflects the changes in the modes of knowledge production. Additional to “mode 1” (basic/theoretical research) and “mode 2” (applied research) of knowledge production, “mode 3” integrated non-academic knowledge and is defined as “a multi-lateral, multi-nodal, multi-modal, and multi-level systems approach to the conceptualisation, design, and management of real and virtual, ‘knowledge-stock’ and ‘knowledge-flow’, modalities that catalyse, accelerate, and support the creation, diffusion, sharing, absorption, and use of co-specialised knowledge assets” (Carayannis & Campbell, 2009, p. 205).

Mode 3 of knowledge production entails transdisciplinarity between academic knowledge and community interactions in research development, as illustrated in Figure 1. Similarly, transdisciplinarity, as illustrated in Figure 2, connects diverse knowledge holders (academia and practice), shares power within the process, and generates diverse outcomes that include concepts and practices (Knapp et al., 2019; Ferguson et al., 2022). The aim of transdisciplinarity is “to integrate different bodies of knowledge in order to produce context-tailored solutions that are both scientifically sound and socially relevant” (Sattler et al., 2022 p. 63). Mode 3 of knowledge

production, as mentioned by Carayannis and Campbell (2009), implies knowledge produced in the context of application, transdisciplinarity, heterogeneity, organisational diversity (intersectoral collaboration), social accountability, and quality control.

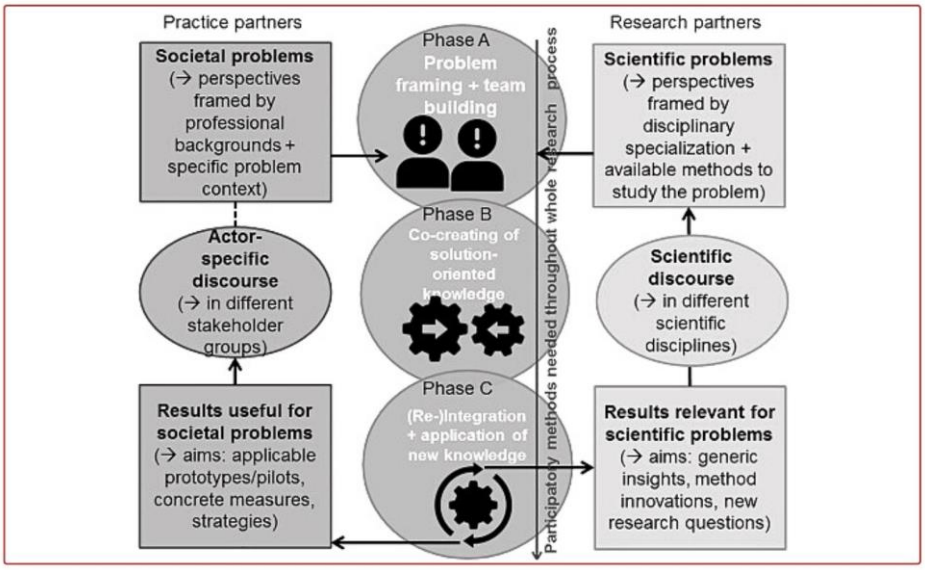
Figure 1: Knowledge production modes and university knowledge transfer.



Source: Gibbons et al. (1994).

Note: Mode 3 covers university knowledge exchange involving a wide range of university–community (external stakeholders) knowledge holders.

Figure 2: Transdisciplinary research process.



Source: Sattler et al. (2021).

Note: The transdisciplinary research process illustrates the implications of mode 3 of knowledge production in the development of research activities.

Mode 3 of knowledge production, which is framed in the quadruple helix model, is commonly named "engaged research", which describes a wide range of research approaches and strategies that share a common interest in collaborative engagement with the community or society and aims to

investigate and tackle societal challenges (CampusEngage et al., 2019). The term "community engagement" has a background in universities in the USA and Latin America that work with communities through service learning, community-based participatory research (CBPR), and other engagement strategies. In European policy, engagement has been used in the broad sense of involving diverse societal stakeholders, including businesses, in research (Carballo-Cárdenas et al., 2016; Benneworth et al., 2018). Moreover, Carballo-Cárdenas (2016) posited that the term citizen science (CS), which in the USA generally describes large-scale data collection involving citizens, in Europe has the connotation of engaging social perspectives in science and policy making. That is the case of the White Paper on Citizens Science for Europe (Serrano et al., 2015), which defines CS as the active engagement of citizens in diverse stages of research activities.

Furthermore, open innovation and open science are paradigms associated with the development of an engaged research agenda. Open innovation advocates engaging with external knowledge networks as a mechanism to enhance, accelerate and guarantee innovation efficacy (European Commission, 2016; Scheller, et al., 2020). Organisations practising open innovation use external ideas and technologies in their own business and allow unused internal ideas and technologies to go outside for others to use. This implies that research and innovation transition from a knowledge transfer model (unidirectional transfer from academia to society) to a user-centric ecosystem model with knowledge inflows and outflows (European Commission et al., 2014). Open innovation boosts innovation in academia, the public sector, business, industry, and society by profiting from the rapid and open diffusion of the latest knowledge through open science (including datasets, samples, annotations, pre-prints, and codes). Open science has serious implications for intellectual property rights and the circulation of research products (Chesbrough, 2015), to which the European Commission (2022) advises the notion of "as open as possible as close as necessary". Due to their transdisciplinary approaches, open innovation and open science blend their principles with the development of socially engaged research agendas.

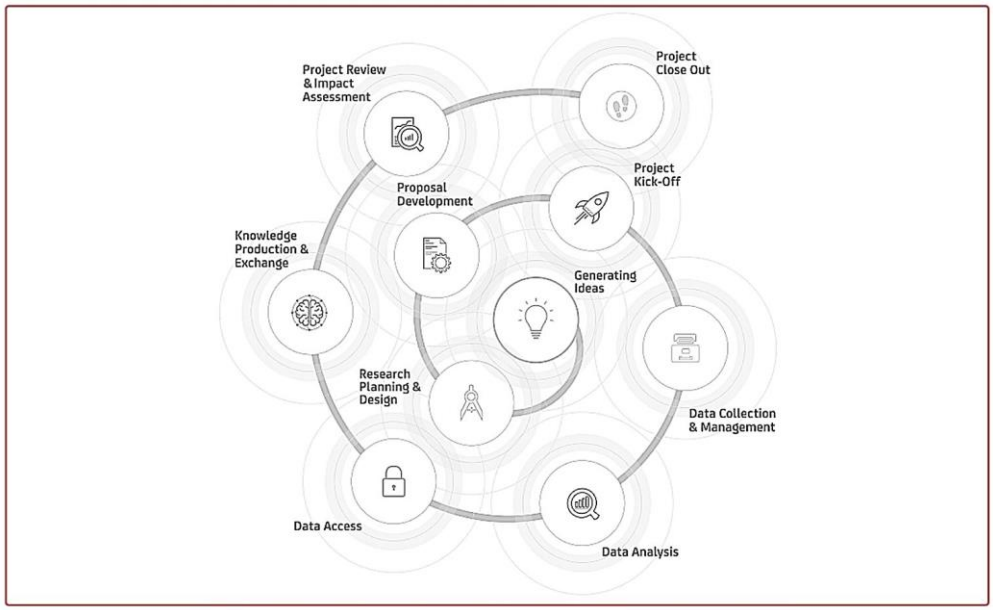
To overcome the understanding of the term "engaged research" as a research approach in which citizens participate only in collecting data, this project proposed the term "socially engaged research-SER". SER encapsulates the quadruple helix model, which engages academia, government, industry and civil society in defining research agendas, policies, and implementation. Alike the quadruple helix model, SER is rooted in "Mode 3" of knowledge production, which implies transdisciplinarity approaches to research conceptualisation and implementation. Godonoga and Sporn (2022) frame this societal approach in the rise of the third mission in higher education. Today, governments and societies expect HEIs to play a role in consolidating knowledge-based economies and cohesive societies by demonstrating their accountability, social responsibility, and relevance to society. In line with the enhancement of the missions of HEIs, policies and funding mechanisms in the EU steer the process of change with programmes such as Biodiversa+, Interreg, Horizon 2020 and Horizon Europe.

The European Commission has played a major role in introducing concepts such as Science with and for Society (SwafS) and Responsible Research and Innovation (RRI) which intertwine with SER. SwafS, a funding stream of EUR 462 million framed in the Horizon 2020 programme (2014-2020),

enhanced the data, resources, indicators, infrastructure, training, and promotion of co-design and co-creation through CS as a way to democratise and build trust in science while leveraging societal contributions to research and innovation (European Commission, 2020). In addition, RRI was also a focus of Horizon 2020. It describes research and innovation impacts on society and the environment through five key elements: science education, gender equality, public engagement, ethics, and open access. Both agendas have been assimilated into European research and innovation. Nevertheless, there are criticisms of the vagueness of the terminology, discouragement of the blue-sky research, and unfavourable conditions of reward systems based on competition and short-term contracts (Pain, 2017). Overall, these policy orientations and funding mechanisms shape the consolidation of a socially engaged research agenda.

At the country level, initiatives steering the change towards a socially engaged research agenda have also emerged. This is the case with CampusEngage which has produced guidelines, frameworks, and tools to advance "engaged research" in Ireland. CampusEngage (2019) defines "engaged research as "a wide range of rigorous research approaches and methodologies that share a common interest in collaborative engagement with the community and aim to improve, understand or investigate an issue of public interest or concern, including societal challenges" (p. 4). They posit that a socially engaged agenda in research will positively address challenges in the economy, environment, health and well-being, policy and product development, professional and public services, society and culture, internationalisation, and capacity building. As a framework, they proposed social engagement in diverse stages of a research project, as illustrated in figure 3. Complementarily, Ferguson et al. (2022) created a model of an "engaged research project", as shown in Figure 4, emphasising three steps: assessment of the engagement intensity, commitment to continuous dialogue and shared power, and creation of outcomes that are mutually beneficial, with social and scientific impact.

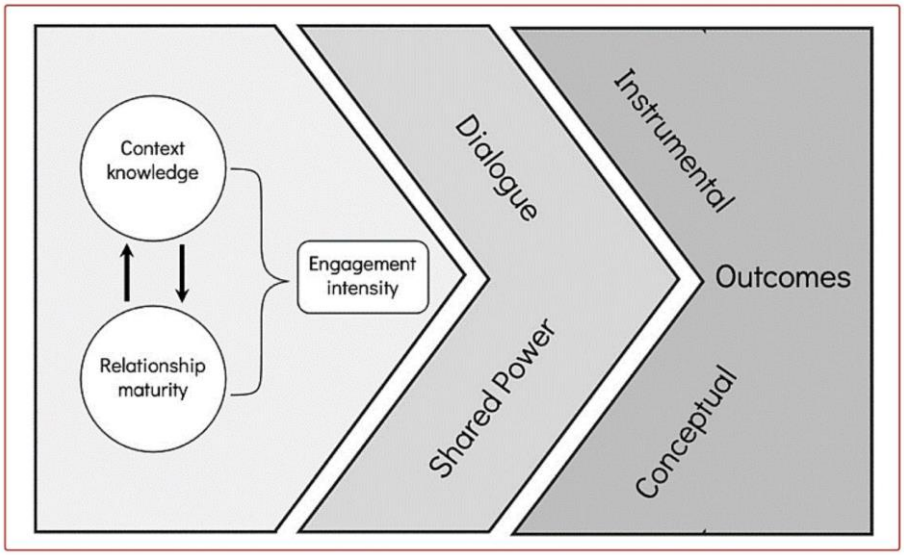
Figure 3: Opportunities for engaging society in research.



Source: Bowman et al. (2018).

Note: The Engaged Research Framework presents reflective questions to identify opportunities for community engagement and involvement across the research lifecycle.

Figure 4: Considerations for engaged participation.



Source: Ferguson et al. (2022).

Note: This model of engaged research emphasises contextual conditions and engagement intensity as a departure point to build a balanced distribution of power and outcomes conceptually sound and beneficial for the context.

This report delimitates SER from the perspective of the life sciences, the focus of the BETTER Life project. As defined by the Life Sciences and Biotechnology Strategy for Europe (European Commission, 2002), life sciences comprise the study of living organisms and ecosystems (microorganisms, plants, and human beings), which has applications in sectors such as health, agriculture, medicine, biotechnology, environmental protection, pharmacy, and food, among others. This field is highly relevant for Europe due to the fact that "life sciences and biotechnology are widely recognised to be, after information technology, the next wave of the knowledge-based economy, creating new opportunities for our societies and economies" (European Commission, 2002, p.7). Therefore, the role of life sciences in the near future requires the development of policies and strategies for effective governance at EU, country, and institutional levels. The EU started to develop these mechanisms in line with shifts in the governance of science, reflecting socially engaged research perspectives (Lyall & Tait, 2019). As a result, the European Commission is playing a prominent role in shaping the scientific research agenda through plans such as the Strategic Vision of Life Sciences and Biotechnology (2001), the Sciences and Biotechnology Strategy for Europe (2002), the Bioeconomy Strategy for Europe (2012), the New Bioeconomy Strategy for a Sustainable Europe (2018), and the European Green Deal (2020), among other actions.

