Public Engagement Innovations
for Horizon 2020

A Refined Typology of PE Tools and Instruments D2.1

Authors:
Saulė Mačiukaitė-Žvinienė
Loreta Tauginienė
Mikko Rask
Niels Mejlgaard
Tine Ravn
Luciano d'Andrea

Contributors:
Vytautas Dikčius
Timo Aarrevaara

1 September, 2014

This report is electronically available at http://www.PE2020.eu

1

The PE2020 Project

Year of implementation: **February 2014 – January 2017**
Web: http://www.PE2020.eu

Project consortium:

	NCRC	National Consumer Research Centre, Finland
	UH	University of Helsinki, Finland
	UA	University of Aarhus, Denmark
	VU IBS	Vilnius University International Business School, Lithuania
	LSC	Laboratorio di Scienze della Cittadinanza, Italy
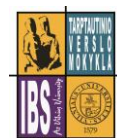
The PE2020 project

PE2020 will identify, analyse and refine innovative public engagement (PE) tools and instruments for dynamic governance in the field of Science in Society (SiS). PE2020 analyses the PE tools and instruments through a systemic and contextual perspective, and contributes to the potential and transferability of new governance innovations. PE2020 will create new knowledge of the status quo and trends in the field of public engagement in science, refines innovative PE tools and instruments and propose new ones.

The project will do this by (1) further developing a conceptual model that provides a systemic perspective of the dynamics of public and stakeholder engagement; (2) creating an updated inventory of current and prospective European PE innovations; (3) context-tailoring and piloting best practice PE processes related to the grand challenges of the Horizon 2020 and (4) developing an accessible net-based PE design toolkit that helps identify, evaluate and successfully transfer innovative PE practices among European countries.

New tools and instruments for public and societal engagement are necessary to boost the quality, capacity and legitimacy of European STI governance and to solve the looming problems related to the grand societal challenges of the Horizon 2020. In order to ensure practical relevance, the project will work through intensive co-operation between researchers and science policy actors. PE2020 will expand the capacity of European and national science policy actors to integrate better societal engagement by providing an easy access to new PE tools and instruments, to be included in the requirements and implementation of research in Horizon 2020 and beyond.

Acknowledgements

Legal Notice

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no [611826]

3

Contents

TABLES AND FIGURES

1 Introduction

1.1   Public engagement – an active field of development

Theories of public participation have received considerable academic and political attention since the early 1990s, but have been a source of debate for more than fifty years. Participatory and deliberative democratic processes have developed significantly since their inception in the late 1960s and institutionalization in the 1980s and 1990s (Geurts and Mayer, 1996; Dryzek, 2000). Inspired by the insights of deliberative democratic theorists (Rawls, 1993; Habermas, 1997), various democratic innovations have been proposed, such as modifications to conventional institutions of government, ways of communicating between governmental and   civil society agencies, usage of e-governance tools and mass-mediated deliberations, surveys, and citizen panels or 'micro-publics', where lay citizens and non-partisan actors gather together to discuss topical matters of policy relevance (Renn et al., 1995; Goodin and Dryzek, 2006; Dietz and Stern, 2008; Pytlik Zilling and Tomkins, 2011).

Public engagement (PE) tools and instruments supporting science, technology and innovation (STI) policy making have developed significantly during the last 30 years in Europe. Examples of active fields of research and development (R&D) include technology assessment and foresight, risk studies, the social study of science and technology, the sociology of the public understanding of science as well as studies in deliberative democracy (Wynne, 1995; Collins and Evans, 2002; Joss and Belluci, 2002).

The new participatory approaches have given the public a more meaningful role in policy formation, and the concept of PE has evolved steadily from information dissemination to a more interactive one with regard to scientific education, ways of transmission and accountability, and responsible research and innovation activity. Considering the societal challenges facing European societies and hopes and fears related to future technologies, we find it easy to support the idea of A. I. Leshner (2003) that simply trying to educate the public about specific science-based issues is not working in the global market. 'The public' is becoming a more active player in several arenas of STI activity, and there are good reasons to believe that it is often to the benefit of the public sector to support this development. New governance approaches are needed to ensure that European research responds effectively to the societal challenges facing European societies.

This report discusses governance, which refers to the rules, processes and behaviour of science actors. Good governance refers to the five governance principles of openness, participation, accountability, effectiveness and coherence. These principles also promote proportionality and subsidiarity, two profound Principles of European governance (Ozolina et al., 2009).

In this report, dynamic governance refers to the decision-making process and particularly to the relationship between science and deliberative democracy for the dynamics of public and stakeholder engagement in STI. In this regard, dynamic governance promotes a better understanding of the place of science and technology in European societies, as described in the Science in Society work programme (EU 2012). Despite widespread efforts to develop and introduce new practices of PE in STI policy making, there are some challenges that need further attention. Wilsdon and Willis (2004) argue that engagement with the public often does not take place early enough in the decision-making process and the impact of public inputs on policy outputs is unclear and uncertain (Pytlik Zilling and Tomkins, 2011). Interesting approaches are being developed – globally – in various research organizations and think tanks, and it can be difficult to build an overview of existing PE tools and methods that could help policy makers to involve the relevant actors in decision making.

1.2 The aim of PE2020

The PE2020 project aims at supporting a shift toward more dynamic governance of the science and society relation by identifying and exploring recent cutting edge PE innovations within this composite and multifaceted field. The aim is furthermore to "develop a tool for science policy actors that helps them identify, evaluate and successfully transfer innovative PE practices among European countries" (PE proposal B 2013:3).

This report is the second output of the three-year research project and is part of the (WP2) conceptual work package supporting data collection and analysis of innovative PE practices (WP1) and design of PE practices supporting research programme in Horizon2020 and beyond (WP3 & WP4). The report presents work-in-progress that helps to validate and enrich typologies and categories that are needed in the analysis of innovative PE practices. The specific objectives and the methodology of this report are outlined below.

2 Objectives

The general aim of WP2, as stated in the PE2020 proposal, is to refine the conceptual model that will 1) inform and possibly reorient data collection (WP1), 2) provide conceptual categories that are relevant in identifying contextual factors related to the tailoring of best PE practices (WP3), and 3) help to draw generalizable lessons of PE case studies to be used in the development of the PE design toolkit (WP4).

The first task of WP2 concerns the validation and enrichment of the relevant typologies of PE tools and instruments that are being empirically analysed in parallel with WP1. In order to support further analysis of innovative PE practices, this report has the following three objectives:

First, to contribute to a better understanding of 'innovativeness' of PE. Innovative PE practices are at the focus of PE2020 project, and novel participatory approaches can potentially help to develop better governance practices. To support empirical analysis of new PE tools and instruments, we therefore review literature to analyse what constitutes innovativeness in this field. Criteria of innovativeness contribute both to the selection of the most promising PE process for further analysis and to the understanding of what are truly novel PE approaches that may have additional value for science governance.

Second, to validate the pre-categorization used in the classification of PE practices. WP1 task 1.1 identified hundreds of PE practices in Europe and beyond that were included in a structured inventory. To substantiate the pre-categories used in the classification of the PE practices, we describe and critically reflect the conceptual classification and multi-actor coding procedure used in that task.

Third, to contribute toward a deeper analysis of the 50 most promising and innovative PE practices. WP1 task 1.2 will further explore and analyse selected PE procedures. To support the analysis of such cases, we therefore review literature to find relevant categories that can enrich the analysis and link it to previous research.

The three research questions defined above also structure the remaining parts of this report.

3 Methodology and conceptual starting points

The main methodology of WP2 is to review relevant literatures in order to validate and support empirical research and development carried out in other work packages. To this end, we have taken the 'practical definitions' provided in the project proposal and WP1 (Deliverable 1.1) as our starting point, and we will progress toward refined understanding of such concepts based on academic and grey literatures.

Public engagement (**PE**) is the core concept of the PE2020 project. Acknowledging that the whole project is aimed at analysing the full scope of such practices, we do not, at this point, intend to propose a new definition of PE – with the risk of unnecessarily limiting data collection and analysis – but refer to the definition that was used in the PE2020 proposal that also guided the data collection in WP1:

> "We understand PE, in this context, as activities where there is a distinct role for citizens or stakeholder groups in research and innovation processes. Characteristic to such processes is that they involve new types of interactions between 'laymen' and 'scientific actors'." (PE proposal B 2013 : 5)

Innovativeness of PE, as defined in the project proposal refers to "the novelty and potential impact in respect to Horizon2020". Resulting from the discussions among the consortium and its advisory board, the following additional characteristics were identified as potentially also contributing to the notion of innovativeness in the current praxis of PE: 'institutional hybridity', 'methodological novelty' (referring to intensity and function of communication), 'new ways of representation', 'potential impact' and 'bearing on societal challenges'.

In order to develop a more elaborate understanding of the innovative dimension of PE practices we studied both peer-reviewed and grey (consisting of European research programmes documents, websites, annual and evaluation reports) literatures. First, we identified and analysed 114 peer-reviewed papers (see Appendix 1). Second, we reviewed 19 grey literature documents, 8 websites of the European research programmes with 9 annual and evaluation reports in it (see Appendixes 2 and 3). To guide our search, we developed a conceptual framework for PE in research and used key terms search for both peer-reviewed and grey literatures (including Internet sources). In addition, the exploration on innovative approaches is based on the methodology of Mallery et al. (2012), who reviewed innovative methods of stakeholders' engagement with the intention to identify promising approaches that have the potential to expand and enhance the roles stakeholders play on programme level.

On the basis of the results we will review how innovativeness is understood in literatures and what dimensions are acknowledged as contributing to innovative and cutting edge PE practice. Finally, we use illustrations to highlight the dimensions that we found most relevant for further research and analysis of innovative PE practices.

Validation and enrichment of PE typologies. The collection and inventorying of innovative PE cases, in Deliverable 1.1, was based, firstly, on a distinction between engagement 'initiatives' (specific cases or examples of participatory projects) and 'mechanisms' (generic ways of enacting participation), and, secondly, on a distinction between five different categories of PE: public communication, public activism, public consultation, public deliberation and public participation. As it is stated in Deliverable 1.1, these divisions primarily served as a heuristics for organising data and using a pre-categorisation that helps further exploration, conceptualization and refinement of typology construction in WP2.

In this report, we describe and critically reflect the process of defining relevant pre-categories that were used in cataloguing of innovative PE practices in WP1. This is what we call the **validation of the pre-categorization** (that actually led to an extended set of concepts used in the final inventory). We also review

academic literatures to identify such categories that are generally used to analyse the functionality, dynamics and success of PE practices, and that could potentially be used in the later stages of WP1 analysis. This we call the **enrichment of PE typologies**.

Participatory performance is a theoretical concept and model that was developed earlier in 2011-2012 by some project partners to describe the level and quality of PE activities in 37 European countries (see Rask et al., 2012). It consists of four components: participatory resources (supporting regulations, supporting infrastructure, funding opportunities, etc.), demand conditions (level of education, culture of public dialogue, social capital, etc.), supportive factors (civil society organisations, networking, good practices, etc.), and governmental strategies (strategies of PE, national priorities, etc.). The model has roots in the Dryzek's (2009, 2010) model of the deliberative system, and in Porter's (1998) 'diamond model' of the national economic systems.

The model of participatory performance focuses on the factors that contribute to the level and intensity of PE, and explain the success of PE activity. It is the aim of PE2020 to elaborate this model toward a model that helps explaining PE activities at the level of research programmes. At this stage of the project, however, we do not aim at revising the model, but making remarks of such factors can be later used in conceptual elaboration, and at the later stages of the project we will proceed with the enrichment of this model (Deliverable 2.3).

Finally, we emphasize that the conceptual work reported in this deliverable is work-in-progress and mainly intended to serve the following steps of the PE2020 project. It is the idea of WP2 to work iteratively, continuing conceptual elaboration after having again new empirical results from WP1, and targeting further conceptual analysis on the basis of the reactions to this report.

4 Innovativeness of PE

In this section, we will discuss the question of innovativeness in PE initiatives. In particular, the aim of this section is identifying where innovation is more likely to be found, i.e., which aspects of PE processes are presently more exposed to change according to the international literature. This is particularly important for providing criteria of innovativeness for the in-depth analysis of 50 cases of PE initiatives to be carried out under WP1.

