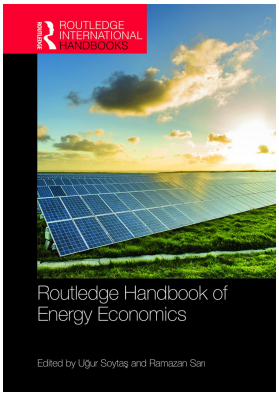

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Energy and the public

The economic relevance of citizens' engagement

Alessandro Sciullo and Anna Pellizzone

Energy transitions have historically been a matter of innovating the incumbent energy systems by overcoming their implicit inertia in terms of technologies, infrastructures, resources, and processes (Smil 2010). Energy transitions thus are complex processes that produce the shift to a new regime of the energy socio-technical system as a result of interacting changes in a wider spectrum of technological and social elements, such as plants, conversion, and distribution devices, formal and informal rules, business models and market relationships, social actors, values and culture (Geels 2007). Given this complexity, engaging citizens and stakeholders in this process has been gaining attention in recent years among scientists and decision-makers as a crucial requirement for supporting the contemporary renewables transition (RES) (Sciullo and Padovan 2018). The relevance of this engagement lays primarily on the design of effective strategies for supporting the spread of new energy infrastructures and technologies by empowering the diffusion of new practices and behaviors, integrating different perspectives, knowledge and experiences in the debate around energy technologies, improving the innovation process, and lowering the potential conflicts often connected with new energy plants, also in the case of RES. In addition to these strategic aims, effective engagement of the wider public may have a direct economic impact at different level of the economic system from the micro-level of firms' R&D and market strategies through the meso-level of the processes connected to local development up to the macro-level of political economy.

In this chapter, we start from a general framing of engagement in energy transition (Section 1) with a particular focus on the crucial distinction between acceptance and engagement. Then, in Section 2, the Responsible Research and Innovation framework (RRI), a general approach to research and innovation processes adopted and promoted by European Commission in order to put society at the center of these processes both in theory and in practice, is outlined. Finally, in Section 3, some of the main economic impacts that engaging public, in the medium and long run, are addressed with specific attention to energy sector when applicable.

1 From acceptance to engagement

The involvement of citizens has been gaining in the recent decades a central role for the success or failure of innovation also in the energy field, particularly when dealing with the social aspects connected to new energy infrastructures. A variety of labels have been adopted to make reference

to activities and processes aimed at spreading information, shifting awareness, and fostering inclusion of citizens in innovations development: public and/or stakeholder engagement, public and social acceptance, citizen and community involvement, and participatory and inclusive processes.

Even if they share a common focus, these labels refer to deeply diverse processes. The objective of this section is to clarify, from the theoretical as well from the practical perspective, the difference between involving people in terms of *engagement* and/or in terms of *acceptance*, concepts that are far to be synonymous.

1.1 Energy and society: framing the debate

As a growing number of researches show (see Sovacool 2014), if we want to succeed in moving towards a sustainable future, we have to alter both technologies and society, for instance, in terms of habits, behaviors, community organization, and institutional patterns. However, non-technical studies – meaning here social sciences and humanities (SSH) – are still neglected in the energy realm. As an example, in the United States, the rate between the dollars spent in behavioral and demand-side energy research and dollars spent in energy supply and infrastructure research is 1/35 (Gaffigan 2008). But this needs to change if we want to succeed in the development of a carbon-free society and reach two of the UN Sustainable Development Goals (SDGs): Affordable and Clean Energy (SDG7) and Climate Action (SDG13).

As governments from across the world have set ambitious goals in terms of reduction of the carbon emissions and increase of the share of renewables, a factor that has been increasingly recognized as a potential obstacle towards the energy transition is social acceptance. The concept has been described in the literature (Wüstenhagen et al. 2007) as a mix of three different components, namely (1) sociopolitical, (2) community, and (3) market acceptance (Figure 17.1).