The changes introduced by mode 3 of knowledge production, transdisciplinary approaches to research, steering policies, and funding requirements have direct implications at the institutional level. Internally, HEIs must redesign their career development pathways, funding attraction strategies, and institutional performance targets. Externally, HEIs have developed strategies to integrate the dynamics of local innovation, regional economic development and social relevance

measures (Nguyen & Meek, 2015; Shykhnenko & Sbruieva, 2021). To cope with these challenges, various European governments and institutions have adopted a New Public Management approach to higher education administration, characterised by efficiency and effectiveness principles, downsizing, agencification, contracting out, customer orientation and flexible employment practices (Kettl, 1997; Hammerschmid et al., 2018). Hence, science governance has to cope with managerial oversights, increased pressure to be aligned with policy agendas, accountability requirements, "ill-defined, controversial and sometimes moving targets" (Lyall & Tait, 2019, p.2). With this panorama, HEIs must consider shifts in the scientific, policy, regional, and institutional environments when designing their research strategies.

In summary, this introduction frames SER from theoretical, policy and practical perspectives. SER is rooted in the emergence of the third mission of higher education and mode 3 of knowledge production, which emphasises the interaction of research with societal stakeholders to generate positive and relevant impacts on society (Gibbons et al., 1994; Carayannis & Campbell, 2009; Godonoga & Sporn, 2022). From a policy perspective, the EU has played a key role in promoting science with and for society, responsible research and innovation, open science, and open innovation, among other strategies that support the implementation of a socially engaged agenda in research planning and implementation (European Commission, 2020; Scheller, et al., 2020). At the country level, some efforts have been made to frame the elements that constitute a research project into "engaged research" (Bowman, 2018; CampusEngage, 2019; Ferguson et al., 2022). Finally, at the institutional level, SER must face New Public Management institutional perspectives as well as increased pressures to align with diverse policy agendas. In the following pages, this report frames SER into its enabling mechanisms, implementation, opportunities and implications.

Methodology

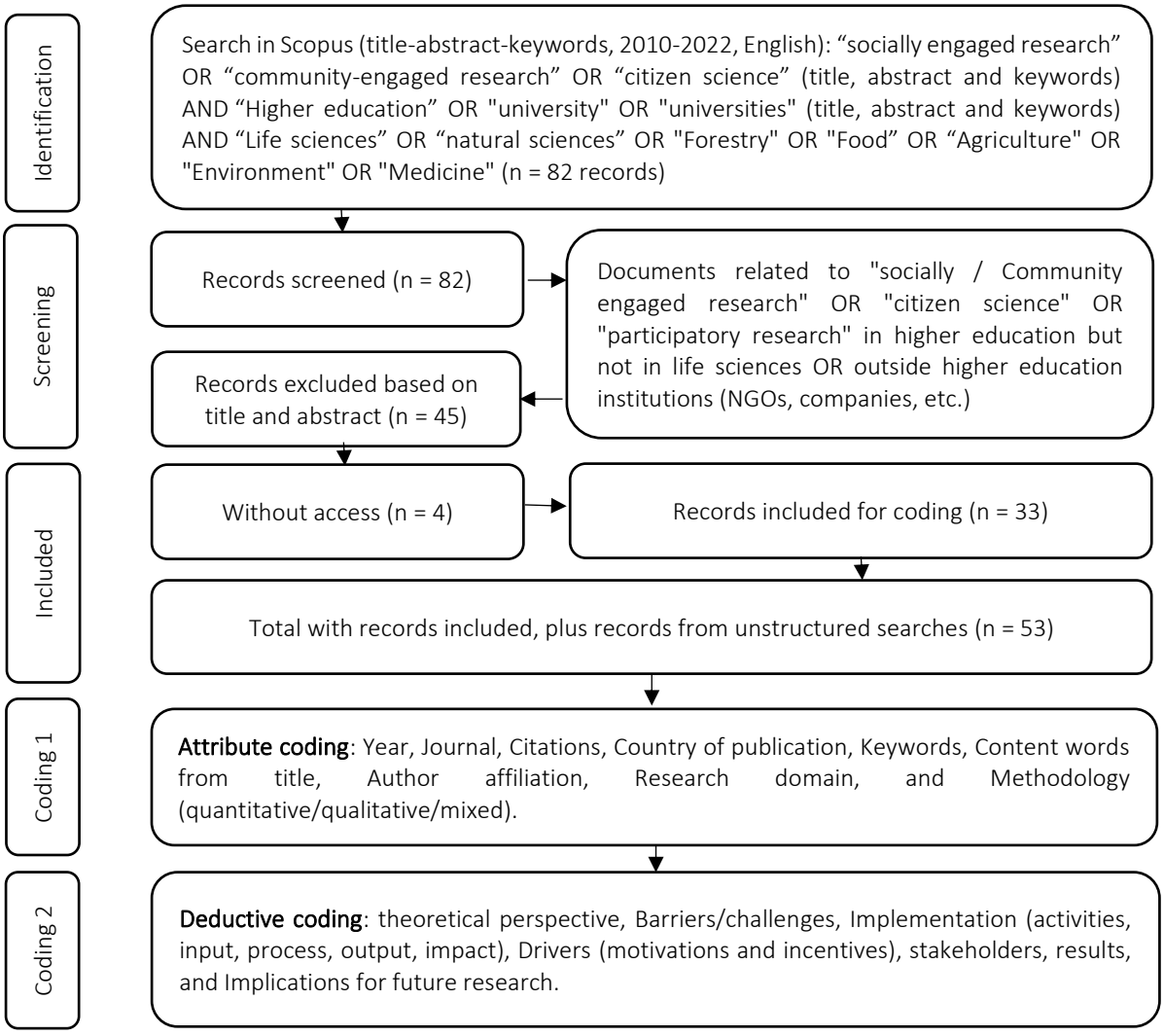
2. Methodology

This literature scanning aimed to map the state of the art of SER in life sciences to identify the definitions, characteristics, drivers, barriers, support mechanisms, stakeholders, and opportunities that frame it. This report provides a basis for defining the creation of the Digital Centre of Excellence for Socially Engaged Research in Life Sciences (BETTER Life), which provides a broad strategic picture rather than focusing on SER as a research strategy applied to specific projects.

Given the aim of the literature scanning, the consortium delimited the keywords related to SER in three keyword strings and searched within the title, abstract and keywords, using a timeframe from 2010 to 2022, in English, as illustrated in Figure 5. The three keyword strings are as follows:

- “Socially engaged research” OR “community-engaged research” OR “citizen science” (title, abstract and keywords) AND
- “Higher education” OR "university" OR "universities" (title, abstract and keywords) AND
- “Life sciences” OR “natural sciences” OR "Forestry" OR "Food” OR “Agriculture" OR "Economy" OR "Environment" OR "Medicine"

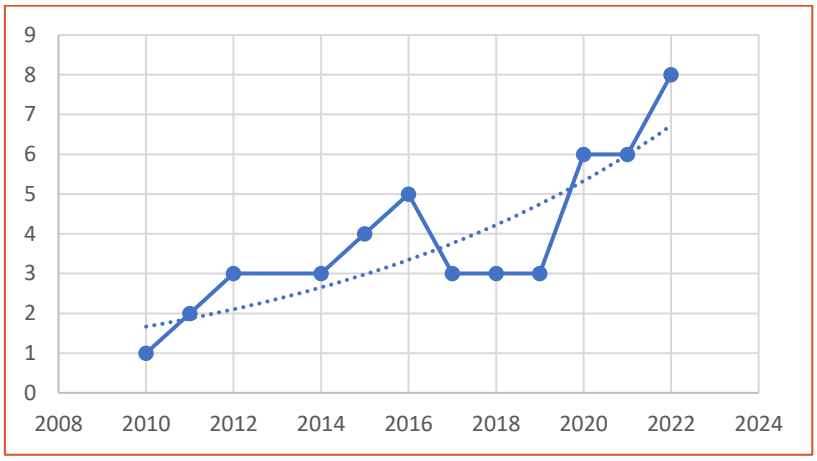
Figure 5: PRISMA flow diagram:



Note: This flow diagram illustrates the methodological decisions to delimit the sample.

The main significant descriptors of the final sample of documents are the year of publication, keywords and graph of collocated terms. Firstly, the year of publication showed a growing tendency in the number of publications, as shown in Figure 6.

Figure 6: Sample by year of publication



Secondly, the keywords and title content words showed a high frequency of use of the term CBPR. In fact, the keywords related to "social" were very scarce and mentioned only once in each keyword (social and economic impact, social engagement, social impact, social responsibility, and social-ecological research). In the title content words, socially engaged research was mentioned only twice, and engaged research five times. Additionally, it is to highlight the prominence of citizen science, participatory research and community-engaged research.

Table 1: Keywords and content words frequencies.

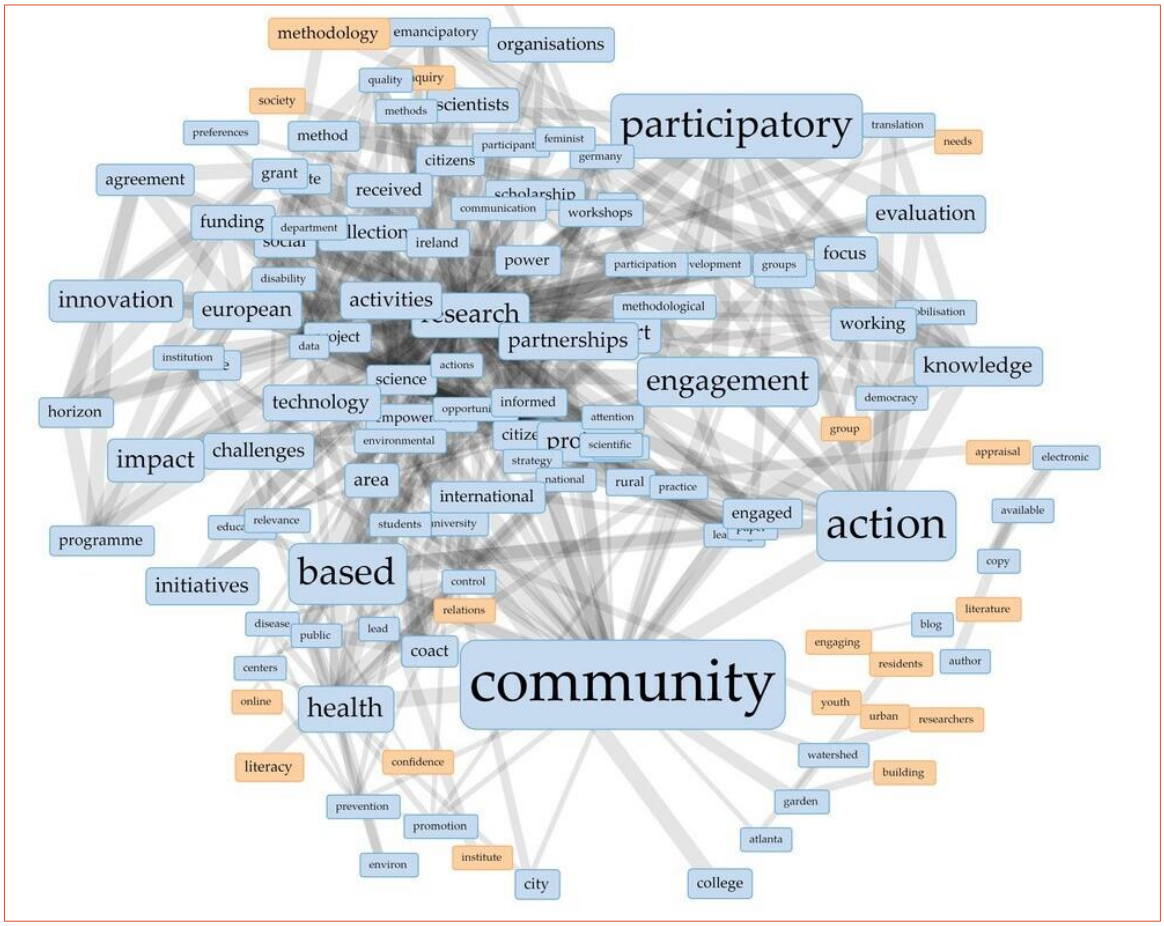
Keywords	Frequency	Title content words	Frequency
Community-based participatory research (CBPR)	14	Community-based participatory research (CBPR)	12
Citizen science	4	Citizen Science	8
Participatory research	4	Participatory research	8
Community-engaged research	3	Engaged research	5
Motivations	3	Community Research Partnership	4
Participation	3	Community-Engaged Research	3
Environmental Health	2	Partnership synergy	2
Food insecurity	2	Socially engaged research	2

The predominance of the keyword community-based participatory research (CBPR) was related to the predominance of the health/medicine field of study (38.3%). This correlation was evident in the document review since CBPR is a widespread practice in public health, epidemiology, and e-health. Moreover, the term citizen science was related to environmental studies (9%), biology (6.4%) and sustainability (4.7%). On the other hand, the title content terms related to "engaged" (engaged research, community-engaged research, and socially engaged research) were in fields such as higher education (6.4%) and environmental studies (4.3%). This difference could be supported by the fact that the European Commission, through diverse policies and funding strategies, has emphasized social engagement in higher education and research (CampusEngage et al., 2019; Godonoga & Sporn, 2022; Sattler et al., 2022). Additionally, the relationship between the "social" focus and higher education is reinforced by the theorization of the models of research and innovation with

frameworks such as the quadruple helix.

Third, the collocated words (high-frequency words that appear in proximity) analysis in the corpus of texts of the sample showed a dominant presence of the words community, participatory, action, based, engagement and research, as illustrated in Figure 7. At the same time, the word community was closely related to health (prevention, promotion, and public). Participatory was related to action, engagement, research and knowledge. Research was highly related to partnerships, innovation, Europe, technology, impact, power, etc. The collocated words figure confirmed that, on one hand, the emphasis of the sample on community participation, engagement and actions. On the other hand, it validated the key role of Europe, funding, partnerships, and citizens in the corpus of documents.