It is important to recall here what is at stake with innovation in PE. Actually, innovative PE tools and instruments are needed to develop better STI governance practices and involve European publics in the definition of such research strategies that help more effectively responding to the societal challenges facing our societies.

The section is divided in three sub-sections. In the first sub-section, we will focus on the definition of innovativeness in PE initiatives. The second sub-section will provide a short analysis of international literature on innovative PE practices. Finally, the third one includes a proposal of the main areas to be observed in the analysis of the 50 cases of PE initiatives.

4.1 Definitional remarks

Innovation research has yielded a high number of different discussions and definitions of what innovativeness means. A starting point can be in the notion by Vuarin and Rodriguez (1994), who emphasized that "innovation is not an 'invention'". Instead, the idea of making new combinations of existing parts is suggested as an essential characteristic of innovation, which is generally considered as a

process of introducing new inventions into the market of some sort. Rogers (1995), for example, defined innovation as: "an idea, practice or object that is perceived as new by an individual or other unit of adoption. It matters little […] whether or not an idea is objectively new as measured by the lapse of time since its first use or discovery […] if the idea seems new to an individual, it is an innovation" (Rogers 1995:11). We largely share these basic remarks of the essence of innovations (Mirza et al., 2012).

In the context of PE innovations the question of innovativeness is more specific. It relates to the time and context of such activities; something is currently done differently in the context of governance than what was done before (Mallery et al., 2012). In other words, the question of innovativeness becomes a historical and perceptual matter, where the nature of current PE activities is being compared to our experiences and memories of the nature of past PE activities. We can distinguish two types of drivers for the changing practice of PE. First, there is the necessity to find more effective responses to the societal challenges and other problems of governance, such as decreased trust toward decision makers or societal acceptance of technological solutions. Another driver can be found in the emerging opportunities provided by new information and communication technologies that provide new tools for the practice of governance, for example, crowd-sourcing for the formulation of public policies, or citizen science for providing evidence of new phenomena and research issues that are important for the public at large or some local groups of citizens. As Kingdon (1995) has claimed, windows of opportunity open, when the stream of problems meets the stream of possibilities; and it is the challenge of decision makers to match the two with the right timing of their decisions and actions (Kingdon, 1995).

These short remarks allow to highlight some points which are useful to keep in mind when dealing with innovation in PE: 1) innovativeness is, in general, a concept susceptible of multiple interpretations and therefore difficult to manage; 2) in the case of PE, innovativeness should be viewed as a context-sensitive concept, being innovation strongly related to the institutional, organisational and cultural context where PE activities are carried out; 3) for this reason, innovativeness in PE practices can be appreciated only in historical or evolutionary terms, that is observing how they change over the time in relation to changing contextual conditions; 4) there is also a perceptual components of what is innovative and what is not to be taken into account; 5) finally, at least two main drivers of innovation can be identified: societal challenges and technological changes.

4.2   Characteristics of innovative PE practices

From its outset, PE2020 has tried to identify and understand characteristics of innovative PE practices. In the process of selecting the 50 most interesting and potentially innovative PE processes among several hundred cases identified in WP1 task 1.2, consortium partners proposed five **criteria of innovativeness** on the basis of their own expertise and collective discussions within the consortium:

- **Institutional hybridity** (in order to reconcile or unify different systems and principles);
- **Methodological solutions** (in order to develop practices aimed at, e.g. increasing the intensity, scope and function of communication);
- **Levels of representation** (how to make PE initiatives representative of larger population sectors);
- **Impact** (how to increase the potential impact of PE initiatives especially at the policy level);
- **Responsiveness to societal challenges** (referring to what extent PE initiatives bear on relevant societal challenges).

In this sub-section we will reflect these dimensions in the light of the finding from the literature analysis (for the selection and analysis of the literature, see Appendixes 1-3). After presenting the key findings of the literature analysis, we propose table providing a synthetic perspective on interesting innovative dimensions of PE that can be used in further analyses of the selected case studies. While we expect the

deeper analysis of the 50 PE cases to help us better to understand what constitutes innovativeness in these particular cases, in the following we introduce some observations from previous studies of innovative PE.

First, innovative PE is often linked to deeper commitment to collaborative activities by the public, researchers and policy makers. This is reflected in Chopyak and Levesque's (2002) notion that "what <…> may be said to be 'new' is the thriving methodological innovation, the wide practical application and the apparently increasing interest in, and commitment to, public participation on the part of officialdom and the scientific community" (Borchelt and Hudson, 2008). Other **general notions of innovative engagement practices include following ideas** (see especially Mallery et al., 2012; Mirza et al., 2012):

- Innovation does not have to be driven by a new idea. It can be a different approach to active problem solving.
- Innovation can involve finding an effective approach to implementing an existing idea.
- Innovation includes non-traditional activities.
- Innovation is policy and impact oriented.
- Innovation tends to be "most quickly adopted".
- Innovation reduces the time associated with current engagement processes.
- Innovation should be observable, advantageous, compatible, simple, and reversible.
- Innovation is an idea, practice that is perceived as new by an individual whether or not it is objectively new as measured by the lapse of time since its first use or discovery.
- Innovation is not an invention.

In order to summarize our findings from literature review, we organized them into the following five categories: key engaging groups; culture and motivation of PE; forms and techniques of PE; dynamics of information flows; outcomes and points of PE. Innovative approaches to PE or innovative mechanisms will be discussed and highlighted under each category, and illustrated in an 'innovation hectogram' in section 4.3.

Key Engaging Groups. The materials we reviewed often referred to stakeholders (researchers or science communities, SMEs, local schools, policy makers), partners (national contact points, programme partners, funding institutions) or members of some organisations (research councils, state agencies, academic institutions). The majority of sources mixed up different stakeholders and treated them as one, while wider public remained majorly out of the scope of their interest. We noticed that those programmes which provided e-tools for the engagement of different types of stakeholders, also engaged wider public more successfully. It also seems that such programmes had more extensive social networking with broader geographic scope, and they expressed a more determinate orientation to impacting policies and creating new markets for their products.

Understanding the needs of different stakeholder groups and using targeted communications is important. In the literature we found extensive discussions on how to successfully **target specific groups** (Mallery et al., 2012; Marks, 2013), by engaging, for example, young families, Civil Society Organisations (CSOs) (EC, 2008), youth, unengaged groups, local communities and schools (Facer et al., 2012). Considering that information of such targeting strategies is available and could be more effectively used, innovative PE could mean **public availability of engagement tools** constructed for specific target group.

Culture and Motivation of PE. The majority of PE cases we identified were related to health and environment sectors (see Appendixes 1 and 2). We can expect that such popularity depends on public awareness of environmental and health risks, as well as the opportunities that research and technological development can carry out in these two sectors. Possibly it can also be a question of how, and in which

research sectors STEM (science, technology, engineering, medicine) education is organized (Welcome Trust, 2012).

Considering that national and European funding institutions increasingly require public engagement in the research activities they fund, there is potential for PE in other research sectors as well. How this potential is used, depends partly on the motivations and prevailing practices of the research institutions. Many times the landscape is dominated by instrumental ideas, such as increasing the number of product users or promoting more effective utilization of the research infrastructure (e.g. Mallery et al., 2012). At the programme level, there can be found the motivation to transform behavioural patterns of the public (Devonshire and Hathway, 2014).

These and other motivation of PE are not inadequate, but a different way of perceiving the benefit of PE relates to the attempts to see it as mutually beneficial practice for both researchers and the public (Banks and Armstrong, 2012). Whatever these benefits are depend on the research sectors, and they could be collaboratively defined. **Promoting an engagement culture in science community** would welcome different motivations and help to see PE not as an external and instrumental activity but sooner as an essential part of current research activity. Increasing the motivation of researchers toward PE could be supported through activities such as awarding **rewards for researchers** for their public activities or providing **PE mentors** (Hussain and Moore, 2012). Wider public's motivation, on its part, could be supported through new means of PE support, e.g. **participatory videos** (Welcome Trust, 2012) and **face to face communication** (Welcome Trust, 2012).

Forms and Techniques of PE. The review of different sources showed that public engages at specific stages of the research cycle: idea nomination, research process, dissemination of results, involvement in research programmes, and participation in decision making. Most research programmes involved public in the topic nomination and dissemination process. Untapped potential can be found at the other stages of the cycle.

The most popular forms of engagement included different types of scientific education, events, networking, and communication. All forms of engagement faced a diverse range of innovative techniques and combination of various forms, for example, training and dissemination. Many of them are not new ideas, but they are in need of **institutionalisation** (EP, 2014), especially with respect to policy orientation and impact. Following types of processes of operationalization in research governance were seen as innovative approaches for PE on programme and project levels: establishing **PE officers**, developing **citizens' juries, recruiting public**, constructing **schemes of funding for involvement of CSOs** in research process (DMU, 2013).

Networking is also not a new form of PE, however, the reviewed literature focused on strengthening networks and suggests **establishing meta-networks** (Facer et al., 2012), and also communication should face a more innovative form using **multiple engagement principles** and participants, for example, **combining non-typical communication** activities of research institutions and museums.

We support the notion that the cooperation of **online communities** is still an innovative approach which helps to decrease costs of engaging larger communities (Mallery et al., 2012). **Collaboration with local organisations** and **partnership** between research groups and community groups is seen as innovative approach in the reviewed literature as well.

Dynamics of information flows[1]. Communication with the public or spread of information to the public does not remain innovative anymore and the so called 'Sagan effect'[2] has become a classical example in science communication. People have developed various forms of communication and are comfortable enough: in person, via e-mail, blogs, Facebook, Twitter, etc. In addition, the analysis of literature supports that **social media** is an innovative technique. However, we found that there are different practices of dissemination through social media and it might not necessarily be effective only because information is spread through social media. There is a big difference between impact oriented and information oriented dissemination, as we indicate in Appendix 3. However, further investigation is needed to establish a correlation between communication forms and public engagement in research programmes.

We remark that the world of dissemination seems divided. Technology and computers provide rich and interactive experience, while at the same time nothing replaces human-to-human communication; using technology and arts for more effective dissemination is acknowledged as effective but so is advertising of research in **local newspapers** (Welcome Trust, 2001; 2012). To continue, many of the innovative means of dissemination took place through **exhibitions, participatory films, theatres, charity events** (EC, 2013), while **social media**, **Apps** or **creative arts** in science communication seem to be the basis the radical innovations of PE (Lee and Kwak, 2011). All in all, we find it easy to support the age old saying "Tell me and I will learn, show me and I will remember but involve me – I will understand" (Campbell, 2014). At every level new dimensions should be developed and/or traditional ones should be enriched.

Outcomes and Access Points of PE. European research programmes are mostly co-funded by national or private funding. Such joint activities lead to the selection of thematic priorities, and avoidance of redundant duplication of research efforts is important. To save public spending and use resources wisely, research must be organized responsibly. PE is increasingly considered as an innovative tool for orienting socially responsible research, and it is expected to do so not only in an experimental manner, but more and more with a direct impact orientation in mind.

The idea of consequentiality or political impact is very much in line with the literature on citizens' empowerment, where the purpose of engagement is to work with the public enabling them to play key roles in decision processes. Analysis of the literature showed that public involvement at all stages of research has a potential to generate economic and societal impact, and PE processes such as **transnational micro-publics** (Arvanitakis et al., 2012) and **participatory budgeting** (Fischer, 2009:75; Pieczka and Escobar, 2013) can lead to increased sentiments of **civil empowerment**, and occasionally **impact political processes**.

In addition, engagement practices need to build an evidence base, and **participatory monitoring and evaluation** (Welcome Trust, 2012) on programme level is not only an innovative approach for PE, but it is also the indispensable component of effective governance. Very few documents described the evaluation of PE processes and outcomes. The most common evaluation methods we identified were interviews with stakeholders and/or researchers. In addition, we found other methods to be used: existence of logic framework, application of theory of change, nomination of impact, reach, quality and value for money variables (Welcome Trust, 2012).

---

[1] The PE theory of Rowe and Fewer, which was used as a baseline for constructing inventory of PE (see Deliverable 1.1), is also constructed on the conception of information flow.

[2] The 'Sagan effect', named after the astronomer and famous science communicator Carl Sagan, suggests that frequency of media interaction might be inversely proportional to scientific ability. Sagan's biographers, Keay Davidson and William Poundstone, both say that his popularization of science was a big reason that the National Academy of Sciences did not accept him as a member. And yet Sagan, as they document, had a prolific publication record and many protégés. Retrieved from http://www.nature.com/naturejobs/science/articles/10.1038/nj7322-465a.