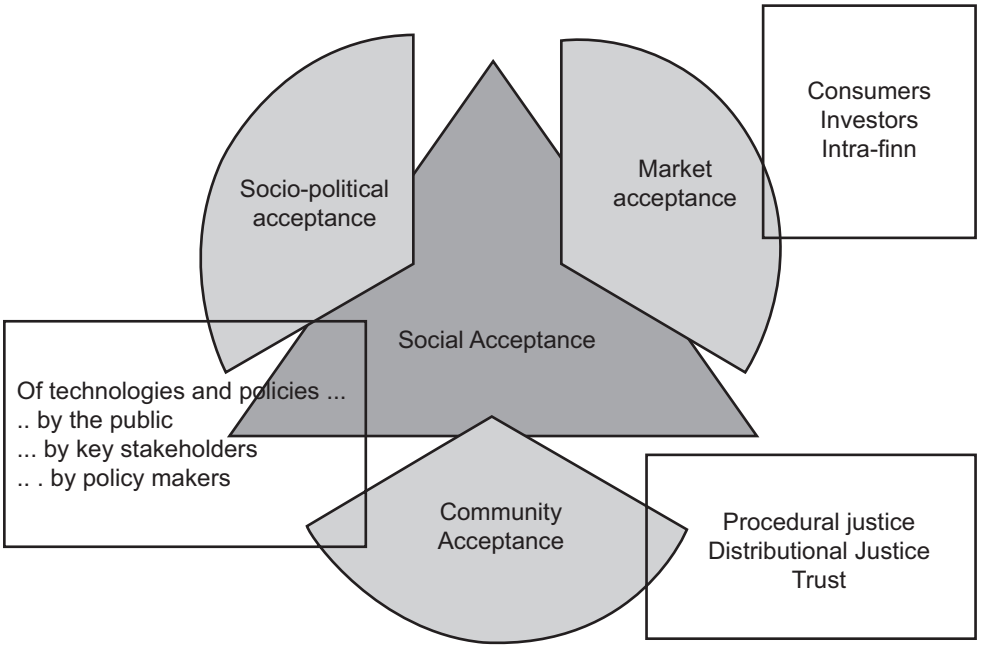

Figure 17.1 The triangle of social acceptance

Source: Adapted from Wüstenhagen et al. (2007).

The three dimensions of social acceptance are each other closely intertwined, but can be distinguished as follows. The sociopolitical acceptance regards both technologies (e.g. solar or wind energy) and policies (e.g. carbon tax or incentives) at a general level; the community acceptance is more site-specific and deals with issues such as procedural and distributional justice; the market-acceptance, as the process of market adoption of an innovation, has to do with consumers' and investors' choices.

In the past decades, policy makers highly underestimated the relevance of sociopolitical acceptance and for years didn't consider it as an issue to deal with. But they were wrong, for two main reasons. The first is that achieving a successful projects implementation requires more than being broadly accepted. As an example, if we consider the share of electricity from renewable energy sources, a great challenge comes from the fact that the energy sector is "locked" into a carbon-intensive system in terms of generation, transmission and distribution, as well as storage and demand (Unruh 2002). When electricity was massively introduced in our societies, human habits, market and infrastructure were organized around the needs of a fossil fuel-based system (centralized production, gas pipelines, distribution of grids, storage systems, international relationships, etc.). After decades, this is still resulting in a path dependence favoring fossil-fuel technologies over low-carbon alternatives. This means that in order to move beyond the way in which our societies are organized, we need to put in place some efforts in order to overcome the inertia of the current energy system.

Another important reason is that when moving from the global to the local the general support towards energy technologies and policies doesn't always correspond to the support of effective implementations of new plants and siting decisions.

This brings us to another component of social acceptance, which is community acceptance. The discrepancy between the general support and the resistance to specific projects, has been described trough the NIMBY (Not in My Back Yard) debate, arguing that people support new plants and infrastructures as long as they are not in their own backyard. However, some authors (see e.g. Wolsink 2006; Bell et al. 2005) have found evidence that NIMBYism represents an oversimplification of the issue (i.e. in a series of empirical studies on wind energy researches showed that opposition to new developments decreases rather than increases as the degree of being directly affected increases).