Figure 7: Collocated words.



Note: this collocate analysis was generated using the corpus of documents in the sample through Voyant Tools.

As illustrated in the PRISMA flow diagram (Figure 5), once the sample was defined and the main attributes were coded, the partners of the consortium proceeded to the analysis of the content of the corpus and the deductive coding.

Enabling mechanisms for SER

3. Enabling mechanisms for SER

3.1 Supporting mechanisms

At the policy level, the European Commission has advanced the implementation of SER by mandating the incorporation of concepts such as the quadruple helix, RRI, SwfS, and citizen science into the criteria for ex-ante funding of research proposals. These elements are also embedded in the Horizon Europe Programme (2021-2027), the primary funding mechanism in the EU, with a budget of €95.5 billion to support R&D and innovation. At the national level, various initiatives are aimed at integrating SER into national research strategies. For example, the Irish Research Council funds programs such as 'Research for Policy and Society', the 'New Foundations Scheme', and the 'Collaborative Research Fellowships for a Responsive and Innovative Europe - CAROLINE', which prioritise social engagement (CampusEngage, 2019). In the UK, the National Co-ordinating Centre for Public Engagement (NCCPE) supports the quality and impact of public engagement in higher education by utilising the EDGE tool (Embryonic, Developing, Gripping, and Embedded approaches to engagement). Recently, the Berlin School of Public Engagement and Open Science published the 'Principles of Public Engagement' (2022), intended to promote public engagement in Germany and embed collaboration between researchers and society as a fundamental aspect of research. These examples illustrate that, at the policy level, there is an increasing prioritisation of involving the public in the research landscape.

Networks and platforms are other critical mechanisms for advancing SER at national and international levels. This phenomenon has been labelled as the 'platformisation' of engagement (HIIG, 2020). The most outstanding network is the Living Knowledge International Science Shop Network, which promotes cooperation between research institutions and civil society organisations to formulate research questions, ideas, and agendas. The DESIS Lab Network is an initiative that brings together diverse laboratories focused on promoting design for social innovation and fostering meaningful social change. Additionally, various digital platforms support the implementation of projects that involve civic society participation, such as:

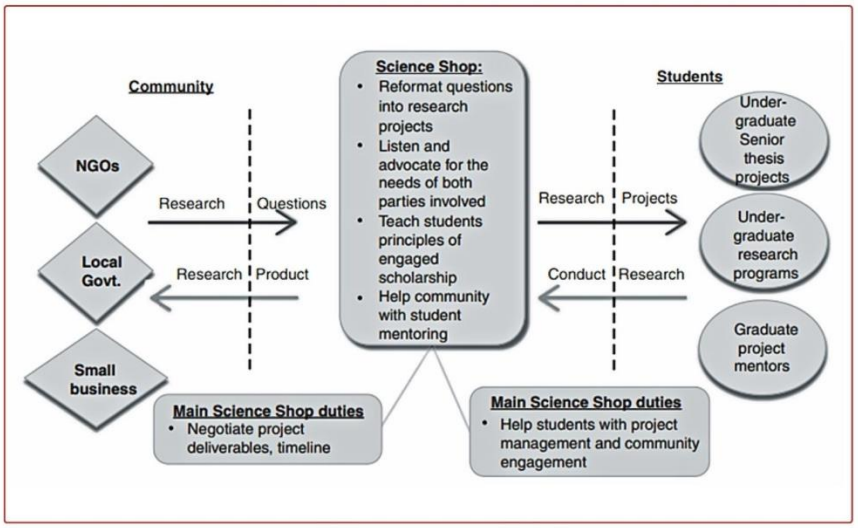
- Österreich Forscht (Austria Research).
- Bürger schaffen Wissen (Citizens Create Knowledge, Germany).
- Just One Giant Lab – JOGL (France).
- MICS: Measuring the impact of citizen science (Hungary, the Netherlands, Romania and the UK).
- Maptionnaire (Finland).
- CitizenLab (Belgium, the UK, USA).
- RRI Tools (Austria, Belgium, Bosnia and Herzegovina, Croatia, Czechia, Denmark and Estonia).
- EU.Citizen.Science (Austria, Belgium, Germany, Ireland, Lithuania, Portugal, Spain, the UK).
- InSPIRES Open Platform (Brazil, France, Hungary, Italy, the Netherlands, Portugal, Spain, and Tunisia).

These platforms provide visibility for digital and on-site collaboration, particularly for citizen science

projects. These networks and platforms play a crucial role in advancing digital SER globally by fostering collaboration and promoting public involvement in research.

At the institutional level, HEIs have implemented support units such as Science Shops, which serve as a liaison between HEIs and civil society organisations or local communities, facilitating collaborative problem-solving (Andrade et al., 2018; Barasine et al., 2018). Figure 8 illustrates how a support unit (science shop) operates for the SER.

Figure 8: Roles and processes in a science shop.



Source: Andrade, Cushing and Wesner (2018).

HEIs have also established research laboratories such as the POLIMI DESIS Lab, which brings together researchers to focus on systemic and strategic approaches to SER. Other universities have created internal platforms to support community-engaged research and enhance institutional social impacts, such as the Maastricht Platform for Community-Engaged Research (MPCER). Additionally, HEIs maintain databases of agreements and partnerships with local authorities, businesses, SMEs, and civil society organizations (Carballo-Cárdenas, 2016; Osborne, 2020; Trotter et al., 2021), which offer opportunities for SER and enable the development of sustainable and effective relationships.

HEIs not only implement internal support to promote SER but also establish guiding measures. Prominent examples of such support include 'Engage your Research: An Introductory Guide to Engaging & Involving the Public in Research' (UCD Dublin, 2021) and 'How to Engage with Society to Boost the Impact of Your Research' (Maastricht University, 2021). These guidelines align the HEI's research with national and international policy agendas, provide a strategic approach for engaging with societal stakeholders and define opportunities for researchers to implement SER. These measures are complemented with incentives such as competitive ex-ante funds for research proposals such as the 'Seed Fund for Engaged Research Initiatives' announced by the Erasmus University of Rotterdam in 2023. HEIs have also developed strategies for mentoring younger researchers, facilitating their networking with the local ecosystem, providing information dialogue opportunities, and supporting the design of research that generates social impact (Varumo et al., 2020; Ferguson et al., 2022).

The upskilling and deep-skilling of researchers, support staff, and non-academic stakeholders must be addressed at the institutional level. Training in SER must be comprehensive, covering all stages and complemented by institutional support mechanisms (Holliman & Warren, 2017). Scientists and non-academic stakeholders require guidelines, technology, examples, institutional strategies, and inspirational communication for effective participation (Bonn et al., 2018; CampusEngage 2019). Dedicated support staff who are trained in managing partnerships and orienting the process are also crucial, and they could be embedded in structures such as knowledge transfer offices, science shops, labs, and engagement offices. (Motala & Baatjes, 2015; CampusEngage, 2019). Additionally, the increasing popularity of digital citizen engagement through platforms and social networks presents opportunities to explore online methodologies of social engagement in research (Varumo et al., 2020). To effectively engage non-academic stakeholders in scientific research, research agendas need to build capacities to foster that engagement.

In addition, internal activities such as stakeholder mapping are crucial for supporting SER. According to Bonn et al. (2018), this helps identify and engage interested parties in research projects. This implies defining the level of inclusiveness in diverse projects that varies depending on the techniques used for SER. Onsite tools, spaces, and techniques, as well as digital technologies (social networks, open-source hardware, and software), can provide a means to empower participants from different backgrounds and expertise levels to become involved in scientific research, regardless of their formal education. The participation of stakeholders may vary according to the capacity, readiness, and maturity of the relationships (Trotter et al., 2021), and institutions must be ready to diagnose and tailor interventions according to each context.

Implementation of SER

4. Implementation of SER

4.1 Stakeholders

SER implies a total change in the audience of science, which in Mode 1 of knowledge production was academics, and, potentially, some derived applications. It means that one of the crucial issues in understanding SER is a new definition of the stakeholders in such kind of research. Stakeholders are not anymore only researchers operating in various areas of science but also societal actors such as policy makers, businesses communities, civil society and citizens or the Quadruple Helix (Fischer et al., 2021; Kok et al., 2021). The apparently clear delimitation between scientists investigating the world from an objective perspective, using unmistakable knowledge embedded in rigid methods, and the people who are living in the world using common sense to understand and operate their everyday knowledge is blurred (Giddens, 1993). The reason for such a shift vanishing the differentiation of stakeholders doing research is the erosion of the scientific role. The scientific role traditionally has been conceived as separated from the everyday world to ensure the purity of scientific investigation and to reflect the guiding principles. Nevertheless, modernity has confronted science with diverse social problems, which resulted in the emergence of post-isms such as post-modernity, or inter- and transdisciplinary approaches to research (Beck, 1992). Therefore, transdisciplinarity involves various stakeholders and is used “when knowledge about a problem field is uncertain when the concrete nature of problems is in dispute, and when much is at stake for those concerned by these problems” (Pohl & Hirsch Hadorn, 2007, p. 16)

Under such a panorama, stakeholders doing research are not only scientists but potentially they may be all members of society if they observe the principles of ethics (Wolff et al., 2019). Various stakeholders opened the window for using the synergy of the collaboration of actors from multiple academic disciplines together with actors from outside academia, such as government agencies or citizen groups. The academic and non-academic stakeholders who are involved in developing research mutually inform one another. This cooperation facilitates the co-creation of knowledge (Pohl & Hirsch Hadorn, 2007).

The literature review developed by Fernandez et al. (2021) showed that the interaction among stakeholders ranges from information, consultation, and collaboration to self-mobilization. In the classification of mentioned authors, there may be three types of stakeholders (apart from the professional researchers):

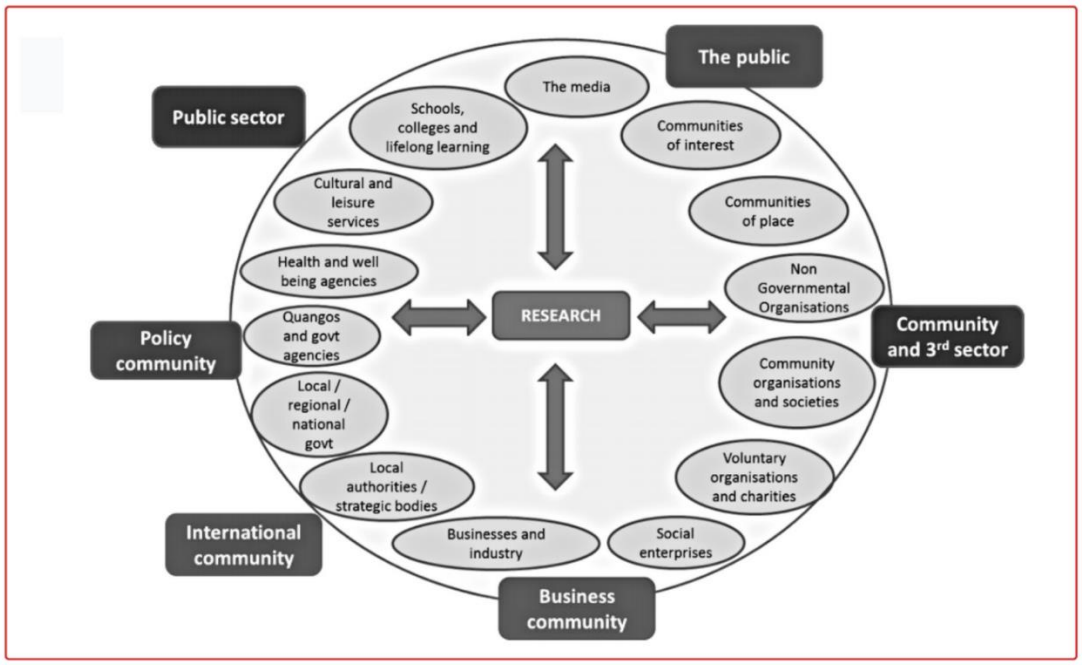
1. those who have local know-how;
2. those that science has marginalized and with whom researchers should collaborate and help strengthen skills and organization capacities;
3. those that are directly or indirectly affected by a problem, which means that all types of stakeholders (policymakers, farmers, consumers, etc.) should be included.

The idea about “those that science has marginalized” is in line with the discussion about power in relations among people. Kok et al. (2021) introduced the project Fit4Food 2030, which brings

together both the powerful (those whose voices as decision-makers are more heard such as big industries, or those in the positions to organize the research, for instance) and marginalized stakeholders (not so powerful but interested in research such as NGOs and citizens, among others). Together, both stakeholders produce the outputs of the project. Brining stakeholders with different power positions is important for the co-creation processes. It echoes the paradox of strong and weak ties described by M. Granovetter (1973), strong ties might be weak because of bringing the same information while weak ties might be strong because of providing the information needed.

Since the co-creation of knowledge is a form of cooperation implemented through social networks, and networks are by their nature endless, it is difficult (impossible) to name all potential stakeholders. NCCPE (2011) classified the stakeholders' groups in the general public, community and 3rd sector, business community, international community, policy community and public sector, as illustrated in Figure 9. These categories could be further delimitated and adapted to each context and most importantly, researchers may be involved with diverse stakeholders at the same time and play the role of the ones facilitating the dialogue.

Figure 9: diverse stakeholder groups with whom researchers could engage.



Source: NCCPE (2011).