As a concluding remark resulting from literature review we ended up with consideration that it is also essential to examine whether initiatives of PE continued to proceed after funding ended and whether there were any **long-term impacts** of temporally funded programmes or projects. We raise a question again: what is PE trying to achieve? Is it only impact or civil empowerment? And we assume that the most important is to consider **whether PE activities are really doing what we want them to do** and the last is the most innovative approach for PE.

4.3 Emerging innovation areas for PE

While collecting and analysing information on key points for inventory of PE (Deliverable 1.1.) we used a triangle-category system: basic information; engagement forms/tools; and impact, considering that there is a direct relation between nature of engagement, potential methods and impact (Improving Access for Research and Policy , 2012).

Based on our review we elaborated inventory of PE (Deliverable 1.1.) while **identifying areas where innovations are most likely to occur and innovative approaches** for PE. We illustrated the PE areas and approaches in Table 1. As a PE2020 consortium we found 5 areas where innovations are more likely to occur. In addition, in column two we presented 5 areas we identified through literature review. Overlapping the two lists, we drew out resulting list of 8 areas explained below, where innovations can be looked for, and finally, we interlinked them with 10 innovative approaches, which are going to be elaborated in further research.

Table 1. Innovation Areas for PE

FROM PE2020 PARTNERS	FROM LITERATURE	PROPOSESD NEW NAMES	INNOVATIVE APPROACHES	INNOVATIVE TECHNIQUES
Institutional arrangements	Access points	**Institutional dimension**	Institutionalisation of the engagement	PE officers; citizens' juries; engagement in research process; public recruitment; engagement of mentors
			Monitoring and evaluation	
			Institutional hybridity	mixing science museums and STI policy institutions
Methodological solutions	Forms and Techniques of Engagement	**Tools and strategies**	N/A	N/A
Levels of representation	N/A	**Representation**	Multilevel engagement	N/A
Responsiveness to societal challenges	N/A	**Societal responsiveness**	N/A	N/A
N/A	Key engaging groups	**Groups' involvement**	Targeting of specific groups	young families; local organisations; CSOs; communities; unengaged groups; youth
			Understanding of needs of different groups	N/A
N/A	Culture and motivations of PE	**Cultural dimension**	Promotion of the engagement culture among researchers	rewards; nominations

FROM PE2020 PARTNERS	FROM LITERATURE	PROPOSESD NEW NAMES	INNOVATIVE APPROACHES	INNOVATIVE TECHNIQUES
			Public availability of engagement tools	N/A
Impact	Outcomes	**Policy relevance**	Impact and policy orientations	N/A
N/A	Dynamics of information flows	**Communication flows**	Meta and social networking	N/A
N/A	N/A	N/A	Non-typical dissemination and innovative communication	social media; exhibitions; local newspapers; participatory videos; Apps; charity events

Developed by authors

In addition, we explained the suggested new names for the innovative areas of PE:

- **Institutional dimension**: this area concerns the capacity to make PE practices and objectives fully embodied in the organisation (i.e., PE processes endowed with stable funds, human resources, institutional recognition and visibility); therefore, all the approaches aimed at the institutionalisation of the engagement, to attempt new forms of institutional arrangements or to favour the development of reliable systems for monitoring and evaluating PE initiatives are considered here.
- **Tools and strategies:** this area concerns the development and use of effective PE tools and strategies; this includes, therefore, the development of new PE tools, the application of existing tools in new contexts, the adaptation of existing tools in order to pursue new aims or to involve new target groups, the development of new strategies combining different tools and techniques, and so forth.
- **Representation**: this area concerns the capacity to involve a wide range of stakeholders following participation principle of the multilevel governance, fostering awareness and prompt dissemination, support evolving dialogue on application of multilevel governance.
- **Societal responsiveness:** this area concerns the capacity of making PE initiatives able to match real problems, risks or opportunities; this implies the capacity of PE sponsors to really understand each time what is at stake with PE.
- **Groups' involvement**: this area concerns the capacity to identify which are the target groups, to favour their mutual interaction, to understand their specific needs and expectations and to select and use PE strategies and tools which are appropriate to each of them.
- **Cultural dimension**: this area concerns the capacity to change cultural orientations, modify views and behavioural patterns at the individual and organisational levels, as well as to understand, interpret and support the motivations of any actor concerned with PE activities.
- **Policy relevance**: this area concerns the capacity of PE initiatives to have real policy impacts, e.g. influencing the decision making processes, allowing people to directly take decisions, permanently changing the way in which policy institutions or bodies work, influencing policy-makers' cultural and social attitudes towards science, technology and PE.
- **Communication flows**: this area concerns the capacity to promote and manage fast, broad and effective communication flows among all the players actually and potentially involved, through, e.g. non-typical dissemination and innovative communication, meta-networking and social networking.

Based on our literature review, further elaboration of the identified approaches leads us to innovative engagement techniques that we defined as effective in research programme context. Additionally, we

identified that exclusively social media was emphasized as a base of PE and presented as a radical innovation (Lee and Kwak, 2011). We also consider that these innovative approaches and techniques are relevant to our further exploration of nominated 50 cases (WP1) and justification (WP3) focusing only on programme level.

5   Validation of the pre-categorization

In this section, we discuss the validation and enrichment of PE typologies. The point of departure for this discussion was the inventory of PE mechanisms and initiatives that was developed for Deliverable 1.1. The list of more than two hundred specific engagement initiatives that was compiled in WP1 was tentatively organised using an initial pre-categorisation model significantly informed by previous studies within the field of PE in science and technology. Below, we describe the empirical and theoretical sources for the pre-categorisation model. In turn, we describe our efforts to test and validate the pre-classification model, and we present the resulting, enriched model, which came to be applied as the systematizing scheme for the inventory. The validation procedure itself has been instrumental in developing our understanding of PE.

5.1   Research strategy for the categorization of PE initiatives

At the outset, the research strategy for the categorization procedure comprised a two way process; an explorative and inductive approach, which took the empirical material as its starting point and at the same time, the approach was also informed by a tentative pre-categorization model, derived from existing literature. A preliminary interpretative framework and categorization procedure could emphasize a range of different dimensions and variables to highlight similarities and differentiations between and among PE initiatives as well as for further consideration for the following refinement of typology construction: nature of participants; nature of sponsors; nature of organisers; selection methods; time scale/duration; objectives/function; intensity of participation; themes; geographical scale (see Section 6).

However, we initiated data collection and coding process with a fairly simply model which at its outset included two main dimensions: the degree of formalization as well as the degree of intensity in terms of participation in knowledge co-construction (see Deliverable 1.1). The pre-categorization model was intended to help to guide and structure the data collection and coding process while remaining simple and open, to allow for an explorative research strategy at which further categorization and data analysis would be 'grounded in the data' (Charmaz 2006:2). The tentative pre-categorization model depicted in Deliverable 1.1 entails a 6 cell typology. The first dimension concerns degrees of formalization of the engagement mechanisms/initiatives and it has 2 categories – formalized and non-formalized. The second dimension concerns the intensity of public involvement and is focused on the flow of information with 3 categories – communication, consultation and participation.

Then, to differentiate between PE mechanisms along with specific initiatives, these are categorized according to structure (the first dimension). This structure corresponds well to the MASIS report division of formalized vs. non-formalized procedures, respectively, and it allows for a scaling of mechanisms and specific examples from the most regulatory and institutionalized procedures to the more spontaneous initiatives. For a visualization of this structure, see Figure 1.

Figure 1. A Map of Public Participation in Science and Technology

Figure 19.1
A map of public participation in science and technology.
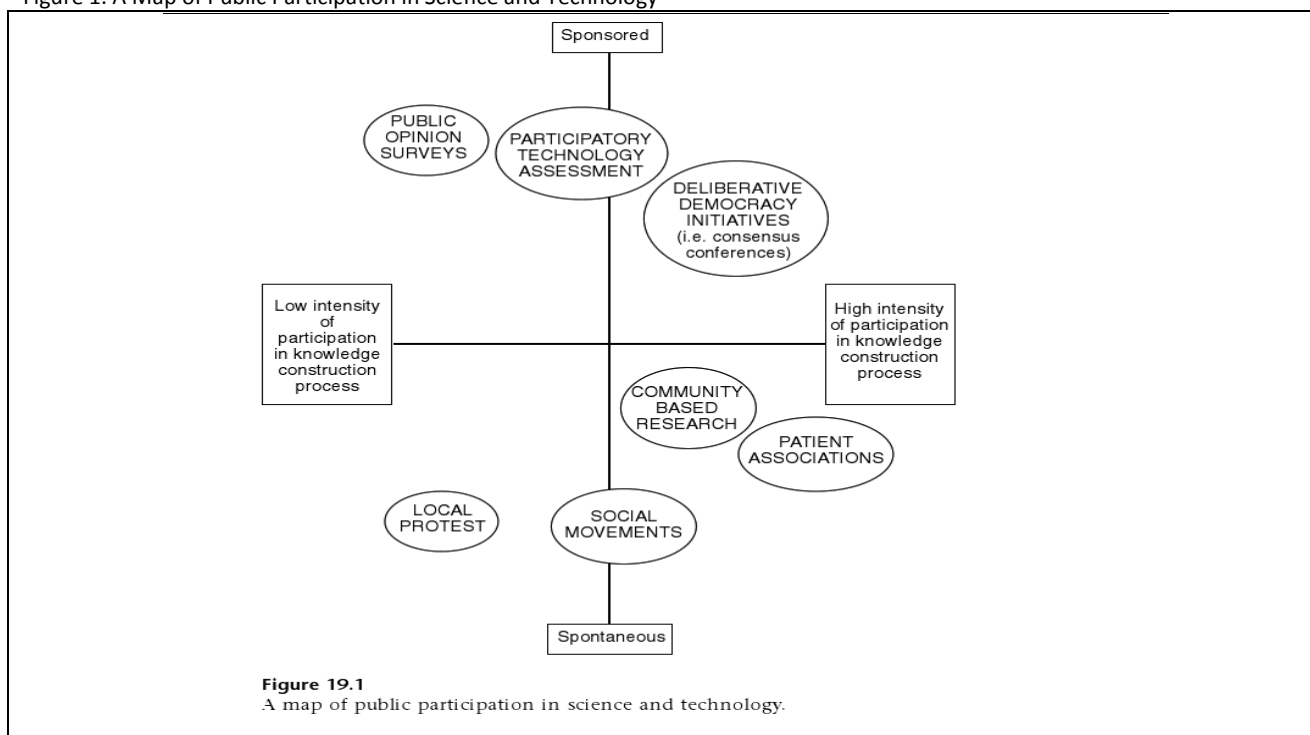
Source: Bucchi and Neresini 2008:462

The second dimension includes the intensity of participation in the 'knowledge construction process' (Bucchi and Neresini 2007:462) and thus concerns the levels, at which the public is involved. This scaling resembles well-known theoretical notions of interpreting and typologising public participation, in which Arnstein's 'ladder of citizen participation' (1969) represents one of the most familiar and renowned models. The public can participate in a number of ways, and can, for example, be merely 'passive recipients of information' from governmental bodies, it may be included in consulting procedures where the public opinion is taken into consideration or it may be an active participant in dialogue-based activities which forms part of decision-making processes, among others (Rowe and Frewer 2005:254).

In these examples, the *'flow of information'* differs to a substantial degree, and Rowe and Frewer (2005:254-255) therefore put forward a tripartite definition of PE – a definition that we also applied as a starting point for the second dimension:

- **Public communication**; the flow of information constitutes one-way communication from sponsors to public representatives, and no specific mechanisms exist to handle public feedback (e.g. public hearings and public meetings).
- **Public consultation**; held public opinions on certain topics are sought from the sponsors of the PE initiative and no formal dialogue is implemented. Thus, in this case, the one-way communication is conveyed from citizens to sponsors (e.g. citizens' panels, referendums and science shops).
- **Public participation**; information is exchanged between sponsors and public representatives and a certain degree of dialogue is facilitated. The flow of information constitutes two-way communication (e.g. consensus conferences and citizen juries).