Bringing together powerful and marginalized stakeholders will result in enriching both. Marginalized stakeholders may become powerful because of the knowledge they have and powerful stakeholders may become marginalized because their knowledge might lack any practical outcome. Only their cooperation has the potential to push forwards the research and knowledge generated by the research.

Non-academic stakeholders, especially those who are marginalized in public discourse, represent a challenge for the contemporary academic world because the proportion of disruptive findings in science is much lower than it was in the past in the relation to incremental findings (Kozlov, 2023).

The reason for science to be, in terms of Kuhn (1962), for a long time in a mode of a normal science without scientific revolution, is seen to be in the fact that large research teams produce more incremental than disruptive knowledge. They, as Granovetter (1973) suggested, are typified by "strong weak ties" because they are more common and therefore produce incremental knowledge (Kozlov, 2023). Marginalized stakeholders will bring into these teams "weak strong ties" and new information with local knowledge and with real problems they face.

Problem-driven research reflecting the real problems the stakeholders face contributes to societal challenges echoed by various stakeholders better than curiosity-driven research (Kok et al., 2021; Fischer et al., 2021). The nature of stakeholders influences the nature of the type of research and the research methods which are of participative type. Such an approach will also help to build trust between university researchers, NGOs, businesses, local administration or advisory companies. As Harris and Lyon (2013) documented, trust as a needed element for cooperation is to be built by having information on others, prior experience of working together, norms of cooperation, and sanctions exerted on those who might transgress norms of behaviour which is in line with game theory. Because we might see the trust between researchers and the non-academic stakeholders eroded such kinds of arrangements and involvement will be more than welcomed.

4.2 Methods and approaches

The methods and approaches to research in "engaged research" involves diverse terms involving a wide variety of research traditions. CampusEngage (2019) identified the most common terms used to describe engaged research methods:

> community action research, community based research, community, empowerment research, community readiness model, community service learning, community-university partnerships, co-operative inquiry, citizen science, citizens' summit, citizens hearing, decolonising methodology, design science method, Delphi method, emancipatory disability research, emancipatory research, engaged scholarship, feminist action research, focus groups, indigenous methodology, knowledge democracy, knowledge mobilization, knowledge translation, organisational action research, participant action research (PAR), participatory back-casting, participatory development, participatory evaluation, participatory research, participatory rural appraisal, scholarship of engagement, science shops, user committee, world café, action learning research, action research, arts-based research, arts-informed research, collaborative inquiry, among others (p. 26).

This constellation of terminology involves qualitative, quantitative and mixed methods, with a clear tendency to transdisciplinary research. Despite these methodologies clearly indicating a socially engaged perspective, it does not exclude that "more traditional" approaches could not include strategies for engaging social stakeholders in any of the stages of the research process.

In the literature analyzed for this report, the majority of the documents refer to concrete examples of applications of research, such as case studies and interventions (which are here broadly categorized as case studies). Some documents describe and compare examples of application whereas others rather describe a specific setting in which the method could be used. Additionally, two documents involve expert knowledge in their pursuit of forming a methodological basis. In general, most of the reviewed documents are case study-focused. Table 2 provides an overview of the findings of the literature review regarding the research approaches used by the studies.

Table 2: Approaches used in the sample of documents.

Approach	Frequency
Case study focused	33
Literature review	10
Other approaches	3
Literature-based documents	2
In total:	48

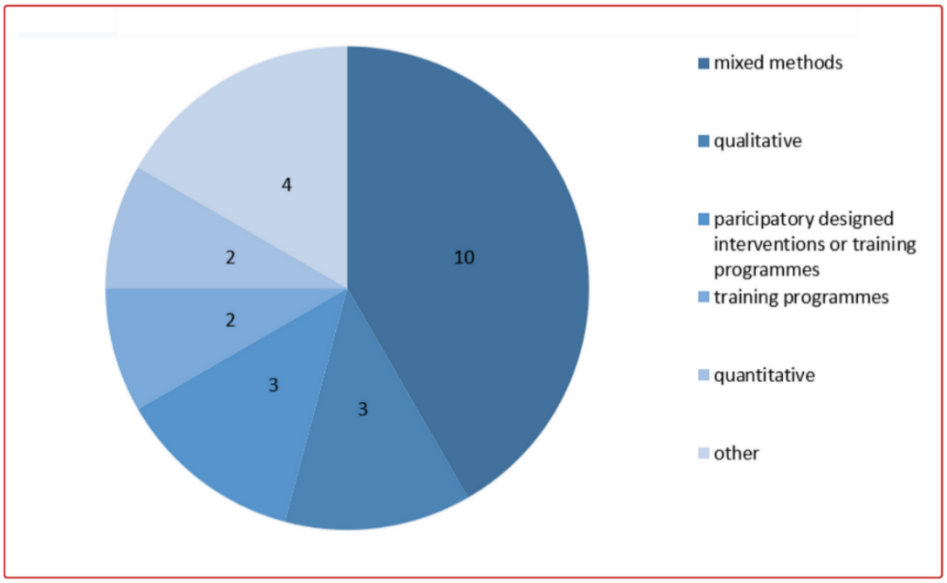
Out of the ten documents based on a literature review, one focuses on empirical studies, one on the application of methods, and three on a combination of literature reviews in junction with consultations or workshops. The other five documents work exclusively with a literature review. The scales of the analyses are both national and international depending on the setting and individual study. Further, two literature-based reflections form the basis for a discussion paper and provide an overview. Furthermore, the other approaches consist of mapping, discussions or interview approaches.

Among the 33 case-study-focused documents, nine sources compare diverse cases with each other.

Among them, four documents combine various qualitative methods and one case also considers quantitative methods. When combining the analyses of case studies with an empirical approach, most of the literature reviewed involved researchers, community members and representatives of NGOs.

Moreover, 24 documents refer to single case studies and interventions in diverse contexts. The methods and approaches used in the case studies vary from mixed methods to training programmes and qualitative or quantitative methods. Figure 10 provides an overview of the methods used by the documents focused on case studies.

Figure 10: Methods used in the case-study-focused documents.



The application of the mixed methods extends across data collection, mapping activities, interviews, surveys, interventions and focus group discussions. On average, between two and three methods were used. In two cases, photovoice as a special method is used.

Figure 11: Mixed methods used in the case-study-focused documents.

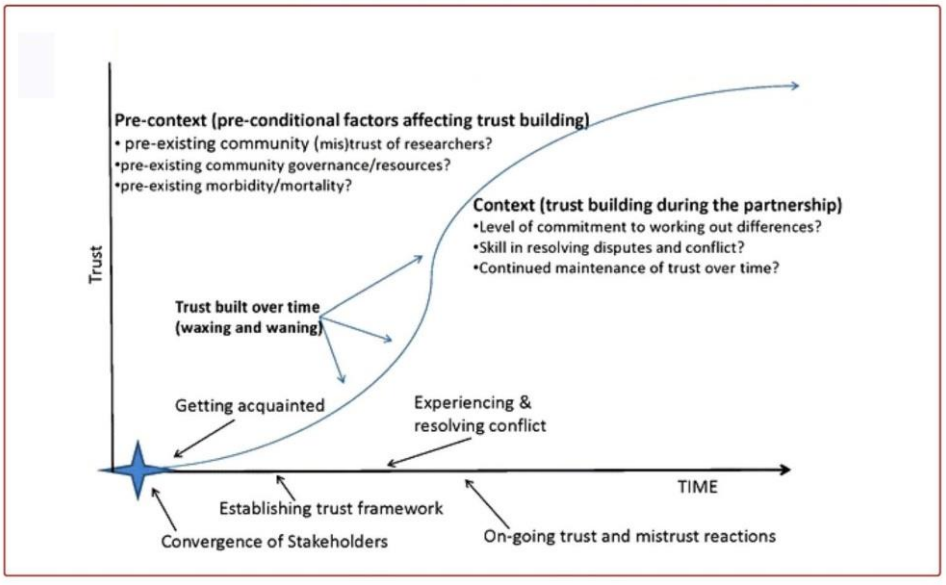
As shown by figure 11 the most frequently used mixed methods are interviews, mapping and data collection methods. Explorative approaches are conducted mainly through qualitative methods, training programmes or involving specific local researchers and experts. Additionally, quantitative methods were used in some of the studies to capture the attitudes and opinions of participants.

The sample sizes featuring participants involved in diverse studies range from a few people to large-scale studies involving more than one hundred participants. In four case studies, activities targeted specific ethnic groups. Additionally, other four cases involved students and young adults either defining them as the target group of the research or having them as co-researchers and multipliers of the project vision. Members of a particular community form the sample of three other case studies. Residents of a region make up the sample in five case studies. Overall, the case studies or projects indicate a broad variety of methods.

4.3 Inputs and Activities

Implementing SER requires the necessary inputs, particularly at the institutional level. First, institutions must strategically support and promote SER by developing institutional frameworks that identify common themes and internal policy recommendations related to SER (Osborne et al., 2020). Apart from mapping the external stakeholder groups with whom the institution might engage, it is necessary to determine the level of trust developed at the regional level, maturity of the relationships, trustworthiness, accuracy, and reliability (Jagosh et al., 2015; Holliman & Warren, 2017; Scheller et al., 2020). Figure 12 illustrates the trust pathway in partnership building, by referring to the pre-conditional factors, the context of the partnerships, and the development over time.

Figure 12: The pathway in partnership building.



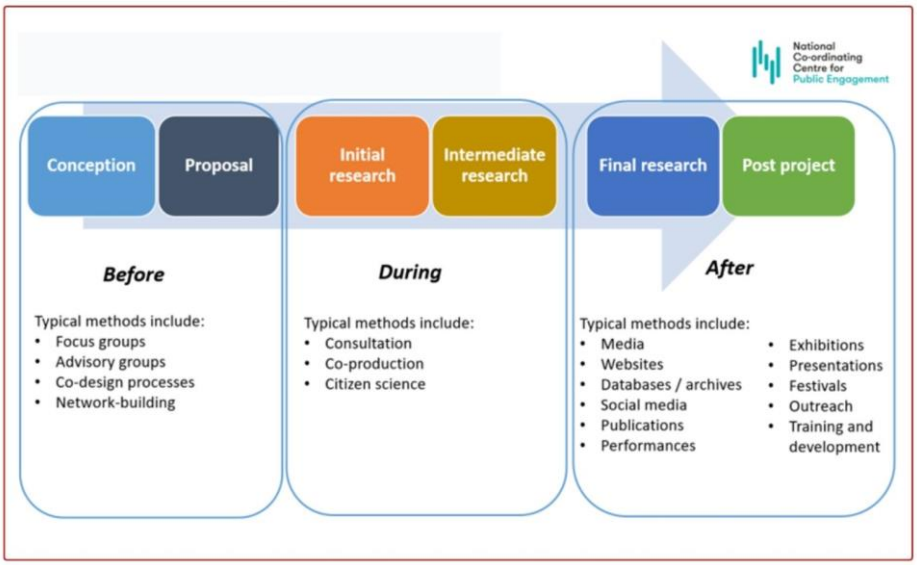
Source: Jagosh et al. (2015).

Jargosh et al. (2015) posit that "trust building and maintenance can make significant contributions to sustainability and systemic transformation which are key to both increasing the knowledge of factors supporting successful community-academic partnerships and transforming contexts to improve the conditions" (p. 10). Mature relationships may change the panorama of how SER approaches the institutional level.

At the project level, SER requires several inputs to ensure its successful implementation. These inputs include developing internal support mechanisms for researchers and external stakeholders to ensure they have the necessary resources and infrastructure to effectively engage in the research process. Additionally, SER requires defining the process and logistics of research, including opportunities for introducing engagement according to the requirements of each project, and the definition of necessary procedures such as informed consent, ethical procedures, dissemination requirements, data treatment, and intellectual property measures, among others (NCCPE, 2020; Trotter et al., 2021). Alignment of the interventions with the institution's strategies is essential to ensure that the research outcomes align with the institution's goals. SER requires the definition and logistics of the process to ensure that engagement is effectively integrated into the research process. The successful implementation of SER at the project level requires careful planning and consideration of necessary inputs to ensure that the research process is conducted ethically, sustainably, and effectively.

The definition of processes at the project level allows the identification of opportunities for engagement. Figure 3 (Engaged research framework) and Figure 4 (Considerations for engaged participation) illustrate the opportunities and requirements for social engagement. Both figures describe the process of engaged research and are complementary to Figure 13, which illustrates the research stages and the most representative opportunities for engagement at each stage.

Figure 13: Opportunities for engaging research with society.



Source: NCCPE (2020).

By using the NCCPE (2020) as a framework to classify the activities used before, during, and after the process of SER, the following classification collects the activities mentioned in the sample of

documents of this literature scanning:

Before the research process

- Stakeholders mapping, networking and agreements: Establishing agreements for research and innovation with industry, businesses and SMEs and Community asset mapping (Jagosh et al., 2015; Lightfoot et al., 2016; Scheller et al., 2020; Ferguson et al., 2022)
- Focus groups: stakeholders meetings and consultation events, Workshops for project design (Ferguson et al., 2022; Thomas & Cassidy, 2022).
- Training and orientation activities: training for social actors as a prerequisite to conducting research and guidelines to establish partnerships (Scheller et al., 2020)
- Customization of interventions, advisory groups, and co-design: community needs assessment, co-design workshops and community advisory boards (Jernigan et al., 2018; Mosavel et al., 2018; Mance et al., 2020)

During the research process

- Data gathering or data generation: monitoring and reporting on specific topics, mapping of community activities, gathering data about community processes, focus group discussions, cross-sectional assessments, group sessions, transcribing documents, classifying images, interviews, surveys volunteerism (Ablah et al., 2016; de Vries et al., 2019; Mejia et al., 2020; Greer et al., 2021; Ferguson et al., 2022; Nelson-Peterman et al., 2022).
- Decision-making and prioritization: Listing local concerns, raking of community priorities, consultation for policy design, public dialogue forums, and decisions on community interventions (Reich et al, 2015; Ablah et al., 2016; Greer et al., 2021).
- Training activities: service learning activities, online skilling and upskilling (Guin et al., 2012; Thomas & Cassidy, 2022).
- Online approaches: digital engagement, crowdsourcing, online consultation, online panels, digital activism and digital volunteering (Bonn et al., 2018; Thomas & Cassidy, 2022).

After the research process:

- Online engagement: social media, platforms, and mass media communication (Bonn et al., 2018; de Vries et al., 2019; Thomas & Cassidy, 2022).
- Training activities: workshops, conferences, short-training activities, etc. Guin et al., 2012; Thomas & Cassidy, 2022).
- Publications: revision and dissemination of publications (NCCPE, 2020).
- Other activities: festivals, exhibitions, fairs, etc. (NCCPE, 2020).

The ten Key principles for good practices in citizen science were developed by the European Citizen Science Association (2015).

1. Active involvement of citizens in scientific tasks that generates new knowledge.

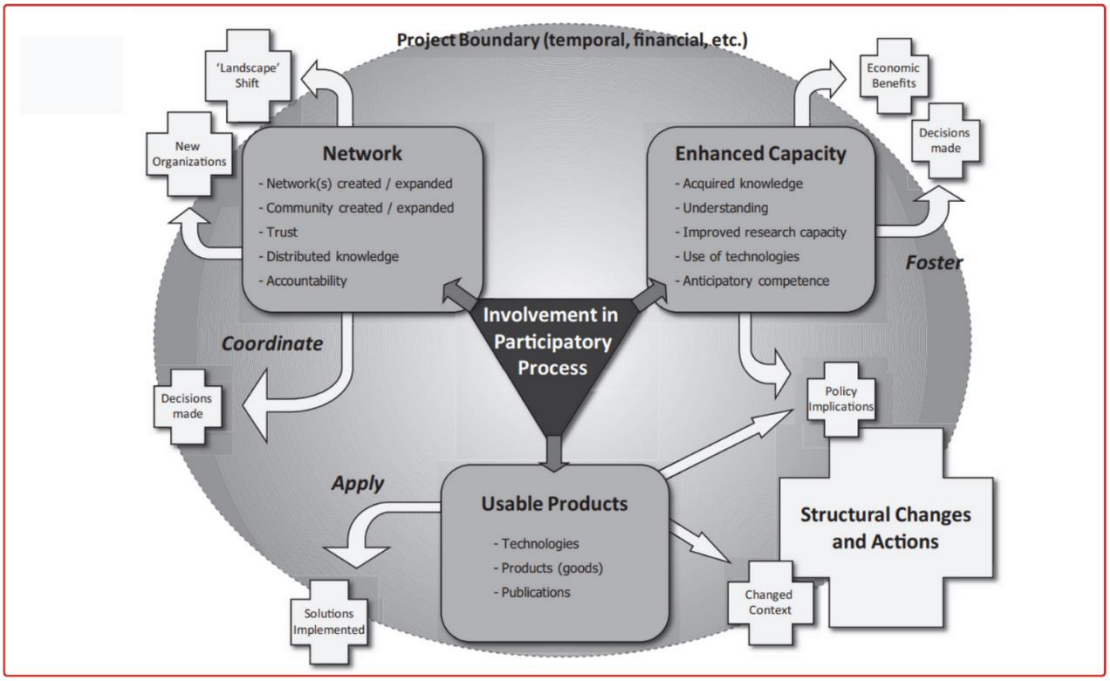
2. Genuine science outcomes such as answering a research question, informing conservation actions, contributing to management decisions or developing environmental policies.
3. Both scientists and citizen scientists benefit from taking part.
4. Citizen scientists are allowed to participate in multiple stages of the scientific process.
5. Citizen scientists receive continuous feedback from the project.
6. Citizen science is considered a research approach like any other, with limitations and biases that should be considered and controlled for.
7. Citizen science project data and meta-data are made publicly available and where possible, results are published in an open-access format.
8. Citizen scientists are acknowledged in project results and publications.
9. Citizen science programmes are evaluated for their scientific output, data quality, participant experience and wider societal or policy impact.
10. The leaders of citizen science projects take into consideration legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of any activities.

In conclusion, implementing SER requires a strategic commitment at the institutional level. To provide the necessary inputs, institutions formulate policy recommendations related to SER, develop internal frameworks, determine the level of trust developed at the regional level and map key stakeholder groups with whom to engage. At the project level, SER requires support mechanisms, defining the logistics of research, and aligning interventions with institutional strategies. Hence, the implementation of SER requires careful planning and consideration of the necessary inputs to ensure that the research process is conducted ethically, sustainably, and effectively.

4.4 Outputs and impacts

Evaluating outputs and impacts of SER has been highlighted to be as one of the key weaknesses in "engaged research" due to the contextual factors to which it is tied and the lack of reliable indicators and recognition mechanisms that measure impacts over time (Brush et al., 2020; Bonn et al., 2022; Ferguson et al. 2022). The immediate outputs that the stakeholders can expect are publications, learning opportunities, community activities, scientific data, solutions to specific problems, and potential influence on local policies. To better understand the impacts of SER, the framework developed by Wiek et al. (2014) explains the effects of participatory research over time, as illustrated by Figure 14.

Figure 14: Framework of effect categories of participatory research over time.



Source: Wiek et al. (2014).

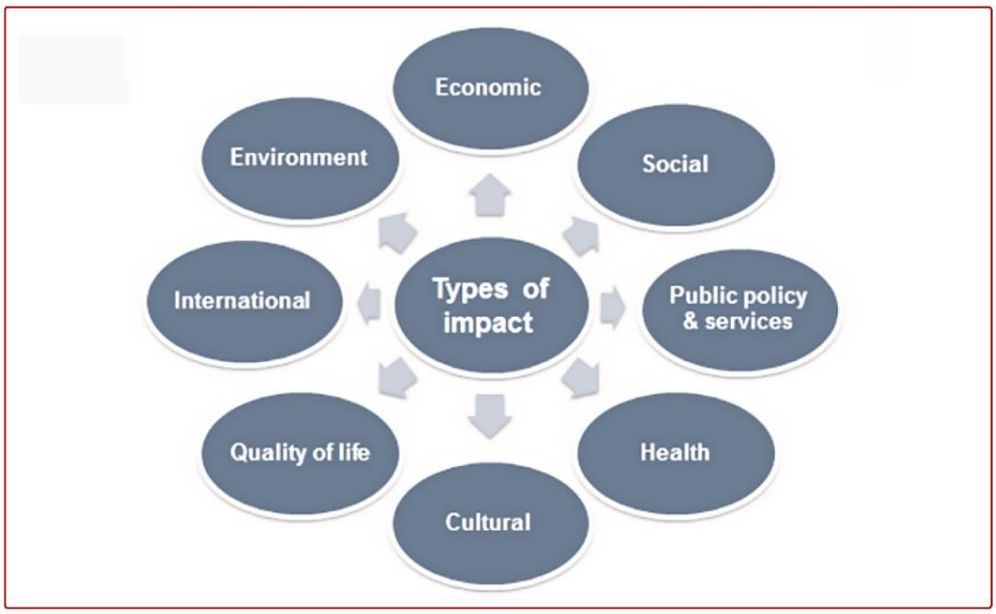
The framework of Wiek et al. (2014) links the participatory research process to products, capacity, and network effects. Further, the effects are related to wider structural changes and actions represented by the crosses (policy implications, decisions made, changed contexts, solutions implemented, economic benefits, new organizations, and landscape change. This framework represents a great way of framing the key outputs and impacts of engaged research in a project.

SER can generate significant impacts for diverse stakeholder groups in society. For example, it can empower local communities by providing them with a platform to voice their concerns and engage them in decision-making processes (CampusEngage et al., 2019). This can result in policies and initiatives that better reflect local needs. SER can also enhance the relevance and rigour of research by involving stakeholders in the research process, leading to more meaningful and impactful outcomes. Additionally, SER can help build links between academia and society, promoting a culture of collaboration and co-creation of knowledge (NCCPE, 2011). This results in greater trust,

understanding, and mutual benefits for researchers and stakeholders. Finally, SER can lead to more equitable, sustainable, and inclusive societies by promoting social justice, environmental sustainability, and democratic participation.

Accoring to NCCPE (2011), engaging research with society can generates eight types of impacts: economic, social, public policy & services, health, cultural, quality of life, international, and environmental. Figure 15 illustrates the impacts generated by engaging research with society according to NCCPE (2011). This classification of impacts was reorganized by CampusEngage (2019) which proposed similar categories in eight categories: economic, social and cultural, policy and/or product development, health and wellbeing, professional and public services, international, environmental, and capacity building.

Figure 15: types of impact generated by engaging research with society.



Source: National Coordinating Centre for Public Engagement - NCCPE (2011).

By using the NCCP (2011) framework to classify the impacts of SER, the results are:

- Economic: new innovative products, and new services for regional residents (Wiek et al., 2014; Mosavel et al., 2018; Vesalides et al., 2021).
- Social: Resilience, adaptation and management of social change, consolidation of networks, solutions with better social legitimacy better dissemination of science (Wiek et al., 2014; Brush et al., 2020; Vesalides et al., 2021; Ferguson et al., 2022).
- Public policy & services: Environmental management, dialogue among diverse stakeholders acceptance and legitimacy of decision-making, improved policy implementation, awareness-raising and mutual learning. (Brush et al., 2020; (Varume et al., 2020; Vesalides et al., 2021).
- Health: health prevention, development of new medicines and treatments, and mental health support (Murawiec et al. 2018; Oetzel et al., 2022).

- Cultural: educational programmes, Traditional knowledge valorised, trained to serve as community researchers, development of the capacity of agency in communities (Mosavel et al., 2018; Vesalides et al., 2021; Oetzel et al., 2022).
- Quality of life: improvement of local conditions, inclusivity, attraction of volunteer work aspects of the study design, implementation, data analysis, and dissemination (a more detailed description is provided elsewhere. (Mosavel et al., 2018; Brush et al., 2020; Vesalides et al., 2021).
- International: international networks and support mechanisms.
- Environmental: Nature conservation, mitigation of climate change (Vesalides et al., 2021; Ferguson et al., 2022).

The main differences between the NCCPE and the CampusEngage frameworks are the merging of the cultural impact category with the societal one, and the inclusion of one category for capacity building that groups education, training, and development of capacities. The limitation of both frameworks is not including academic impacts such as improving methods of research and promotion of collaborative research methods (Vesalides et al., 2021; Ferguson et al., 2022). This limitation is aligned with the need of developing academic mechanisms for quality assurance, data standards and recognition systems, as mentioned by Bonn et al. (2022) and Ferguson et al. (2022).

Implications for Future Developments

5. Conclusion – Implications for future developments

SER is a holistic approach for research in continuous development, with several elements to be addressed in future research. From a scientific perspective, SER requires moving beyond the discussion about the dichotomy between disciplinary and transdisciplinary research (Ferguson et al., 2022); addressing the discussions about scientific values and knowledge commodification (Motala & Baatjes, 2015); developing normative scientific conventions for effective peer review processes (Motala & Baatjes, 2015); developing data standards, metrics assessing social impact, social involvement in assessment processes, and scientific reputation and recognition systems (Bonn et al., 2022; Ferguson et al., 2022); and evaluating ethical implications of social involvement in sensitive topics (Carballo-Cárdenas & Tobi, 2016). These elements are crucial for ensuring the successful embedding of SER in HEIs.

From the perspective of processes, benefits, and impacts on society, one of the main challenges is defining and measuring the social impact (Scheller et al., 2020). To advance the understanding of the full impact of SER, it is crucial to examine how social impact can be measured, how SER generates social impacts, what types of impacts SER generates, who benefits from them, and what variables are linked to intermediate- and long-term outcomes (Oetzel, 2012; Bonn et al., 2018; Scheller et al., 2020; Godonoga & Sporn, 2022). Advancements are needed to understand the links between research approaches and societal effects they may generate (Wiek et al., 2014). Therefore, it is necessary to better comprehend the social agency, resources, and ownership of the change processes (Scheller et al., 2020). Additionally, the quality assurance processes of the results are crucial in determining the SER of the society (Scheller et al., 2020). Addressing these elements will help to ensure that SER has a meaningful and lasting impact on society.

At the institutional level, from the perspective of research planning and management, there is a need to improve the definition of institutional commitment, strategy, goals, support mechanisms, and general encouragement (Ferguson et al., 2022). There is a need to manage institutional cultural change through interventions that focus on defining staff roles, support, processes, and purposes (Holliman & Warren, 2017). To facilitate collaboration between HEIs and community-based organisations, it is necessary to advance the support and management of data and the quality of the relations between researchers and stakeholders, providing the conditions for the establishment of those relationships, and defining those processes and the conditions of those agreements (CampusEngage, 2019; Thomas & Cassidy, 2020; Trotter et al., 2021; Vasiliades et al., 2021). Failure cases should be carefully examined to advance the building and maintenance of trust in society (Jagosh et al., 2015). Additionally, institutions must implement measures to provide flexible scheduling and timetabling, and the workload of researchers should be considered (CampusEngage 2019). Moreover, internal funding and incentives are crucial elements in embedding SER into HEIs.