Operating with these three broad categories during the initial coding phase helped organize and structure the comprehensive data material while maintaining "*an open, generative, emergent methodology*", without normatively forcing one's data to fit preconceived theories (Glaser, 1998). Furthermore, the typology allowed for a comparison of similarities and differences among PE mechanisms and formed the basis for 'conceptual clarification and thorough impact evaluation' where different procedures are compared against a range of different significant variables related to the objectives linked with the three types of PE sketched above. For example, mechanisms such as consensus conferences, action planning workshops and citizens juries could be conceptually juxtaposed as they all involve a controlled selection of participants, facilitated elicitation and an open response mode, among other characteristics (Bucchi and Neresini 2007:460; Rowe and Frewer, 2005).

However, when applying the simple model proposed in D 1.1., these mechanisms would broadly be categorized within the 'formalized' and 'participation' dimension, but the model facilitates further conceptualization through data analysis, also in terms of intensity of participation (regarded as a continuum). The tripartite definition of PE was initially targeted towards formalized procedures, but it was anticipated that it could be transferred to include non-formalized and more spontaneous mechanisms as well, not least in the initial and tentative pre-categorization phase. As will be described below, the tentative pre-categorization model was designed to assist the initial categorization phase and guide this empirical driven categorization procedure. Further conceptualization was needed to not only capture variation, but also to understand the 'hybrid forums' where information exchange perhaps also includes the negotiation and construction of new identities (Bucchi and Neresini 2007:460) and to understand hybridization in terms of the cutting edge interlinking of PE initiatives and new areas for citizens and policy makers to meet.

5.2   Coding procedure

The software programme Nvivo (a software package for computer-assisted qualitative data analyses) was applied to assist the organization, structuring and coding of data as well as to facilitate the systematic analysis and categorization of PE initiatives. The coding, categorization and validation procedure can be viewed as both a stepwise as well as an iterative process. This procedure will be outlined below along with a multiple coding exercise which can be considered a partial validation of the preliminary classification scheme that has been developed for the inventory. Reflections on the challenges to typology construction and on validation output are also included, as part of the procedural steps towards the refinement of analytical categories.

The MASIS reports as well as additional data material (see Deliverable 1.1) were exported to an Nvivo database, and PE mechanisms as well as specific case examples were coded according to the broad set of pre-constructed categories presented in Deliverable 1.1. This procedure involved a stage of more focused coding while at the same time, the coding process did also apply an open coding strategy which remained close to data and remained open towards the materializing of new categories and themes which aimed to help refine, specify, synthesize and conceptualize data further in order to determine whether the final pre-categories were sufficient and fit. These final categories were then to be tested against the data material to reach valid conclusions (Charmaz, 2006) and serve as a foundation for further analysis.

5.3   Towards refinement of analytical categories – validation and test of the preliminary classificatory scheme

As a first result of the pre-categorisation coding, we found that in some of the specific initiatives/cases, the information flow is conveyed from citizens to sponsors, but not on the initiative of the sponsors (which

characterizes the 'public consultation' category). In these cases, most mechanisms and initiatives are grassroots and activist oriented (for example, demonstrations and protests). We therefore constructed a fourth category grounded in the data; 'public activism', in which the above mentioned mechanisms can be included (see Deliverable 1.1). This 8 cell typology formed the bases for a partial first phase validation.

5.3.1   Multiple coder exercise

As a next step in the analytical approach, all consortium partners (four groups besides the AU partner) carefully examined 50 randomly chosen initiatives from the inventory list of PE mechanisms and specific initiatives and coded them within the categories constructed as a result of the first round of coding. This multiple coding exercise was designed to function as the first level of both technical and substantial validation as the pre-categorization model were to be tested as well as the 'inventory content'. As others have stated, no systematized and thorough descriptions of all PE mechanisms exist and, furthermore, different mechanisms are sometimes regarded under one category as well as similar mechanisms have been described with various labels (Rowe and Frewer, 2005:253). The appliance of multiple 'coders' were to a greater degree to ensure that such conceptual contradictions would be detected and systematically clarified. Another issue concerned the level of aggregation. Some of the specific inventory PE initiatives have implemented several generic PE mechanisms and/or objectives which can complicate categorization. A meticulous multiple coding's procedure aimed to help to validate the process and also function as an initial case exploration for all partners.

The different partner classifications were then compared and involved a 'pattern matching' pro-cess at where variations were identified in an iterative manner of systematically comparing each classification of generic mechanisms and specific case examples against the other classifications. A graphic presentation of the full multiple coding exercise, which collates the individual/group based coding results, is illustrated in Figure 2. The illustration helps to visualize how the 50 case codings are distributed across the two dimensions in terms of agreement among coders.

5.3.2   Validation outputs – challenges and further approach

As illustrated in Figure 2, the validation exercise showed some inter-coder variations. Several potential explanations can be emphasized:

1. *Variation may be a result of insufficiently described cases/initiatives*, i.e. we simply do not have enough knowledge of the cases to perform a plausible categorization. Many cases include various actions and mechanisms which have also constituted a real challenge in the pre-coding process. The 'real-life' examples are complex and multifaceted and often several mechanisms are used and have been altered due to objectives, resources, etc. Furthermore, the terminology also differs across countries. Another challenge includes the lack of thoroughly and well described mechanisms as well as specific initiatives in the data.

2. *Variation may be a result of insufficiently specified preliminary dimensions*, i.e. we do not have a thorough, consistent, and shared understanding of what the preliminary categories are intended to capture. The four categories within the second dimension (communication, consultation, activism, and participation) are too broad to contain variation across cases. Especially the distinction between 'consultation' and 'participation' remains unclear. This is also complicated by occasionally equivocal case descriptions. Furthermore, (a) the current dimensions are not able to fully embrace the question of political impact and degree of 'power sharing' in decision-making processes; (b) the current dimensions do not capture dimensions of 'innovativeness' and 'challenge-orientation', which are central to the overall project. The formalized/not-formalized dimension also needs

further elaboration. A very clear exercise output concerns the vagueness of the formalized/non-formalized categories and it seems that the concepts connote different meanings. For example, the degree of formalization can be also related to the sponsor and/or organizer of the initiative as well as to the temporal character of the initiative (one-off initiative or permanent exercise → institutionalization) along with other considerations.

3. *Variation may signal inadequacy of the categories to capture the empirical examples*, i.e. the dimensions as such do not align with real-life of PE.

We believe that all of these three explanations have some relevance and especially explanation 1 and 2. However, at the same time the pre-categorization model has in our view also fulfilled one of its objectives of highlighting – in a tentative way – how participants are involved (e.g. as passive recipients of knowledge, as 'activists', as consultants or active participants in decision-making processes). This intensity of participation can assist locating innovative and cutting edge examples, as these probably not to a great extent will be found in the 'public communication' category.

Figure 2. Results of Multiple Coding Exercise
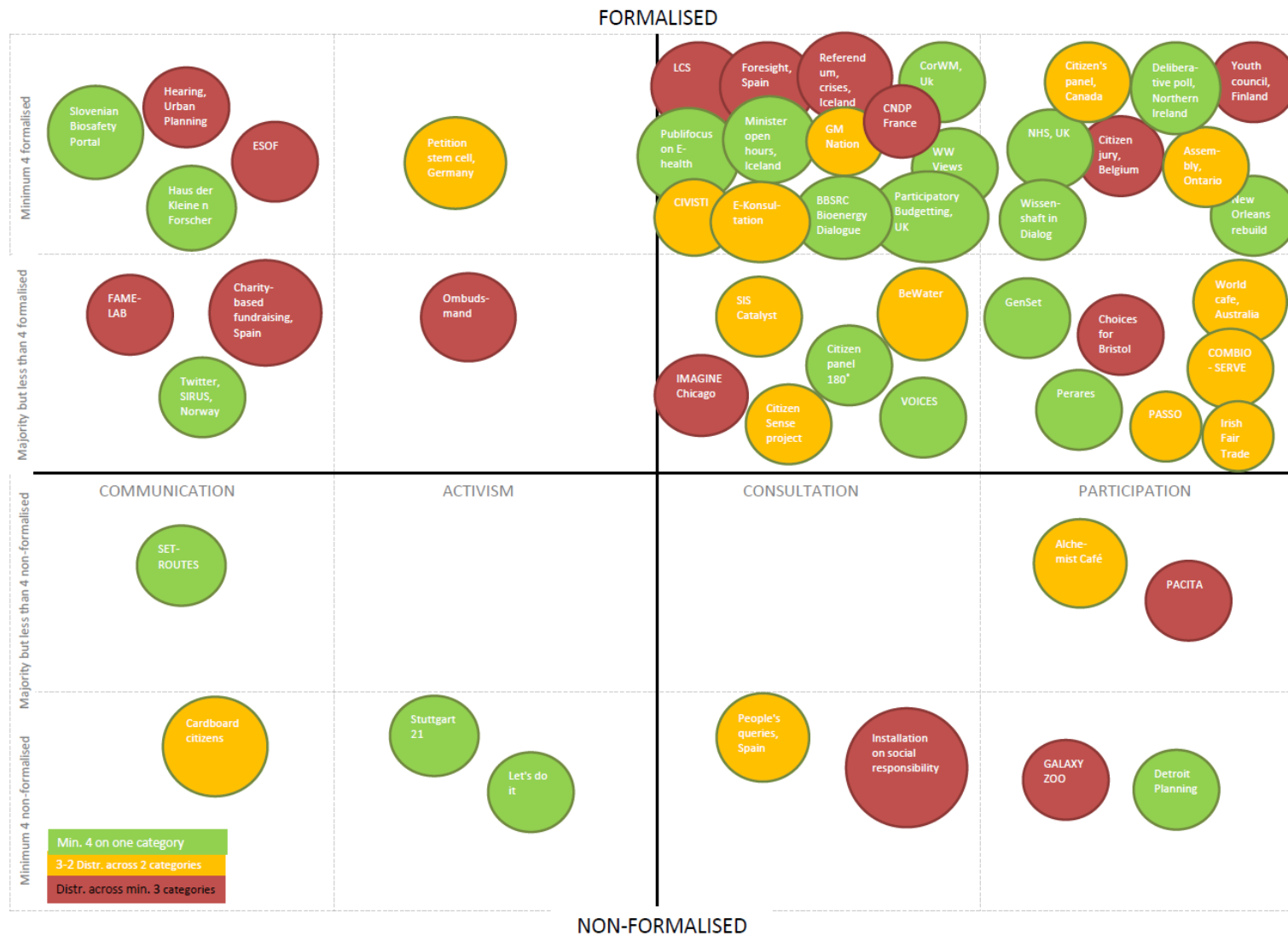
5.4 Revised pre-categorization of PE mechanisms and initiatives

The multiple coder exercise revealed important challenges associated with the two dimensions in the first pre-categorization model. Especially **the first dimension encompassing formalized/non-formalized initiatives remained too vague and imprecise for further categorisation** in its current state and for the further task of pre-categorising, **this dimension was excluded while the other dimension was further refined**. For instance, beside the fourth category of 'public activism', a fifth category concerning 'public deliberation' was also constructed, as it was evident from the empirical findings that the tripartite definition (plus the fourth category) was not sufficiently specified to capture the diversity among the inventory mechanisms and initiatives. Furthermore, it was especially evident that the distinction between 'consultation' and 'participation' remained imprecise which could possibly be explained by the fact that they do not sufficiently outlined the aspect of deliberation. The latter category of 'public deliberation' then covers deliberative forms of engagement which go beyond consultative mechanisms, but where the outcome does not necessarily impact decision making.

Furthermore – and as included above and described in Deliverable 1.1., the tripartite definition put forward by Rowe and Frewer was not able to fully embrace the question of political impact and degree of 'power sharing' in decision-making processes which to a greater extent are included in Arnstein's model and other classification models (Smith, 2005; Burgess and Chilvers, 2006). The five categories applied still partly build on the tripartite definition characterized above, but have been elaborated according to the intensity of participation in terms of involvement in decision-making processes and the potential political impact of citizens on these processes (Smith, 2006).