HEIs also need to define the elements of citizens' participation in their context: their views, needs, motivations, levels of engagement, and benefits. Researchers have highlighted that it is necessary to move beyond the passive role of citizens as data collectors by defining the level of citizen participation as co-creators or co-researchers, among other roles (Scheller et al., 2020; Vasiliades et al., 2021. This might require identifying the motivations of communities to participate, which would

depend on each context (Bonn et al., 2018). This delimitation must be accompanied by strategies to increase inclusiveness (gender, class, ethnicity, or hard-to-reach communities), accessibility, and applicability of research (Scheller et al., 2020; Valladares, 2021). Underrepresentation of certain social sectors might be an urgent concern for certain communities (Hobbs & White, 2012). These elements are crucial for ensuring the successful embedment of citizens' participation in research.

The communication of science to civil society has also been highlighted as a compelling concern in several studies. Effective communication of research to citizens is crucial in developing and incentivising participation (de Vries et al., 2019). This requires clarity, consistency, and innovative strategies in the communication of engaged research agendas to researchers, support staff, and nonacademic stakeholders (Holliman & Warren, 2017). Addressing power relations in the communication process, creating a safe communicative space and channels, and establishing the effectiveness of regional communication with communities could be crucial elements for building a regional reputation, trust, and motivation to participate (CampusEngage, 2019; Scheller et al., 2020).

In sum, the successful implementation of SER in HEIs requires addressing several key elements, such as scientific processes and skills, institutional management and support, citizens' participation in science strategies, and communication of science to civil society, among others. Addressing these elements will help ensure that SER in higher education institutions has a meaningful and lasting impact on society and can effectively communicate its impact to the wider society and the scientific community.

References

Ablah, E.; Brown, J.; Carroll, B.; Bronleewe, T. (2016). A Community-Based Participatory Research Approach to Identifying Environmental Concerns. Journal of environmental health, 79, 5, Pp 14-19.

Accreditation Council for Entrepreneurial and Engaged Universities -ACEEU. (2016). Standards and Guidelines: Engaged university Accreditation. https://www.aceeu.org/docs/ACEEU_Standards_and_Guidelines_Engaged_University_v1.0.pdf

Andrade, K., Cushing, L., Wesner, A. (2018). Science Shops and the U.S. Research University: A Path for Community-Engaged Scholarship and Disruption of the Power Dynamics of Knowledge Production. In: Mitchell, T., Soria, K. (eds) Educating for Citizenship and Social Justice. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-62971-1_11

Artheau, M., et al. (2013). Responsible Research and Innovation: A quick start guide for science engagement organisations. RRI Tools project. https://www.ecsite.eu/sites/default/files/quick_start_guide_in_rri.pdf

Barasini, F. et al. (2018). Science Shop: Establishment Guide. SciShops Project. https://www.scishops.eu/resources/science-shops-establishment-guide/

Barker, K. (2015). "The Challenging Australian Policy Context for University Engagement." Journal of Higher Education Policy and Management 37 (5): 477–489. www.doi.org/10.1080/1360080X.2015.1079384

Baruch, A, May, A and Yu, D. (2016). The motivations, enablers and barriers for voluntary participation in an online crowdsourcing platform. Computers in Human Behavior, 64: 923–931. DOI: https://doi.org/10.1016/j.chb.2016.07.039

Beck, U. (1992). Risk Society (Towards a New Modernity). Translated from German by Mark Ritter). Sage Publications.

Belansky, E. S., Cutforth, N., Chavez, R. A., Waters, E., & Bartlett-Horch, K. (2011). An adapted version of intervention mapping (AIM) is a tool for conducting community-based participatory research. Health Promotion Practice, 12(3), 440-455. https://doi.org/10.1177/1524839909334620

Belone, L., Lucero, J., Duran, B., Tafoya, G., Baker, E., Chan, D., and Wallerstein, N. (2016). Community-based participatory research conceptual model: Community partner consultation and face validity. Qualitative Health Research, 26, 117-135.

Benneworth, P.S., Ćulum, B., Farnell, T., Kaiser, F., Seeber, M., Šćukanec, N., Vossensteyn, H. & Westerheijden, D.F. (2018). Mapping and Critical Synthesis of Current State-of-the-Art on Community Engagement in Higher Education. Zagreb: Institute for the Development of Education.

Bonn, A et al., (2022) Citizen Science Strategy 2030 for Germany. Helmholtz-Gemeinschaft, Leibnitz-Gemeinschaft, Universitäten und außeruniversitäre Einrichtungen, Leipzig, Berlin SocArXiv. https://doi.org/10.5281/zenodo.7117771

Bonn, A., Hecker, S., Bowser, A., Makuch, Z., Vogel, J., & Haklay, M. (2018). Citizen Science: Innovation in Open Science, Society and Policy. In Hecker, S., Haklay, M., Bowser, A., Makuch, Z., Vogel, J., & Bonn, A. (Eds.). Citizen Science: Innovation in Open Science, Society and Policy. UCL Press. pp. 465-484 https://www.jstor.org/stable/j.ctv550cf2.38

Bowman, S., et al. (2018). A Framework for Engaged Research: Society and Higher Education Addressing Grand Societal Challenges Together. https://www.campusengage.ie/wp-content/uploads/2018/12/Framework_for_Engaged_Research_May_18_Web.pdf

Brockhage, F., Lüsse, M., Klasmeier, J., Pietzner, V., & Beeken, M. (2022). Citizen Science as an Innovative Approach to Analyze Spatial and Temporal Influences on Nitrate Pollution of Water Bodies: Results of a Participatory Research Project in Germany. Sustainability, 14(15), 9516. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su14159516

Brush, B. L., Mentz, G., Jensen, M., Jacobs, B., Saylor, K. M., Rowe, Z., ... & Lachance, L. (2020). Success in long-standing community-based participatory research (CBPR) partnerships: A scoping literature review. Health Education & Behavior, 47(4), 556-568. https://doi.org/10.1177/1090198119882989

Campus Engage, Iris university Association-IUA, & Irish Research Council. (2019). Engaged Research: Society and Higher Education. http://www.campusengage.ie/wp-content/uploads/2019/01/FINAL-JAN-16_ER-Report-2016-Jan-v2.pdf

Carayannis, E. and Campbell, D. (2009). 'Mode 3' and 'Quadruple Helix': Toward a 21st Century Fractal Innovation Ecosystem, *International Journal of Technology Management* 46, no. ¾, pp. 201–34. https://doi.org/10.1504/IJTM.2009.023374

Carballo-Cárdenas, EC and Tobi, H. (2016). Citizen science regarding invasive lionfish in Dutch Caribbean MPAs: Drivers and barriers to participation. Ocean & Coastal Management, 133: 114–127. DOI: https://doi.org/10.1016/j.ocecoaman.2016.09.014

Chesbrough, H. (2015). From Open Science to Open Innovation. ESADE. https://www.fosteropenscience.eu/sites/default/files/pdf/1798.pdf

CyberValley and Berlin School. (2022). The Principles of Public Engagement: How we shape the dialogue between research and the public. https://www.publicengagement.berlin/the-principles

de Vries, M., Land-Zandstra, A. and Smeets, I. (2019). Citizen Scientists' Preferences for Communication of Scientific Output: A Literature Review. Citizen Science: Theory and Practice, 4(1), pp.2-13. http://doi.org/10.5334/cstp.136

ECSA (European Citizen Science Association). 2015. Ten Principles of Citizen Science. Berlin. https://zenodo.org/record/5127534#.Y8bFdXbMKUm

European Commision (2022). Open Science and Intellectual Property Rights. Directorate-General for Research and Innovation: How can they better interact? state of the art and reflections. https://data.europa.eu/doi/10.2777/347305

European Commission (2019). Open science. https://research-and-innovation.ec.europa.eu/system/files/2019-12/ec_rtd_factsheet-open-science_2019.pdf

European Commission, Directorate-General for Communication, Directorate-General for Research and Innovation. (2013). Responsible research and innovation (RRI), science and technology: report, Publications Office. https://data.europa.eu/doi/10.2777/45726

European Commission, Directorate-General for Research and Innovation, Open innovation. (2016). Open science, open to the world: a vision for Europe, Publications Office, https://data.europa.eu/doi/10.2777/061652

European Commission, Directorate-General for Research and Innovation, Wellen, D., Vermeulen, E., Andersen, B., et al., (2014) Boosting open innovation and knowledge transfer in the European Union : independent expert group report on open innovation and knowledge transfer, Publications Office. https://data.europa.eu/doi/10.2777/72620

European Commission, Directorate-General for Research and Innovation, Iagher, R., Monachello, R., Warin, C., et al., (2020). Science with and for society in Horizon 2020: achievements and recommendations for Horizon Europe. Publications Office. https://data.europa.eu/doi/10.2777/32018

European Commission. (2002). Life sciences and biotechnology: A strategy for Europe. https://ec.europa.eu/biotechnology/pdf/com2002-27_en.pdf

European Committee of the Regions, Volpe, M., Friedl, J., Cavallini, S., et al. (2016). Using the quadruple helix approach to accelerate the transfer of research and innovation results to regional growth. Committee of the Regions. https://data.europa.eu/doi/10.2863/408040

Farnell, T. (2020). Community engagement in higher education: trends, practices and policies. NESET report, Luxembourg: Publications Office of the European Union. www.doi.org/10.2766/071482

Ferguson, D.B., Meadow, A.M. & Huntington, H.P. (2022). Making a Difference: Planning for Engaged Participation in Environmental Research. Environmental Management 69, 227–243. https://doi.org/10.1007/s00267-021-01585-5

Fernández González, C., Ollivier, G., Bellon, S. (2021). Transdisciplinarity in agroecology: practices and perspectives in Europe, Agroecology and Sustainable Food Systems, 45: 4.

Fischer, J., Riechers, M., Loos, J. Martin-Lopez, B., Temperton, V.M. (2021). Making the UN Decade on Ecosystem Restoration a Social-Ecological Endeavour. Trends in Ecology & Evoluation 36 (1): 20-28. https://doi.org/10.1016/j.tree.2020.08.018

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., and Trow, M. (1994) The new production of knowledge: the dynamics of science and research in contemporary societies. London: Sage.

Giddens, A. (1993). New Rules of Sociological Method: A Positive Critique of Interpretative Sociologies. Stanford University Press (second edition).

Godonoga, A. & Sporn, B. (2022). The conceptualisation of socially responsible universities in higher education research: a systematic literature review, Studies in Higher Education. https://doi.org/10.1080/03075079.2022.2145462

Granovetter, M.S. (1973). The Strength of Weak Ties. American Journal of Sociology 78 (6): 1360-1380.

Grant J, Nelson G, Mitchell T. (2008). Challenges of participatory action research: relationships, power, participation, change and credibility. In: Reason P, Bradbury H (eds) The SAGE Handbook of Action Research. SAGE Publications Ltd., Thousand Oaks, https://doi.org/10.4135/9781848607934

Greer, A.E.; Martinez-Carrasco, A.; Goldsman, D.; Knausenberger, A.-U. (2021). Walking Toward a Brighter Future: A Participatory Research Process to Advocate for Improved Walk-to-School Corridors. Health Promotion Practice Vol. 22, No. (2) 248–256. https://doi.org/10.1177/1524839919890872

Guin, S. M., Wheat, J. R., Allinder, R. S., Fanucchi, G. J., Wiggins, O. S., & Johnson, G. J. (2012). Participatory research and service-learning among farmers, health professional students, and experts: An agromedicine approach to farm safety and health. Journal of Agromedicine, 17(1), 22-29. http://dx.doi.org/10.1080/1059924X.2012.627319

Haklay, M. (2015). Citizen Science and Policy: A European Perspective. Woodrow Wilson International Center for Scholars. https://www.wilsoncenter.org/sites/default/files/media/documents/publication/Citizen_Science_Policy_European_Perspective_Haklay.pdf

Hammerschmid, G., Van de Walle, S., Andrews, R., & Mostafa, A. (2018). New Public Management reforms in Europe and their effects: findings from a 20-country top executive survey. International Review of Administrative Sciences, 0(0), https://doi.org/10.1177/0020852317751632

Harris, F., Lyon, F. (2013). Transdisciplinary environmental research: Building trust across professional cultures. Environmental Science & Policy 31: 109-119

Hobbs, SJ and White, PCL. (2012). Motivations and barriers in relation to community participation in biodiversity recording. Journal for Nature Conservation, 20(6): 364–373. DOI: https://doi.org/10.1016/j.jnc.2012.08.002

Holliman, R. (2017). Supporting excellence in engaged research. JCOM 16 (05), C04. https://doi.org/10.22323/2.16050304

Holliman, R. and Warren, C.J. (2017). Supporting future scholars of engaged research. Research for All, 1 (1), pp. 168–84. https://doi.org/10.18546/RFA.01.1.14

Humboldt Institute for Internet and Society -HIIG. (2020). Third Civic Engagement Report: Future of civil society: Youth civic engagement in the digital age. https://www.bmfsfj.de/resource/blob/159512/75022eae56070dc8e064bb5899335af1/dritter-engagementbericht-englisch-data.pdf

Jagosh, J., Bush, P.L., Salsberg, J. et al. (2015). A realist evaluation of community-based participatory research: partnership synergy, trust building and related ripple effects. BMC Public Health 15, 725. https://doi.org/10.1186/s12889-015-1949-1

Jernigan, V. B. B., Williams, M., Wetherill, M., Taniguchi, T., Jacob, T., Cannady, T., Grammar, M., Standridge, J., Fox, J., Wiley, A., Tingle, J., Riley, M., Spiegel, J., Love, C., Noonan, C., Weedn, A., & Salvatore, A. L. (2018). Using community-based participatory research to develop healthy retail strategies in Native American-owned convenience stores: The THRIVE study. Preventive medicine reports, 11, 148–153. https://doi.org/10.1016/j.pmedr.2018.06.012

Kettl, D. (1997). The Global Revolution in Public Management: Driving Themes, Missing Links', Journal of Policy Analysis and Management, 16: 446–462.