In conclusion, as resulting from the validation exercise of the pre-categories, we ended up with a revised classification, where the inventoried PE mechanisms and initiatives in Deliverable 1.1 are presented according to the following five categories:

- **Public communication** – *the aim is to inform and/or educate citizens*. The flow of information constitutes one-way communication from sponsors to public representatives, and no specific mechanisms exist to handle public feedback (examples include public hearings, public meetings and awareness raising activities).
- **Public activism** – *the aim is to inform decision-makers and create awareness in order to influence decision-making processes.* The information flow is conveyed in one-way communication from citizens to sponsors, but not on the initiative of the sponsors as characterizes the 'public consultation' category (examples include demonstrations and protests).
- **Public consultation** – the aim is to inform decision-makers of public opinions on certain topics. These opinions are sought from the sponsors of the PE initiative and no formal dialogue is implemented. Thus, in this case, the one-way communication is conveyed from citizens to sponsors (examples include citizens' panels, planning for real, focus groups and science shops).
- **Public deliberation** – the aim is to facilitate group deliberation on policy issues of where the outcome may impact decision making. Information is exchanged between sponsors and public representatives and a certain degree of dialogue is facilitated. The flow of information constitutes two-way communication (examples include 'mini publics' such as consensus conferences, citizen juries, deliberative opinion polling).
- **Public participation** – the aim is to assign partly or full decision-making power to citizens on policy issues. Information is exchanged between sponsors and public representatives and a certain degree of dialogue is facilitated. The flow of information constitutes two-way communication (examples include co-governance and direct democracy mechanisms such as participatory budgeting, youth councils and binding referendums).

As the main aim of these categories are to organize and survey a large amount of data, the categories need to be able to allow for a comparison of similarities and differences among PE mechanisms, but at the same time be inclusive enough to encompass hybrid forms of PE innovations. This implies that a mechanism/initiative could potentially feature in more than one category. The main aim of the mechanism/initiative has therefore been the decisive factor for the preliminary categorization. In cases where several mechanisms are applied, the main mechanism (as well as the main objective) has been the decisive factor. In general, the categorization of both initiatives and mechanisms has been informed by established literature and by a qualitative and careful assessment of case description/additional material established through multiple coding sessions.

The inventory presented in Deliverable 1.1 thus applies a simple, dual classification scheme. First, it distinguishes between PE mechanisms (which are generic ways of enacting PE) and PE initiatives (which are the concrete examples of specific engagement activities). Second, it classifies PE mechanisms according to five overarching models, namely communication, activism, consultation, deliberation, and participation. This basic classification scheme is primarily a means for arranging the empirical cases in an accessible and informative way. It is meant to reduce complexity in a highly complex database. Clearly such classificatory schemes also involve a certain degree of violation of the subtler nuances of the individual cases, and attempt to validate the classification scheme by multiple coding procedures within the PE consortium have revealed considerable interpretative variation and have highlighted the difficulties in applying even simple categorisation of PE initiatives.

Finally, it should therefore be stressed that the classification scheme applied here is preliminary. In later stages, the PE2020 project will carry out additional work that aims at further validating, enriching and strengthening the categorisation of PE initiatives.

6 Enrichment of the Inventory of PE practices

In this section, we discuss the enrichment of PE typologies and elaboration of categories. The point of departure for this discussion was the typologies of PE that were developed for Deliverable 1.1. The five categories were defined in WP1. Below, we describe the theoretical sources for the new possible dimensions and variables of PE practices. And we attempted to determine the relevant criteria of PE processes resulting for the further deeper analysis of PE practices.

6.1 Enrichment of the typologies of PE processes

Previously in our analysis for the nomination of 50 cases we applied mechanisms and initiatives (Deliverable 1.1.) divided into five categories, which is visualised below as a Pentagram (Figure 3). For the purpose of elaboration of typologies to a more detailed level, we reviewed academic literature on PE in STI.

Figure 3. Pentagram of Inventory Mechanisms and Initiatives
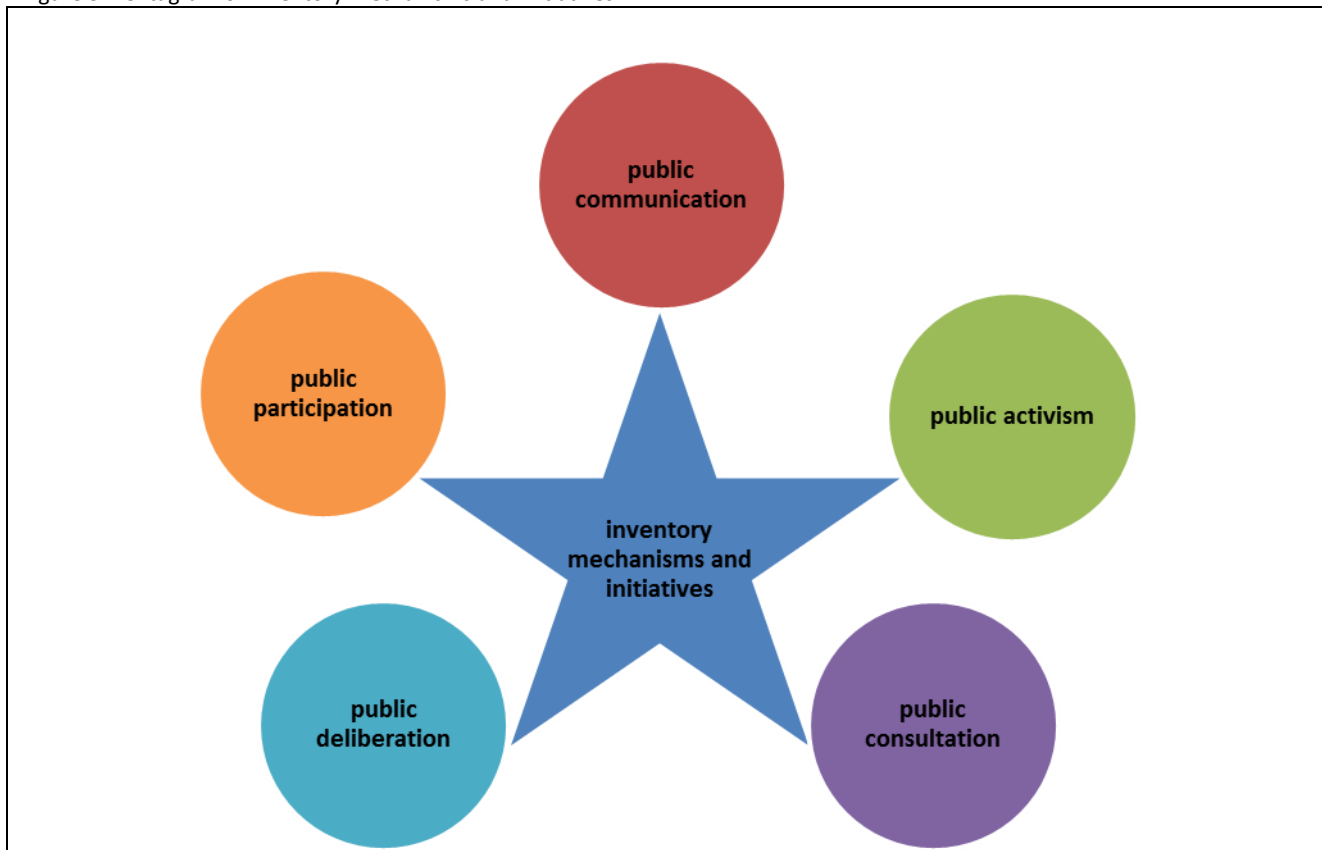
Developed by authors

In our analysis of typologies we also emphasized a range of different dimensions and variables to highlight similarities and differentiations PE initiatives and mechanisms. The following list contributes to further consideration for the refinement of typology construction:

- **Nature of participants**: Public, 'quasi experts', technical expertise, other stakeholders;
- **Nature of sponsors:** Governmental/regulatory agency, professional SIS practitioners, universities/higher education institutions, industry, CSO's;
- **Nature of organisers:** Governmental/regulatory agency, professional SIS practitioners, universities/higher education institutions, industry, CSO's;
- **Selection methods:** Controlled, uncontrolled, self-selection;
- **Time scale/duration:** From a single point in time (voting) to methods which can last much longer (public inquiries/hearings);
- **Objectives/function:** Communication, dialogue/deliberation, mutual engagement, knowledge co-production, education, capacity building, decision-making power;
- **Intensity of participation**: From information to citizen control on final policy decision-making processes (Binding vs. non-binding decisions) – continuum – ladder of participation;
- **Themes (e.g. societal challenges, Horizon 2020):** 1. Health, demographic change and wellbeing. 2. Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bio-economy 3. Secure, clean and efficient energy 4. Smart, green and integrated transport 5. Climate action, environment, resource efficiency and raw materials 6. Europe in a changing world – inclusive, innovative and reflective societies 7. Secure societies – protecting freedom and security of Europe and its citizens;

- **Geographical scale:** Transnational, national, institutional, local, virtual;

The following analysis contributes toward a deeper analysis of the 50 most promising and innovative PE practices (Deliverable 1.1.) and supports further analysis performed in Task 1.2 with relevant categories that can enrich the analysis and link it to previous research.

Table 2. The Most Frequent Typologies of Public Engagement

Criterion	References
Typology based on different degrees of participation on a continuum. Numerous alternative terms suggested for different rungs of the ladder (e.g. Biggs, 1989; Pretty, 1995a,b; Farrington, 1998; Goetz and Gaventa, 2001; Lawrence, 2006; Krütli et al., 2010)	Arnstein's (1969) ladder of participation. Sometimes presented as a wheel of participation Davidson (1998)
Typology based on nature of participation according to the direction of communication flows	Rowe and Frewer (2000)
Typology based on theoretical basis, essentially distinguishing between normative and/or pragmatic participation	Thomas (1993), Beierle (2002)
Typology based on the objectives for which participation is used	Okali et al. (1994), Michener (1998), Warner (1997), Lynam et al. (2007), Tippett et al. (2007)
Typology based on informedness	Pardo et al. (2002)
Typology based on governance of science	Felt and Fochler (2008)
Typology based on levels of interaction between science and citizens within the analytical-deliberative process	Krütli et al. (2010)
Typology based on the purpose to establish communicative strategy	OECD (2012)

Source: Reed, 2008; Felt and Fochler (2008); Stares, 2009; Krütli et al. (2010); OECD (2012)

We identified additional criteria of PE typologies that is reflected in our research on the basis of public activities (see Table 2). Though the way in which activities are being built linking to benefits and risks is highly fragmented in literature, and the processes described are located in a wide range of sectors and levels of engagement. Given these challenges and reflecting the diversity of nominated cases (Deliverable 1.1.) we consider that PE needs to draw on existing understanding and insights in STI, improve science governance, promote collaboration and knowledge exchange between different groups and produce new insights (Marks, 2013) in STI areas of particular societal challenges. The following analysis contributes toward a deeper analysis of the 50 most promising and innovative PE practices (Deliverable 1.1.) and supports further analysis performed in Task 1.2 with relevant criteria that can enrich the analysis and link it to previous research.

6.2 Elaboration of PE categories

This section presents major discussion points on categories of PE based on literature review stimulating further discussion and addressing new options for further categorisation and analysis of PE practices. The

theorized criteria of engagement include the attainment of more effective PE and the enhancement of knowledge in this area. However, the empirical evidence for these advancements is scant. We structured the further discussion on the new criteria according categories of inventory mechanisms. It is emphasized that the following discussion has some validity, though it does not exhaustively cover all appropriate criteria by which PE practices ought to be evaluated.

Public deliberation. The literature review results described that the deliberation of PE processes must involve discussion between participants, variety of targeting groups and sources for dissemination, also a defined and reachable purpose (Embedding Impact Analysis in Research, 2013). For deeper analysis of 50 cases we identified the following possible criteria:

- **Deliberative research** is built on market research mechanisms, for example, citizens' surveys.
- **Deliberative dialogue** is built on communication mechanisms, enabling experts and non-experts to work together, for example, citizens' agenda.
- **Deliberative decision making** is built on partnership mechanisms, enabling public and decision-makers to decide jointly on programme priorities; for example, EC green papers.