Knapp NC, Reid SR, Fernández-Giménez EM, Klein AJ, Galvin AK (2019) Placing transdisciplinarity in context: a review of approaches to connect scholars, society and action. Sustainability 11. https://doi.org/10.3390/su11184899

Kok, K.P.W., Gjefsen, M.D., Regeer, B.J.,Broerse, J.E.W. (2021). Unraveling the politics of 'doing inclusion' in transdisciplinarity for sustainable transformation. Sustainability Science 16: 1811–1826. https://doi.org/10.1007/s11625-021-01033-7

Kou, H., Zhang, S., & Liu, Y. (2019). Community-Engaged Research for the Promotion of Healthy Urban Environments: A Case Study of Community Garden Initiative in Shanghai, China. International journal of environmental research and public health, 16(21), 4145. https://doi.org/10.3390/ijerph16214145

Kozlov, M. (2023). Disruptive' science has declined — and no one knows why. Nature, 613 (12 January 2023), 225. https://www.nature.com/articles/d41586-022-04577-5

Kuhn, T.S. (1962). The Structure of Scientific Revolutions. University of Chicago Press.

League of European Research Universities – LERU. (2018). Open Science and its role in universities: A roadmap for cultural change. https://www.leru.org/files/LERU-AP24-Open-Science-full-paper.pdf

Lebeau, Y. and Bennion, A. (2014). Forms of Embeddedness and Discourses of Engagement: A Case Study of Universities in Their Local Environment. Studies in Higher Education 39 (2): 278–293. www.doi.org/10.1080/03075079.2012.709491.

Leišytė, L. (2008). The Effects of New Public Management on Research Practices in English and Dutch Universities. In Universities as Centres of Research and Knowledge Creation: An Endangered Species? Brill. https://doi.org/10.1163/9789087904807_018

Lightfoot, E., Blevins, J., Lum, T., Dube, A. (2016). Cultural health assets of somali and oromo refugees and immigrants in minnesota: Findings from a community-based participatory research project. Journal of Health Care for the Poor and Underserved, 27, 1, February 2016, Pp 252-260. https://doi.org/10.1353/hpu.2016.0023

Lyall, C. & Tait, J. (2019). Beyond the limits to governance: New rules of engagement for the tentative governance of the life sciences. Research Policy, 5, (48). www.doi.org/10.1016/j.respol.2019.01.009

Maastricht University. (2021). Guide 5: how to engage with society to boost the impact of your research. Guide 5: how to engage with society to boost the impact of your research. Faculty of Law. https://www.maastrichtuniversity.nl/about-um/faculties/faculty-law/research/how-promote-your-research/step-2-create-%E2%80%98how-%E2%80%99-guides-3

Mance, G. A., Rodgers, C. R. R., Roberts, D., & Terry, A. (2020). Deeply Rooted: Maximizing the Strengths of a Historically Black University and Community-based Participatory Research to Understand Environmental Stressors and Trauma among Black Youth. American journal of community psychology, 66(3-4), 256–266. https://doi.org/10.1002/ajcp.12452

Mejia, A., Bhattacharya, M., Miraglia, J., & Village Community Garden & Learning Center (2020). Community Gardening as a Way to Build Cross-Cultural Community Resilience in Intersectionally Diverse Gardeners: Community-Based Participatory Research and Campus-Community-Partnered Proposal. JMIR research protocols, 9(10), e21218. https://doi.org/10.2196/21218

Mezzana, D. (2020). Mainstreaming RRI in biosciences and beyond: a quadruple contextualization. Starbios2. https://starbios2.eu/wp-content/uploads/2020/05/strat-doc-200514.pdf

Mosavel, M., Gough, M. Z., & Ferrell, D. (2018). Using Asset Mapping to Engage Youth in Community-Based Participatory Research: The WE Project. Progress in community health partnerships : research, education, and action, 12(2), 223–236. https://doi.org/10.1353/cpr.2018.0042

Motala, E. & Baatjes, I. (2015).CIPSET: thoughts on socially engaged research and scholarship: differentiating the characteristics of engaged scholarship from 'community engagement. https://cipset.mandela.ac.za/Occasional-Papers-and-Articles

Mulligan, M. (2015). On Ambivalence and Hope in the Restless Search for Community: How to Work with the Idea of Community in the Global Age. Sociology, 49(2), 340–355. https://doi.org/10.1177/0038038514534008

Murawiec, S.; Tyjanowski, P.; Nita, A. An ornithological walk to improve the well-being of mental health professionals during the COVID-19 pandemic: a pilot study. Psychiatria, 2021, 18.3: 190-195.

National Coordinating Centre for Public Engagement – NCCP. (2011). Discussion Paper: Assessing impacts arising from public engagement with Research. https://www.publicengagement.ac.uk/sites/default/files/publication/impacts_arising_from_public_engagement_discussion_paper_0.pdf

National Coordinating Centre for Public Engagement – NCCP. (2020). Tools for talking… about public engagement. https://www.publicengagement.ac.uk/sites/default/files/publication/tools_for_talking_about_public_engagement_-_final_version_0.pdf

Nelson-Peterman, J., Sibeko, L., Mouth, R., & Cordeiro, L. S. (2022). Building on Community Research Partnerships and Training Students in a Multi-Phase Community-Based Participatory Research Study With Young Women of Cambodian Heritage in Massachusetts. Health promotion practice. https://doi.org/10.1177/15248399221135116

Nguyen, H. & Meek, V. L. (2015). Key considerations in organizing and structuring university research. Journal of Research Administration, (46) 1, 41-62. https://eric.ed.gov/?id=EJ1156089

Oetzel, J.G., Boursaw, B., Magarati, M. et al. (2022). Exploring theoretical mechanisms of community-engaged research: a multilevel cross-sectional national study of structural and relational practices in community-academic partnerships. Int J Equity Health 21, 59. 2022). https://doi.org/10.1186/s12939-022-01663-y

Osborne, N.; Smith-Perry, D.J.; Fuller, C.H.; Stauber, C. (2020). Participatory research in Northwest Atlanta's Proctor Creek Watershed: Using photovoice to explore environmental health risks at the water's edge. Health Place 66, 102444, https://doi.org/10.1016/j.healthplace.2020.102444

Pain, E. (2017). To be a responsible researcher, reach out and listen. Science. www.doi.org/10.1126/science.caredit.a1700006

Pasick R, Oliva G, Goldstein E, Nguyen T. (2010). Community-Engaged Research with Community-Based Organizations: A Resource Manual for Researchers. From the Series: UCSF Clinical and Translational Science Institute (CTSI) Resource Manuals and Guides to Community-Engaged Research, P. Fleisher (ed). Clinical Translational Science Institute Community Engagement Program, University of California San Francisco. https://accelerate.ucsf.edu/files/CE/manual_for_researchers_agencies.pdf

Pohl, C., and Hirsch Hadorn, G. (2007). Principles for Designing Transdisciplinary Research. Swiss Academies of Arts and Sciences. Oekom. https://www.oekom.de/_files_media/titel/leseproben/9783865810465.pdf

Reich, S. M., Kay, J. S., & Lin, G. C. (2015). Nourishing a partnership to improve middle school lunch options: a community-based participatory research project. Family & community health, 38(1), 77–86. https://doi.org/10.1097/FCH.0000000000000055

Roman, M., Varga, H., Cvijanovic, V., & Reid, A. (2020). Quadruple Helix Models for Sustainable Regional Innovation: Engaging and Facilitating Civil Society Participation. Economies, 8(2), 48. MDPI AG. Retrieved from http://dx.doi.org/10.3390/economies8020048

Sattler, C., Rommel, J., Chen, C., García-Llorente, M., Gutiérrez-Briceño, I., Prager, K., Reyes, M. F., Schröter, B., Schulze, C., van Bussel, L. G. J., Loft, L., Matzdorf, B., & Kelemen, E. (2022). Participatory research in times of COVID-19 and beyond: Adjusting your methodological toolkits. One earth (Cambridge, Mass.), 5(1), 62–73. https://doi.org/10.1016/j.oneear.2021.12.006

Scheller, D; Thomas, S; Arnold, A; et al. (2020). Report on State of the Art of Citizen Social Science. http://doi.org/10.5281/zenodo.4810909

Serrano, F., Holocher-Ertl, T., Kieslinger, B., Sanz, F. and Silva, C. (2015). White Paper on Citizens Science for Europe. SOCIENTIZE Project. https://www.citizen-science.at/images/White_Paper-Final-Print.pdf

Shykhnenko , K. ., & Sbruieva, A. . (2021). STRATEGIES FOR ORGANISING AND MANAGING RESEARCH AT UNIVERSITIES: SYSTEMIC REVIEW. Advanced Education, 8(18), 42–52. https://doi.org/10.20535/2410-8286.227831

Smith, E., Gunashekar, S., Lichten, C., Parks, S., and Chataway, J. A framework to monitor open science trends in the EU. In OECD Blue Sky III Forum, Informing science and innovation policies: Towards the next generation of data and indicators. 19– 21 September 2016, Ghent, Belgium

The Arctic Institute of Community-Based Research -AICBR. (2012). Community-Based Research. https://www.aicbr.ca/community-based-research

Thomas, V., & Cassidy, A. (2022). Practicing engaged research through pandemic times: do not feed the animals?. Journal of Science Communication, 21(2). https://doi.org/10.22323/2.21020205

Trotter, R.; Baldwin, J.; Buck, C.L.; Remiker, M.; Aguirre, A.; Milner, T.; Torres, E.; von Hippel, F.A. (2021). Health impacts of perchlorate and pesticide exposure: Protocol for community-engaged research to evaluate environmental toxicants in a US border community. JMIR Research Protocols 10 (8). https://doi.org/10.1177/15248399221135116

UCD Dublin. (2021). Engage your Research: An introductory guide to engaging & involving the public in research. https://www.ucd.ie/research/portal/t4media/Engage%20Your%20Research%20Final%20Dec%202021.pdf

Valladares, L. (2021). Scientific literacy and social transformation. Sci & Educ 30, 557–587 (2021). https://doi.org/10.1007/s11191-021-00205-2

Varumo, L., Paloniemi, R., & Kelemen, E. (2020). Challenges and solutions in developing legitimate online participation for EU biodiversity and ecosystem services policies. Science and Public Policy, 47, 4, Pp 571–580, https://doi.org/10.1093/scipol/scaa036

Vasiliades, M.A.; Hadjichambis, A.C.; Paraskeva-Hadjichambi, D.; and Adamou, A.; Georgiou, Y. (2021). A Systematic Literature Review on the Participation Aspects of Environmental and Nature-Based Citizen Science Initiatives. Sustainability, 13, 7457. http://dx.doi.org/10.3390/su13137457

Villeneuve, D., Durán-Rodas, D., Ferri, A., Kuttler, T., Magelund, J., Mögele, M., Nitschke, L., et al. (2019). What is Interdisciplinarity in Practice? Critical Reflections on Doing Mobility Research in an Intended Interdisciplinary Doctoral Research Group. Sustainability, 12(1), 197. MDPI AG. Rfrom http://dx.doi.org/10.3390/su12010197

Wiek, A., Talwar, S., O'Shea, M., & Robinson, J. (2014). Toward a methodological scheme for capturing societal effects of participatory sustainability research. Research Evaluation, 23, 117-132.

Wiggins, A. and Crowston, K. (2012). Goals and Tasks: Two Typologies of Citizen Science Projects. In Proceedings of the 2012 45th Hawaii International Conference on System Sciences, Maui, HI, USA; pp. 3426–3435. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6149239&casa_token=-s1EKasLtWgAAAAA:Dd9ZWlraxlsaqGCWBo2ty1MnivmpmeCu1_iKgGbM5NH9sn3C65ytweOUkrecgdjpvmMNiXakeOo&tag=1

Wolff, M. G., J. J. Cockburn, C. De Wet, J. C. Bezerra, M. J. T. Weaver, A. Finca, A. De Vos, M. M. Ralekhetla, N. Libala, Q. B. Mkabile, O. N. Odume, and C. G. Palmer. (2019). Exploring and expanding transdisciplinary research for sustainable and just natural resource management. Ecology and Society 24 (4): 14.

World Economic Forum-WEF (2013). The Future Role of Civil Society. Soc. http://www3.weforum.org/docs/WEF_FutureRoleCivilSociety_Report_2013.pdf

Annex 1: Doccuments included in the final sample

1. Ablah, E.; Brown, J.; Carroll, B.; Bronleewe, T. (2016). A Community-Based Participatory Research Approach to Identifying Environmental Concerns. Journal of environmental health, 79, 5, Pp 14-19.