Public communication. Most literature defined that public communication or spread of information is not effective anymore, but remains the base for PE (Marks, 2013). We suggest distinguishing additional criteria within this category:

- **Online communication** refers to reading, writing and communication via computers, for example, e-newsletter, blogs, emails, Skype.
- **Social networking** refers to a structure or platform made up of a set of individuals or organisations, for example, Facebook, Twitter, charity organisations.
- **Engagement transfers** refer to technologies or other mechanisms which enables public to become engaged and involved, for example, Apps.
- **Non-ICT-based communication** refers to non-computer based communication (events, traditional media-based communication, etc.).
- **Science education** refers to delivery of PE activities in two-way-flow of information and it relates specifically to higher education institutions, focuses on issues like productive learning and quality. It is tied to formal educational system. First, engaging students in science learning and improving their ability to communicate science to wider audience, and, second, supporting and encouraging researchers to participate in such kind of engagement, for example, science communication subject in a study course.

Public activism. The literature focused mostly on active citizenship or active PE. And we defined **frequency of PE** as possible quantitative criteria; however, we assume that we will be unable to find empirical data at this stage of research. We consider that self-determination for PE is emotionally interlinked to individual values and emotions provoking a sense of urgency, therefore, additionally, we propose **public sensitiveness** as one more criteria to be analysed in further research.

Public participation. A part of literature described public participation as public consultation and vice versa while putting emphasis on variety of engagement forms and funding mechanisms that alter expectations on impact. We propose the following criteria to be considered in the further analysis of the 50 cases:

- **Multiple-engagement** refers to PE at different times with varying degrees and forms of participation to achieve desired goals, i.e. different segments of population will respond differently

to different strategies. In some cases, it might mean Facebook, in other cases, face-to-face communication.

- **Multiple-partnership** is built on partnership with various organisations or states in order to enable them to develop skills for engaging with each other which enables them to work effectively for the same goal, for example partnership between university and museum, cooperation between two or more countries.
- **Multiple-funding** refers to a variety of funding, i.e. co-funding, for example, a programme financed by national foundation and EU programme.

Public consultation. Most of literature described public consultation as a process that elicits 'raw' opinions from the public, other focused on the lack of impact of public consultations. The 'consultative' approach asks for opinions and has no way for making participants to account for what they say (Embedding Impact Analysis in Research, 2013) and at the same time we defined that different groups are pitted and work together in adversarial role. In further analysis we suggest pointing **targeted and non-targeted engagement**, which aims at targeting groups related to a specific research topic or engagement of wider public.

Additionally, we emphasize that empowered communities share responsibility for making decisions and accountability for the outcomes of those decisions (Communities, 2009), and public empowerment implies commitment from public as a stakeholder to maintain a high level of engagement (Morris and Baddache, 2012) during the design, development and implementation of research. And our point is that such framework of governance is built on clear roles and responsibilities of all participants, sufficient resources enabling an empowerment approach. Addressing the results from literature review we also consider the defined criteria contributing to participatory performance in the context of research programmes (Deliverable 2.3.) and to further analysis of best practices (Task 1.2).

Finally, it should therefore be stressed that the enrichment of PE categories will be developed in later stages while the PE2020 project will carry out additional work that aims at further validating, enriching and strengthening the categorisation of PE mechanisms.

References

Arnstein, S. A. (1969) Ladder of Citizens Participation. *Journal of the American Institute of Planners*. 35(4): 216-224.

Arvanitakis, J.; Hodge, B. (2012) Forms of Engagement and the Heterogeneous Citizen, Gateways: *International Journal of Community Research and Engagement*. 5: 56-75.

Banks, S.; Armstrong, A. (2012) *Ethics in Community-Based Participatory Research: Case Studies, Case Examples and Commentaries*, Durham University, NCCPE: Bristol. Retrieved from http://www.engage-nu.com/wp-content/uploads/2013/11/Ethics-in-community-based-participatory-research-Case-studies-case-examples-and-commentaries.pdf.

Borchelt, R.; Hudson, K. (2008) Engaging the scientific community with the public – communication as a dialogue, not a lecture. *Science Progress*. Spring-Summer, 78-81. Retrieved from http://scienceprogress.org/2008/04/engaging-the-scientific-community-with-the-public/.

Bucchi, M.; Neresini, F. (2007) Science and Public Participation. In: Hackett et al. *Handbook of Science and Technology Studies* (3rd edition). Cambridge: MIT Press.

Burgess, J.; Chilvers, J. (2006) Upping the ante: A conceptual framework for designing and evaluating participatory technology assessments. *Science and Public Policy*. 33: 713-728.

Campbell, D. (2014) Inspiring the Next Generation of Scientists Through Citizen Science. Retrieved from http://www.huffingtonpost.co.uk/dallas-campbell/next-generation-scientists_b_5151115.html.

Charmaz, K. *Constructing grounded theory: a practical guide through qualitative analysis*. London: Sage Publications, 2006.

Chopyak, J.; Levesque, P. (2002) Public participation in science and technology decision making: trends for the future. *Technology in Society*. 24: 155-166.

Collins, H.; Evans, R. (2002) The Third Wave of Science: Studies of Expertise and Experience. *Social Studies of Science*. 32(2): 235-296.

Corbin, J.; Strauss, A. (2008) *Basics of qualitative research: Techniques and procedures for developing grounded theory*. 3rd edition. Thousand Oaks, CA: Sage.

Cronin, P.; Ryan, F; Coughlan, M. (2008) Undertaking a literature review: a step-by-step approach. *British Journal of Nursing*. 17(1): 38-43.

Deliberative Public Engagement: Nine Principles (2013), National Consumer Council. Retrieved from http://www.involve.org.uk/wp-content/uploads/2011/03/Deliberative-public-engagement-nine-principles.pdf.

Devonshire, I. M.; Hathway, G. J. (2014) Overcoming the Barriers to Greater Public Engagement. *PLOS Biology*. 12(1): 1-4.

Dietz, T.; Stern, P. C. (2008) *Public Participation in Environmental Assessment and Decision Making*. Washington DC: The National Research Council.

Dryzek, J. S. (2000) *Deliberative democracy and beyond. Liberals, critics, contestations*. New York: Oxford University Press.

Dryzek, J. S. (2009) Democratization as deliberative capacity building. *Comparative Political Studies*. 42: 1379-1402.

Dryzek, J. S. (2010) *Foundations and Frontiers of Deliberative Governance*. New York: OUP.

Empowering Communities to Influence Local Decision Making (2009), Communities and Local Government Publication. Retrieved from https://www.yumpu.com/en/document/view/22481488/ empowering-communities-to-influence-local-decision-making-short-.

Engaging with Impact: How do We Know if We have Made a Difference? (2012) Welcome Trust. Retrieved from http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_grants/documents/web_document/wtp052364.pdf.

Facer, K.; Manners, P.; Agusita, E. (2012) Towards a Knowledge Base for University-Public Engagement: sharing knowledge, building insight, taking action, NCCPE: Bristol. Retrieved from https://www.publicengagement.ac.uk/sites/default/files/90154%20NCCPE%20AHRC%20knowledge%20base%20publication_3%20May.pdf.

Felt, U.; Fochler, M. (2008) The bottom-up meanings of the concept of public participation in science and technology. *Science and Public Policy*. 35(7): 489-499.

Fischer, F. (2009) *Democracy and Expertise*. Reorienting Public Policy. New York: OUP.

Geurts, J. L.; Mayer, I. (1996) *Methods for participatory policy analysis: Towards a conceptual model for research and development*. Tilburg, Netherlands: Work and Organization Research Centre (WORC).

Glaser, B. G. (1998) *Doing Grounded Theory - Issues and Discussions*. Mill Valley, CA: Sociology Press.

Goodin, R. E.; Dryzek, J. S. (2006) Deliberative impacts: The macro-political uptake of mini-publics. *Politics & Society*. 23(2): 219-244.

Habermas, J. (1997) *The theory of communicative action. Vol. 1 reason and the rationalization of society*. Cambridge: Polity Press.

Hussain, R.; Moore, G. (2012) *UCL Beacon for Public Engagement*. University College London.

Improving Access for Research and Policy. (2012) Report from the Administrative Data Taskforce, UK ADR Network. Retrieved from http://www.esrc.ac.uk/_images/ADT-Improving-Access-for-Research-and-Policy_tcm8-24462.pdf.

Embedding Impact Analysis in Research, JISC and National Coordinating Centre for Public Engagement, 2013. Retrieved from http://www.publicengagement.ac.uk/sites/default/files/publication/nccpe_jisc_booklet_proof_07.05.13.pdf.

Joss, S.; Bellucci, S. (2002) *Participatory technology assessment – European perspectives*. London: University of Westminster.

Kingdon, J. W. (1995) *Agendas, Alternatives, and Public Policies*. 2nd edition. New York: Longman.

Krütli, P.; Stauffacher, M.; Flüeler, Th.; Scholz, R W. (2010) Functional-dynamic public participation in technological decision-making: site selection processes of nuclear waste repositories. *Journal of Risk Research*. 13(7): 861-875.

Lee, G.; Kwak, Y. (2011) The Open Government Implementation Model: Moving to Increased Public Engagement. Retrieved from http://www.businessofgovernment.org/sites/default/files/An%20Open%20Government%20Implementation%20Model.pdf.

Leshner, A. I. (2003) Public Engagement with Science. *Science*. 299: 997.

Mallery, C.; Ganachari, D.; Fernandez, J.; Smeeding, B.; Robinson, S.; Moon, M. (2012) *Innovative Methods in Stakeholder Engagement: An Environmental Scan*. AHRQ Publication. Retrieved from http://www.effective healthcare.ahrq.gov/tasks/sites/ehc/assets/File/CF_Innovation-in-Stakeholder-engagement_Literature Review.pdf.

Marks, N. (2013) Six Ideal Types of Public Engagement with Science and Technology: Reflections on Capital, Legitimacy and Models of Democracy. *International Journal of Deliberative Mechanisms in Science*. 2(1): 33-61.

Mirza, R.; Vodden, K.; Collins, G. (2012) Community Engagement in the Grand Falls-Windsor-Baie Verte, Harbour Breton Region, Memorial University. Retrieved from http://www.open.gov.nl.ca/ collaboration/pdf/community_engagement.pdf.

Morris, J.; Baddache, F. (2012) Back to Basics: How to Make Stakeholder Engagement Meaningful for Your Company. Retrieved from http://www.bsr.org/reports/BSR_Five-Step_Guide_to_Stakeholder _Engagement.pdf.

Onwuegbuzie, A. J.; Leech N. L.; Collins, K. M. T. (2012) Qualitative Analysis Techniques for the Review of the Literature. *The Qualitative Report*. 17(56): 1-28.

Optimising Civil Society Participation in Research (2013). De Montfort University, UK. Retrieved from http://ec.europa.eu/research/science-society/document_library/pdf_06/optimising_civil_society_participation.pdf.

Ozolina, Z., Mitcham, Stilgoe, J. (2009) Global Governance of Science. European Commission , Brussels. Retrieved from http://ec.europe.eu/research/research.eu

Pieczka, M.; Escobar, O. (2013) Dialogue and science: Innovation in policy-making and the discourse of public engagement in the UK. *Science and Public Policy*. 40: 113-126.

Planning Guide for Public Engagement and Outreach in Nanotechnology. Key Points for Consideration when Planning Public Engagement Activities in Nanotechnology (2012). OECD. Retrieved from http://www.oecd.org/sti/biotech/49961768.pdf.

Porter, M. E. (1998) *Competitive Advantage of Nations - with a New Introduction*. Basingstoke: Macmillan.

Public Engagement in Science (2008), European Commission. Retrieved from http://ec.europa.eu/ research/science-society/document_library/pdf_06/public-engagement-081002_en.pdf.

PytlikZilling, L.; Tomkins, A (2011) Public Engagement for Informing Sciene and Technology Policy: What Do We Know, What Do We Need to Know, and How We Get There? *Review of Policy Research*. 28: 197-217.

Rask, M.; Maciukaite-Zviniene, S.; Petrauskiene, J. (2012) Innovations in public engagement and participatory performance of the nations. *Science and Public Policy*. 39: 710-721.

Rawls, J. (1993) *Political liberalism The John Dewey essays in philosophy*. New York: Columbia University Press.

Reed, M. S. (2008) Stakeholder participation for environmental management: A literature review. *Biological Conservation*. 141: 2417-2431.

Renn, O.; Webler, T.; Wiedemann, P. (eds.) (1995) *Fairness and competence in citizen participation. Evaluating models for environmental discourse.* Dordrecht, Boston, London: Kluwer Academic Publishers.

Responsible governance of science and technologies Perspectives from Europe, China and India (2014). Workshop on Responsible Governance of Science and Technologies, European Parliament. Retrieved from http://www.europarl.europa.eu/stoa/webdav/site/cms/shared/Booklet_190314.pdf.

Review of Informal Science Learning (2012), Welcome Trust, London. Retrieved from

http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtp040862.pdf

Rogers, E. (1995) *Diffusion of Innovations*. New York: Free Press.

Rowe, G.; Frewer, L. J. (2005) A Typology of Public Engagement Mechanisms. *Science, Technology & Human Values*. 30(2): 251-290.

Russo, G. (2010) Outreach: Meet the press. *Nature*. 468: 465-467.

Smith, G. (2005) *Power beyond the Ballot. 57 Democratic Innovations from around the World*. A report for the Power Inquiry. London: The Power Inquiry.

Stares, S. (2009) Using Latent Class Models to Explore Cross-national Typologies of Public Engagement with Science and Technology in Europe. *Science, Technology & Society*. 14(2): 289-329.

The Role of Philanthropy of Responsible Research and Innovation (2013). European Commission. Retrieved from http://bookshop.europa.eu/en/the-role-of-philanthropy-in-the-promotion-of-responsible-research-and-innovation-pbKINA26543.

The Role of Scientists in Public Debate (2001). Welcome Trust. Retrieved from http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtd003425.pdf.

Tolbert, Caroline J. and Daniel A. Smith. 2006. "Representation and Direct Democracy in the United States", Representation, 42 (1)

Vuarin, P.; Rodriguez, M. (1994) Innovation and communication within LEADER. *LEADER Magazine*. 7: 13-16.

Wilsdon, J.; Willis, R. (2004) *See through Science. Why Public Engagement Needs to Move Upstream*. London: Demos.

Wynne, B. (1995) Public understanding of science. In: *Handbook of Science and Technology Studies* / Eds. S. Jasanoff, G. Markle, J. Petersen, T. Pinch. Sage Publications.

Appendixes

Methodology for Analysis of Peer-Reviewed Literature

We conducted a search of peer-reviewed papers from scholarly journals in EBSCO, SAGE and Science Direct databases using keyword terms with Boolean operator 'AND'[3] listed in Table 1. We restricted searches for peer-reviewed papers in English and items published between 2008 and up-to-date taking in consideration the likely evolution of studies in PE during the latter decade where the attention on PE has increased. We also included our partners and asked them to suggest literature which was already content, but not-time framed. Respectively, some papers published since 2002 were included.

Table 1. Results of the initial search

Search Statement	Number of Records Downloaded[*]		
	by the database of		
	EBSCO Academic Search Complete, Business Source Complete, Education Research Complete, Teacher Reference Center, PsyARTICLES, SocINDEX with Full Text and other	SAGE journals	SciVerse ScienceDirect
Public engagement AND Stakeholder AND S&T	1	107	44
Public engagement AND S&T	7	236	83
Public engagement AND science	545	1010	1035
Public engagement AND science and technology	163	439	318
Public engagement AND research programme	30	63	152
Public engagement AND research project	40	204	269
Public engagement AND innovativeness	0	6	13
Public participation AND Stakeholder AND S&T	0	172	167
Public participation AND S&T	8	360	268
Public participation AND science	545	1444	3172
Public participation AND science and technology	132	465	749
Public participation AND research programme	19	59	372
Public participation AND research project	29	252	653
Public participation AND innovativeness	0	16	29
Public communication AND	1	43	32

---

[3] The Boolean operator 'AND' looks for papers that include all the identified keyword terms.

[*] There is a variety of papers that are referred in more than one database; thus, undoubtedly, there is always some repetitiveness. Papers were mainly retrieved in March 2014.

Search Statement	Number of Records Downloaded*		
	by the database of		
	EBSCO Academic Search Complete, Business Source Complete, Education Research Complete, Teacher Reference Center, PsyARTICLES, SocINDEX with Full Text and other	SAGE journals	SciVerse ScienceDirect
Stakeholder AND S&T			
Public communication AND S&T	6	171	114
Public communication AND science	553	699	721
Public communication AND science and technology	132	223	170
Public communication AND research programme	7	9	69
Public communication AND research project	24	105	144
Public communications AND innovativeness	0	5	14

Developed by authors

At the beginning we found approx. 17 thousand items in all databases together (see Table 1), and to limit the scope of our review to the topic, we developed inclusion criteria that emphasized PE in science and programme level. We also developed exclusion criteria for items that reflected opinions and that provided justification on PE without description of process of engagement. Some of the inclusion or exclusion criteria are reflected in the meta-synthesis strategy. The search was created to identify literature on PE in STI with a focus on programme level and innovativeness of PE. However, there were too few articles related only to programme level and we had to broaden our search and include projects and policy level, also to identify peer-reviewed literature on programme level outside research policy area. Table 2 provides a short description of inclusion and exclusion criteria.

Table 2. Inclusion and exclusion criteria for assessing peer-reviewed literature

Inclusion Criteria	Exclusion Criteria
Applies to PE in science and innovation	Describes public input through methods not related to our working definition of engagement
Applies to stakeholders engagement in science and innovation	
Describes factors and demands influencing PE	Provide justification of PE but does not describe a process, a theory applied, methods, etc.
Provides description of PE processes and approaches	Opinions
Describes impact measurement of PE	
Describes innovations in PE, including research programmes	Articles published prior to 2008 (exception for article identified by partners or AB members)
Suggested articles by partners or AB members (any date)	
Applies to Rowe and Fewer (2005) PE categories	

Developed by authors

Then, abstracts of papers were carefully examined and according to the relevance by topic, the first step to inclusion / exclusion was run. Following this stage of selection of peer-reviewed papers, we had a final undersized list of papers for the in-depth analysis in full-text. Further, the selected papers were grouped thematically (see Table 3).

Table 3. Selected pool of peer-reviewed papers

Theme	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Innovation in PE							1	1	2	1	1	
PE in innovation policy										1		
PE in other programmes and projects						2	2	4	1	2	1	
PE in research programmes and projects								1	1	1		1
PE in science or / and technology policy	1		5	1	1	8	6	10	17	14	8	10
Special cases of PE		1					2	1	4	2		
TOTAL:	1	1	5	1	1	10	11	17	25	21	10	11
	114											

Our research group singly read full-text paper (n=114) and recorded the main findings in a table that contains such variables as demand and supportive factors. Consequently, each factor was categorized by area (STI policy; other policies; research programmes/projects; other programmes/projects) giving more detailed information on reference and citation. Due to this analysis, our main research question was to find out academic observations on PE at three levels – policy (macro), programme (mezzo), project (micro). It helped to find out the most relevant scientific and empirically based issues on PE in STI. We also benefited from peer-review literature by deepening the theoretical framework of research on PE, identifying dependent and independent variables, and evaluated current PE practices. From the perspective of meta-synthesis, our aim was to transform findings into new conceptualizations and interpretations (Cronin et al. 2008:39). Moreover, we applied meta-synthesis method to generate a relevant approach for the analysis of secondary data. Here, we tried to look for new dimensions of demand and supportive factors as well as PE mechanisms and initiatives in line with three-level hierarchy (see Figure 1).

Figure 1. Three-level hierarchy of analysis of peer-literature review

National → Programme → Project

We also used constant comparison analysis that implies five major characteristics (Corbin and Strauss, 2008; Onwuegbuzie et al., 2012:13): i) building a theory; ii) providing analytic tools for data review; iii) introducing the understanding of multiple meanings from data; iv) providing systematic and creative process for data analysis; and v) assist in identifying, creating, and seeing the relationships among components of the data when constructing a theme. And implementing the objectives of the Deliverable 2.1, we constructed our analysis on the basis of grounded theory research (Onwuegbuzie et al. 2012:13), which will lead us to the construction of a conceptual model in Task 2.2.

Overview of Grey Literature and Sources of European Research Programmes

As our project focuses on programme level, we looked for the websites and reports of the European research programmes and grey literature which are majorly related to overview and/or evaluation of research programmes. We selected the European research programmes in two ways. First, programmes under Art. 185 of the Treaty on the Functioning of the European Union, and we excluded Horizon 2020 and Framework programmes as they need a separate analysis which is highlighted in Deliverable 2.2. Second, we asked our partners to suggest European research programmes, and finally we had 8 European Research Programmes: INDIGO, HERA, EUROSTARS, BONUS, EMPR, AAL, COST, EDCTP. And grey literature was selected through the Internet applying the same inclusion and exclusion criteria as for peer-review literature (see Table 2).

Purposes Addressed

The European research programmes achieve critical mass by enabling national research institutions (n=8), funding institutions (n=3), SMEs (n=4) to engage into joint research projects. Websites of European research programmes mostly promote their projects and partners. Most websites are promotional in nature, describing European and / or global challenges, explaining the importance of networking and collaboration among various countries, presenting key performance indicators (n=8). The majority of websites have more a practical (n=7), but not theoretical focus (n=1) in the context of stakeholders and / or wider PE.

Most of the grey literature documents served multiple purposes from describing different levels of PE to detailed presentations of engagement activities and all documents described the individual cases of engagement. Four documents described theory based engagement (n=4), nine of them described engagement methods or specific efforts (n=9), and two documents presented results of surveys and interviews with respect to PE in science (n=2). Few documents analysed risks, barriers and obstacles of PE (n=5).

Objectives and Societal Challenges Addressed

Five websites strongly address innovativeness and excellence of research, others – cooperation among European countries (n=3) and cooperation among European and non-European countries (n=2). Four websites focus on topics related to health care and research. Others perform activities within environment (n=3), agriculture (n=2), technology (n=3), energy (n=4), culture and identity (n=1), competitiveness (n=3). All research programmes encompass more than one thematic issue and covers economic, social and environmental societal challenges to a certain extent.

The majority of grey literature addresses effective methods of engagement and ethics in research, others focus on science governance (n=3), describes activities of engagement in medical research (n=4), biology (n=1), environment (n=2).

Engagements Forms and Techniques Described

Most websites present opportunities of engagement through national contact points (n=6), boards or assemblies (n=3) and even focal points (n=1). Further in line with describing research activities, websites introduced e-tools for engaging stakeholders systematically (n=3), active engagement of members and a target group of stakeholders seemed to be more prioritized (n=8) than wider public (n=2). All research programmes are keen in dissemination of information on research results, activities, best projects, also in collaboration with stakeholders (n=8). Additionally, one programme states about involvement of public into research process (n=1), another one – initial phase of research (n=1). All research programmes state the importance of PE ensuring economic growth and sustainable future of Europe and beyond (n=8), but only few have guidelines for engagement (n=3) or plan having such one (n=1), some engage into scientific education for learning society and children (n=3) or at university level (n=1). Another popular form of

engagement is through different events on project level (n=8), on programme level (n=6), also festivals (n=1), exhibitions (n=1). Networking is the basis for three programmes (n=3), the one states promoting networking between researchers and museums (n=1). All programmes declare that stakeholders and wider PE is one of their key priorities (n=8), but few of them elaborate even further: involvement of public (n=1), partnership with public (n=1), community building (n=1), empowerment of society in decision making on policy level (n=2). Most programmes are equipped with e-tools for provision of questions (n=4), others have e-tool for public communication survey (n=2), blogs (n=1), forums (n=2).

Most documents of grey literature present variety of engagements levels, for example "must do" engagement, "smart to do engagement", "wise to do" engagement and in most cases address engagement for the purpose of mutual learning and impact. Fourteen documents describes new methods of public engagement in science, and call them innovative (n=14), like BrainLab, Bredcrumb test, focal points, soapbox science, beacon for PE, participatory films, etc. One document describes participatory evaluation and monitoring as important form of engagement (n=1),other few strengthens the role of networking with different groups, for example schools, adults, consumers, family audiences, industry, etc. (n=3). Additionally, suggest creating "meta" networks and do not invert in new fields (n=1), creating resource banks (n=1), disseminate information via local newspapers (n=2), creating Apps for engagement (n=1), engaging CSOs (n=10), organising event using multiple engagement principles (n=1). Most of documents look for innovative techniques of engagement, such as social media, strategic design thinking, online engagement, engagement of young families.

Media

Most research programmes use traditional media tools (n=8): leaflets (n=2), (e)-newsletters and / or (e)-bulletins (n=4), briefings and / or fact-sheets (n=5), reports (n=6), flyers (n=5), press-releases (n=4). Four research programmes provide opportunity for subscription for e-newsletters (n=4), others present their research results through open access databases (n=2).