2. Andersen, K.R., Renza, V.A. and Fieseler, C. (2021). Mapping the Socially Engaged Arts in Europe. Artsformation Report Series (SSRN) https://ssrn.com/abstract=3861625

3. Andrade, K., Cushing, L., Wesner, A. (2018). Science Shops and the U.S. Research University: A Path for Community-Engaged Scholarship and Disruption of the Power Dynamics of Knowledge Production. In: Mitchell, T., Soria, K. (eds) Educating for Citizenship and Social Justice. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-62971-1_11

4. Baruch, A, May, A and Yu, D. (2016). The motivations, enablers and barriers for voluntary participation in an online crowdsourcing platform. Computers in Human Behavior, 64: 923–931. DOI: https://doi.org/10.1016/j.chb.2016.07.039

5. Belansky, E. S., Cutforth, N., Chavez, R. A., Waters, E., & Bartlett-Horch, K. (2011). An adapted version of intervention mapping (AIM) is a tool for conducting community-based participatory research. Health Promotion Practice, 12(3), 440-455. doi:10.1177/1524839909334620

6. Bergold, J., & Thomas, S. (2012). Participatory Research Methods: A Methodological Approach in Motion. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 13(1). https://doi.org/10.17169/fqs-13.1.1801

7. Bonn, A et al, (2022) Citizen Science Strategy 2030 for Germany. Helmholtz-Gemeinschaft, Leibnitz-Gemeinschaft, Universitäten und außeruniversitäre Einrichtungen, Leipzig, Berlin SocArXiv. https://doi.org/10.5281/zenodo.7117771

8. Bonn, A., Hecker, S., Bowser, A., Makuch, Z., Vogel, J., & Haklay, M. (2018). Citizen Science: Innovation in Open Science, Society and Policy. In Hecker, S., Haklay, M., Bowser, A., Makuch, Z., Vogel, J., & Bonn, A. (Eds.). Citizen Science: Innovation in Open Science, Society and Policy. UCL Press. pp. 465-484 (22 pages). https://www.jstor.org/stable/j.ctv550cf2.38

9. Brockhage, F., Lüsse, M., Klasmeier, J., Pietzner, V., & Beeken, M. (2022). Citizen Science as an Innovative Approach to Analyze Spatial and Temporal Influences on Nitrate Pollution of Water Bodies: Results of a Participatory Research Project in Germany. Sustainability, 14(15), 9516. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su14159516

10. Brush, B. L., Mentz, G., Jensen, M., Jacobs, B., Saylor, K. M., Rowe, Z., ... & Lachance, L. (2020). Success in long-standing community-based participatory research (CBPR) partnerships: A scoping literature review. Health Education & Behavior, 47(4), 556-568. doi:10.1177/1090198119882989

11. Campus Engage, Iris university Association-IUA, & Irish Research Council. (2019). Engaged Research: Society and Higher Education. http://www.campusengage.ie/wp-content/uploads/2019/01/FINAL-JAN-16_ER-Report-2016-Jan-v2.pdf

12. Carballo-Cárdenas, EC and Tobi, H. (2016). Citizen science regarding invasive lionfish in Dutch Caribbean MPAs: Drivers and barriers to participation. Ocean & Coastal Management, 133: 114–127. DOI: https://doi.org/10.1016/j.ocecoaman.2016.09.014

13. de Vries, M., Land-Zandstra, A. and Smeets, I. (2019). Citizen Scientists' Preferences for Communication of Scientific Output: A Literature Review. Citizen Science: Theory and Practice, 4(1), pp.2-13. http://doi.org/10.5334/cstp.136

14. ECSA (European Citizen Science Association). 2015. Ten Principles of Citizen Science. Berlin. https://zenodo.org/record/5127534#.Y8bFdXbMKUm

15. Ferguson, D.B., Meadow, A.M. & Huntington, H.P. (2022). Making a Difference: Planning for Engaged Participation in Environmental Research. Environmental Management 69, 227–243. https://doi.org/10.1007/s00267-021-01585-5

16. Godonoga, A. & Sporn, B. (2022). The conceptualisation of socially responsible universities in higher education research: a systematic literature review, Studies in Higher Education. https://doi.org/10.1080/03075079.2022.2145462

17. Greer, A.E.; Martinez-Carrasco, A.; Goldsman, D.; Knausenberger, A.-U. (2021). Walking Toward a Brighter Future: A Participatory Research Process to Advocate for Improved Walk-to-School Corridors. Health Promotion Practice Vol. 22, No. (2) 248–256. https://doi.org/10.1177/1524839919890872

18. Guin, S. M., Wheat, J. R., Allinder, R. S., Fanucchi, G. J., Wiggins, O. S., & Johnson, G. J. (2012). Participatory research and service-learning among farmers, health professional students, and experts: An agromedicine approach to farm safety and health. Journal of Agromedicine, 17(1), 22-29. http://dx.doi.org/10.1080/1059924X.2012.627319

19. Hawley, N. C., Wieland, M. L., Weis, J. A., & Sia, I. G. (2014). Perceived impact of human subjects protection training on community partners in community-based participatory research. Progress in community health partnerships: research, education, and action, 8(2), 241–248. https://doi.org/10.1353/cpr.2014.0023

20. Hobbs, SJ and White, PCL. (2012). Motivations and barriers in relation to community participation in biodiversity recording. Journal for Nature Conservation, 20(6): 364–373. DOI: https://doi.org/10.1016/j.jnc.2012.08.002

21. Holliman, R. and Warren, C.J. (2017). Supporting future scholars of engaged research. Research for All, 1 (1), pp. 168–84. https://doi.org/10.18546/RFA.01.1.14

22. Jagosh, J., Bush, P.L., Salsberg, J. et al. (2015). A realist evaluation of community-based participatory research: partnership synergy, trust building and related ripple effects. BMC Public Health 15, 725. https://doi.org/10.1186/s12889-015-1949-1

23. Jernigan, V. B. B., Williams, M., Wetherill, M., Taniguchi, T., Jacob, T., Cannady, T., Grammar, M., Standridge, J., Fox, J., Wiley, A., Tingle, J., Riley, M., Spiegel, J., Love, C., Noonan, C., Weedn, A., & Salvatore, A. L. (2018). Using community-based participatory research to develop healthy retail strategies in Native American-owned convenience stores: The THRIVE study. Preventive medicine reports, 11, 148–153. https://doi.org/10.1016/j.pmedr.2018.06.012

24. Juknevičienė, V. (2016). Expression of absorptive capacity in a regional innovation system of Lithuania: an approach to sampling for qualitative research. Socialiniai tyrimai, 39(1), 49-60. https://doi.org/10.21277/sc.v1i39.79

25. Kattelmann, K. K., White, A. A., Greene, G. W., Byrd-Bredbenner, C., Hoerr, S. L., Horacek, T. M., Kidd, T., Colby, S., Phillips, B. W., Koenings, M. M., Brown, O. N., Olfert, M., Shelnutt, K. P., & Morrell, J. S. (2014). Development of Young Adults Eating and Active for Health (YEAH) internet-based intervention via a community-based participatory research model. Journal of nutrition education and behavior, 46(2), pp. 10–S25. https://doi.org/10.1016/j.jneb.2013.11.006

26. Kou, H., Zhang, S., & Liu, Y. (2019). Community-Engaged Research for the Promotion of Healthy Urban Environments: A Case Study of Community Garden Initiative in Shanghai, China. International journal of environmental research and public health, 16(21), 4145. https://doi.org/10.3390/ijerph16214145

27. Lightfoot, E., Blevins, J., Lum, T., Dube, A. (2016). Cultural health assets of somali and oromo refugees and immigrants in minnesota: Findings from a community-based participatory research project. Journal of Health Care for the Poor and Underserved, 27, 1, February 2016, Pp 252-260. https://doi.org/10.1353/hpu.2016.0023

28. Mance, G. A., Rodgers, C. R. R., Roberts, D., & Terry, A. (2020). Deeply Rooted: Maximizing the Strengths of a Historically Black University and Community-based Participatory Research to Understand Environmental Stressors and Trauma among Black Youth. American journal of community psychology, 66(3-4), 256–266. https://doi.org/10.1002/ajcp.12452

29. Mejia, A., Bhattacharya, M., Miraglia, J., & Village Community Garden & Learning Center (2020). Community Gardening as a Way to Build Cross-Cultural Community Resilience in Intersectionally Diverse Gardeners: Community-Based Participatory Research and

Campus-Community-Partnered Proposal. JMIR research protocols, 9(10), e21218. https://doi.org/10.2196/21218

30. Mosavel, M., Gough, M. Z., & Ferrell, D. (2018). Using Asset Mapping to Engage Youth in Community-Based Participatory Research: The WE Project. Progress in community health partnerships : research, education, and action, 12(2), 223–236. https://doi.org/10.1353/cpr.2018.0042

31. Motala, E. & Baatjes, I. (2015). CIPSET: thoughts on socially engaged research and scholarship: differentiating the characteristics of engaged scholarship from 'community engagement.

32. Murawiec, S.; Tyjanowski, P.; Nita, A. An ornithological walk to improve the well-being of mental health professionals during the COVID-19 pandemic: a pilot study. Psychiatria, 2021, 18.3: 190-195.

33. Nelson-Peterman, J., Sibeko, L., Mouth, R., & Cordeiro, L. S. (2022). Building on Community Research Partnerships and Training Students in a Multi-Phase Community-Based Participatory Research Study With Young Women of Cambodian Heritage in Massachusetts. Health promotion practice, 15248399221135116. Advance online publication. https://doi.org/10.1177/15248399221135116

34. Oetzel, J.G., Boursaw, B., Magarati, M. et al. (2022). Exploring theoretical mechanisms of community-engaged research: a multilevel cross-sectional national study of structural and relational practices in community-academic partnerships. Int J Equity Health 21, 59. 2022). https://doi.org/10.1186/s12939-022-01663-y

35. Osborne Jelks, N.; Smith-Perry, D.J.; Fuller, C.H.; Stauber, C. (2020). Participatory research in Northwest Atlanta's Proctor Creek Watershed: Using photovoice to explore environmental health risks at the water's edge. Health Place 66, 102444, https://doi.org/10.1016/j.healthplace.2020.102444"

36. Pasick R, Oliva G, Goldstein E, Nguyen T. (2010). Community-Engaged Research with Community-Based Organizations: A Resource Manual for Researchers. From the Series: UCSF Clinical and Translational Science Institute (CTSI) Resource Manuals and Guides to Community-Engaged Research, P. Fleisher (ed). Clinical Translational Science Institute Community Engagement Program, University of California San Francisco. https://accelerate.ucsf.edu/files/CE/manual_for_researchers_agencies.pdf"

37. Reich, S. M., Kay, J. S., & Lin, G. C. (2015). Nourishing a partnership to improve middle school lunch options: a community-based participatory research project. Family & community health, 38(1), 77–86. https://doi.org/10.1097/FCH.0000000000000055

38. Sattler, C., Rommel, J., Chen, C., García-Llorente, M., Gutiérrez-Briceño, I., Prager, K., Reyes, M. F., Schröter, B., Schulze, C., van Bussel, L. G. J., Loft, L., Matzdorf, B., & Kelemen, E. (2022). Participatory research in times of COVID-19 and beyond: Adjusting your methodological toolkits. One earth (Cambridge, Mass.), 5(1), 62–73. https://doi.org/10.1016/j.oneear.2021.12.006

39. Scheller, D; Thomas, S; Arnold, A; et al. (2020). Report on State of the Art of Citizen Social Science. http://doi.org/10.5281/zenodo.4810909

40. Thomas, V., & Cassidy, A. (2022). Practicing engaged research through pandemic times: do not feed the animals?. Journal of Science Communication, 21(2). https://doi.org/10.22323/2.21020205

41. Trotter, R.; Baldwin, J.; Buck, C.L.; Remiker, M.; Aguirre, A.; Milner, T.; Torres, E.; von Hippel, F.A. (2021). Health impacts of perchlorate and pesticide exposure: Protocol for community-engaged research to evaluate environmental toxicants in a US border community. JMIR Research Protocols 10 (8). DOI: 10.1177/15248399221135116

42. Valladares, L. (2021). Scientific literacy and social transformation. Sci & Educ 30, 557–587 (2021). https://doi.org/10.1007/s11191-021-00205-2

43. van Ham, C. ,Klimmek , H. (2017). Partnerships for Nature-Based Solutions in Urban Areas – Showcasing Successful Examples .in Kabisch, N , Korn, H., Stadler, J. Bonn, A. Eds Nature-based Solutions to Climate Change Adaptation in Urban Areas Linkages between Science, Policy and Practice. Springer open, DOI 10.1007/978-3-319-56091-5 p. 273-279

44. Varumo, L., Paloniemi, R., & Kelemen, E. (2020). Challenges and solutions in developing legitimate online participation for EU biodiversity and ecosystem services policies. Science and Public Policy, 47, 4, Pp 571–580, https://doi.org/10.1093/scipol/scaa036

45. Vasiliades, M.A.; Hadjichambis, A.C.; Paraskeva-Hadjichambi, D.; and Adamou, A.; Georgiou, Y. (2021). A Systematic Literature Review on the Participation Aspects of Environmental and Nature-Based Citizen Science Initiatives. Sustainability, 13, 7457. http://dx.doi.org/10.3390/su13137457

46. Wiek, A., Talwar, S., O'Shea, M., & Robinson, J. (2014). Toward a methodological scheme for capturing societal effects of participatory sustainability research. Research Evaluation, 23, 117-132.

47. Winter, S. J., King, A. C., Stafford, R. S., Winkleby, M. A., Haskell, W. L., & Farquhar, J. W. (2011). Promoting culturally targeted chronic disease prevention research through an adapted participatory research approach: The Qassim-Stanford Universities project. Translational behavioral medicine, 1(2), 289–298. https://doi.org/10.1007/s13142-011-0033-3

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