The analysis of websites showed that research programmes are in favour using social media tools (n=7). The most popular remain Facebook (n=5), Twitter (n=4), YouTube (n=4), LinkedIn (n=4), other tools seem to be less popular for contacting wider public: g+ (n=3), g+1 (n=1), Skype ID (n=1).

Table 4. Social Media Tools Used at Programme Level

Programme	Followers in			Subscribers to channel in YouTube
	Facebook	Twitter	LinkedIn	
INDIGO	249	204	N/D	N/D
HERA	N/D	129	N/D	N/D
BONUS	67	N/D	N/D	9
EMPR	3	N/D	N/D	7
EUROSTARS*	572	6513	585	24
AAL	N/D	N/D	783	70
COST	2139	2147	2502	88
EDCTP	27	1051	N/D	8

*via EUREKA programme

Social media and online engagement is addressed as innovative technique in most of grey literature. Few documents suggest using technology and media to decrease costs of engaging larger audience (n=2), and other suggest using local newspapers and national television (n=1) and participatory films (n=1), online collaborate platforms (n=1).

Civil Empowerment and Impact of Programmes

Mostly, programmes are related to policy making on international (n=3), European (n=8) levels, and through projects – on national level (n=8). Only few of them have systematic cooperation platform with policy makers (n=3) or plan to develop such operational mechanisms (n=1) on programme level, one – on project level (n=1). Annual reports showed that three programmes support policies through monitoring activities and measurements processes (n=3), and few others declare having influence on policy orientation and implementation (n=4). The share of power between scientists (n=8), stakeholders (n=8) and wider public (n=2) on programme level towards policy is unequal not only while comparing different programmes, but also we notice it within the European research programmes. Nevertheless, analysed reports show that most of the programmes (n=7) seek to increase input of public on programme and policy levels.

Thus, majority of programmes have been running for about 5-7 years and not all programmes have performed impact evaluation partly or fully (n=6), even less were able to make ex-post evaluation (n=4). Despite the lack of publicly available impact evaluation reports, all programmes state that their results had an impact on policy orientation (n=5), economic impact (competitiveness (n=4), creation of new markets (n=4), international standardization (n=2), creation of new jobs (n=2), innovation (n=4), cooperation enhancement (n=4), economic growth (n=8)), social impact (cultural and ethical issues (n=1), improvement of services (n=4)), environmental impact (n=6).

Most grey literature agrees that effective public engagement leads to wider impact of research. Series of documents suggest different approaches for increase of civil empowerment: explore the types of engagement in the past (n=3), establishing guiding principles (n=2), using creative arts (n=3), engage local communities and local media (n=5), establishing rewards (n=1), having engagement mentors (n=1), establishing systematic evaluation and monitoring (n=2).

List of Analysed Grey Literature

Responsible governance of science and technologies Perspectives from Europe, China and India, Workshop on Responsible Governance of Science and Technologies, Brussels, 19/03/2014. Retrieved from http://www.europarl.europa.eu/stoa/webdav/site/cms/shared/Booklet_190314.pdf.

Improving Access for Research and Policy, Report from the Administrative Data Taskforce, UK ADR Network, 2012. Retrieved from http://www.esrc.ac.uk/_images/ADT-Improving-Access-for-Research-and-Policy_tcm8-24462.pdf.

Economic Impact of International Research and Innovation Cooperation: Analysis of 25 Years of Participation in EUREKA, Danish Agency for Science Technology and Innovation, 2011. Retrieved from http://www.eurekanetwork.org/c/document_library/get_file?uuid=939fc1a0-db21-4e00-8f9b-7271b8ff2c11&groupId=10137.

Devonshire, I.; Harthway, G. Overcoming the Barriers to Greater Public Engagement. *PLOS Biology.* 2014, 1: 1-4.

Banks, S.; Armstrong, A. Ethics in Community-Based Participatory Research: Case Studies, Case Examples and Commentaries, Durham University, NCCPE: Bristol, 2012. Retrieved from http://www.engage-nu.com/wp-content/uploads/2013/11/Ethics-in-community-based-participatory-research-Case-studies-case-examples-and-commentaries.pdf.

 Mallery, C.; Ganachari, D.; Fernandez, J.; Smeeding, B.; Robinson, S.; Moon M. Innovative Methods in Stakeholder Engagement: An Environmental Scan, AHRQ Publication, 2012. Retrieved from http://www.effective healthcare.ahrq.gov/tasks/sites/ehc/assets/File/CF_Innovation-in-Stakeholder-engagement_Literature Review.pdf.

Mirza, R.; Vodden, K., Collins, G. Community Engagement in the Grand Falls-Windsor-Baie Verte, Harbour Breton Region, Memorial University, 2012. Retrieved from http://www.open.gov.nl.ca/collaboration/pdf/community_engagement.pdf.

When Innovation Means Business: Eurostars Review 2011, Eureka, 2011. Retrieved from http://www.eurekanetwork.org/c/document_library/get_file?uuid=071b5e81-3585-46db-8068-995e1984352d&groupId=10137.

Final Evaluation of the BONUS+ Programme, Bonus+Evaluation Panel, 2012. Retrieved from http://www.bonusportal.org/files/2336/Final_external_evaluation_of_BONUS_programme_2012.pdf.

Hussain, R.; Moore, G. *UCL Beacon for Public Engagement*. University College London, 2012.

EURAMET 2020 Strategy, EURAMET, 2011. Retrieved from http://www.ucl.ac.uk/public-engagement/documents/evaluatinreports/FINAL_UCL_Beacon_for_Public_Engagement_WEBSITE_Ver.pdf.

HERA Joint Research Programme: Overview of the HERA JRP projects and proposed Knowledge Transfer activities, HERA, 2010. Retrieved from http://heranet.info/system/files/hera_jrp_projects_and_kt_activities.pdf.

Enhancing Cooperation. Report of the High-Level India EU Dialogue, AGCC, 2009. Retrieved from https://seors.unfccc.int /seors/attachments/get_attachment?code=2E2BP14OAUF94JJSWLB85VJHE48MUVY3.

The Role of Philanthropy of Responsible Research and Innovation, European Commission, 2013. Retrieved from http://bookshop.europa.eu/en/the-role-of-philanthropy-in-the-promotion-of-responsible-research-and-innovation-pbKINA26543.

Embedding Impact Analysis in Research, JISC and National Coordinating Centre for Public Engagement, 2013. Retrieved from http://www.publicengagement.ac.uk/sites/default/files/publication/nccpe_jisc_booklet_proof_07.05.13.pdf.

Optimising Civil Society Participation in Research, De Montfort University, 2013. Retrieved from http://ec.europa.eu/research/sciencesociety/document_library/pdf_06/optimising_civil_society_participation.pdf.

Synchronising the Research Policy Dialogue to the Indian Dimension. Position Paper of THE 7th JWG meeting, European Commission, 2011. Retrieved from http://www.euindiacoop.org/download/position_paper_for_the_7th_jwg_meeting.pdf.

 Facer, K.; Manners, P.; Agusita, E. Towards a Knowledge Base for University-Public Engagement: sharing knowledge, building insight, taking action, NCCPE: Bristol, 2012. Retrieved from https://www.publicengagement.ac.uk/sites/default/files/90154%20NCCPE%20AHRC%20knowledge%20base%20publication_3%20May.pdf.

Public Engagement in Science, European Commission, 2008. Retrieved from http://ec.europa.eu/research/science-society/document_library/pdf_06/public-engagement-081002_en.pdf.

Interim evaluation & assessment of future options for Science in Society Actions, Final Report, Technopolis Group, Fraunhofer, 2012. Retrieved from http://ec.europa.eu/research/science-society/document_library/ pdf_06/ phase01-122012_en.pdf.

Sjoberg, B. M. D.; Charpak, Y. Science, H1N1 and Society: Towards a More Pandemic-Resilient Society, HEG Expert Group, 2011. Retrieved from http://ec.europa.eu/research/science-society/document_library/pdf_06/sis-heg-final-report_en.pdf.

Final Evaluation of the Ambient Assisted Living Joint Programme, European Commission, 2013. Retrieved from http://ec.europa.eu/digital-agenda/en/news/report-final-evaluation-ambient-assisted-living-joint-programme.

Vision Paper of the Joint Programming Initiative More Years, Better Lives: The Potential and Challenges of Demographic Change, Innovation+Technik GmbH, 2011. Retrieved from http://www.jp-demographic.eu /about/documents/vision-paper-of-the-jpi-mybl.

The Role of Scientists in Public Debate, Welcome Trust, 2001. Retrieved from http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtd003425.pdf.

Engaging with Impact: How do We Know if We have Made a Difference?, Welcome Trust, 2012. Retrieved from http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_grants/documents/web_document/wtp052364.pdf.

Sharing our Practice: Successes and Challenges of Public Engagement in the Welcome Trust's UK Centres, Welcome Trust, 2013. Retrieved from http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_grants/ documents/web_document/wtp054299.pdf.

Public Attitudes to Research Governance: A qualitative Study in a Deliberative Context, Welcome Trust, 2006. Retrieved from http://www.wellcome.ac.uk/stellent/groups/corporatesite/@policy_communications/documents/web_document/wtx038443.pdf.

Deliberative Public Engagement: Nine Principles (2013), National Consumer Council. Retrieved from http://www.involve.org.uk/wp-content/uploads/2011/03/Deliberative-public-engagement-nine-principles.pdf.

Empowering Communities to Influence Local Decision Making (2009), Communities and Local Government Publication. Retrieved from https://www.yumpu.com/en/document/view/22481488/empowering-communities-to-influence-local-decision-making-short-.

Morris, J.; Baddache, F. Back to Basics: How to Make Stakeholder Engagement Meaningful for Your Company. Retrieved from http://www.bsr.org/reports/BSR_Five-Step_Guide_to_Stakeholder_Engagement.pdf.

Dissemination Practices

Both examples are related to dissemination practices of EMPR programme results[4].

Example 1. It shows the impact of measurements in our immediate surroundings and daily lives, but also its importance in technological developments, environmental issues and health care (5035 views by 2014.06.24).

Example 2. This introductory video was originally produced for the launch of one of the projects funded through EMPR programme. It shows that the European Metrology Research Programme (EMRP) enables organisations to collaborate within specified fields and that measurement are important in daily lives and scientific experiments (770 views by 2014.06.24).
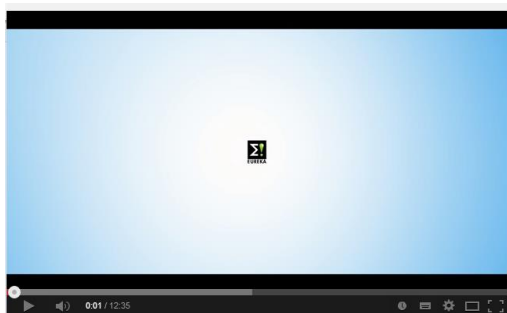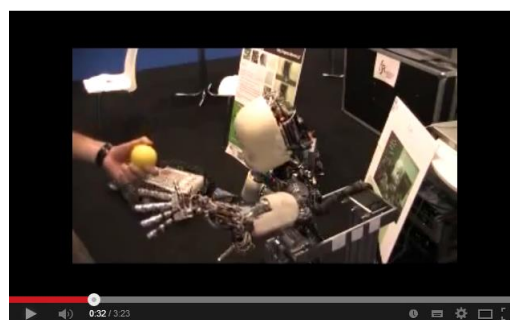

(1)

(2)

Both examples are related to dissemination practices of Eureka! programme results[5].

Example 3. It shows information on what EURIPIDES works on and who they work with as a EUREKA Network cluster (52 views in 2014.06.27).

Example 4. Blogactiv speaks to the scientist from the Lisbon Institute of Systems and Robotics at the EUREKA Innovation Days event, where he shows his invention (183 views by 2014.06.27).

(3)

(4)

---

[4] (1) https://www.youtube.com/watch?v=vRnT8hIxjqk#t=15 (2) https://www.youtube.com/watch?v=3b79SxLXY8g
[5] (3) https://www.youtube.com/watch?v=iPi7rByHIIo (4) https://www.youtube.com/watch?v=iAyfwJb9QCo