Furthermore, the studies around community acceptance in the energy realm are numerous and diverse, showing that there are a lot of factors influencing the levels of support or opposition to new technology and plants implementation. One of the most important factor in the field is undoubtedly trust, which has been described as a "dual" concept, composed by confidence, which is the competence and the technical ability to operate, and social trust or common values (Siegrist et al. 2003). Mutual trust among the different societal actors (developers, policy makers, citizens, civil society organization, investors, etc.) is a prerequisite for cooperation (Gambetta 2000) and socially sustainable developments. In fact, as many socio-scientific studies show, local communities can show high levels of openness towards new technologies implementations but nevertheless resist to new developments due to high degrees of distrust towards decision-makers (Pellizzone et al. 2017). Trust requires the lack of ambiguity in what people cooperate for and also strong, continuous efforts in communication; many authors indicate that trust and risk communication contributes to shaping perceptions, opinions and public attitudes (Renn and Levine, 1991; Poortinga and Pidgeon, 2003). Further interesting – and critical – hints around trust in techno-scientific experts can be found in Camporesi: "echoing Hardin, O'Neill argued that the relation of trustworthiness, and therefore not trust as a state of being, should be seen as the basis of accountability and responsibility in public life", meaning here that the final goal shouldn't be the increase of trust among societal actors, but "to secure and advance trustworthiness – that is,

experts, institutions, and knowledge worthy of trust", focusing on the "qualities and conduct of experts, the practices of science, and to knowledge itself" (Camporesi et al. 2017).

Strictly connected to the issues of trust, cooperation and communication are also two other key factors, strongly impacting community acceptance: the distributional justice (How are costs and benefits distributed among the societal actors?) and the procedural justice (How fair is the decision-making process? Have all relevant stakeholders the opportunity to have a voice in the process?).

All the above mentioned issues – concepts such as the carbon lock-in theory, the mutual trust, the trustworthiness, the risk, the role of information, the fairness of the innovation process – can be framed also based on the different stages of research on science and society relationship (Bauer et al. 2007). In the early days of science literacy, the emphasis of researchers committed in the science-society field was mainly focused on public education. This approach, named "deficit model", is based on the assumption that if lay people would be informed about science and innovation as decided and defined by expert authorities, technological and research developments would run smoothly in the right direction. The focus of the scholars committed in the public understanding of science (PUS) shifted then from science literacy, with public communication as privileged approach, to research on attitudes and perceptions, leaving the stage to public consultation. In recent years (Owen et al. 2012; Stilgoe et al. 2013) the new trend in the field is to favor public engagement and deliberative initiatives. What is different among these three approaches is the type of flow of information between the public and the sponsors arranging the exercises. In the case of (1) public communication, the sponsor is the source of information and the public is the recipient; (2) public consultation, the information are gathered from the public to the sponsors; (3) public engagement, the information is exchanged among sponsors and the public in a dialogic way (Allansdottir et al. 2018, Rowe and Frewer 2005), where all participants play and active role in the debate. The reasons for involving the public are particularly relevant within the energy innovation realm, where citizens may play a pivotal function by moving from the passive role of acceptance (as consumers) into the active role of engagement (as prosumers).

1.2 *Public engagement and public acceptance in the energy transition: the case of RES infrastructure*

As mentioned above, *public engagement* and *public acceptance* must be considered as distinguished concepts. First of all because the former pertains to the realm of active participation, while the second to the realm of passive reception, and secondly because engagement could be intended as the process of involvement, while acceptance (both as merely lack of opposition or more convinced support) could be intended as the product of the involvement process. In other words, public engagement has to be considered as a complex and structured system of activities put in place in order to effectively involve people in the decision and implementation process while public acceptance (as well as lack of acceptance) may be a result of such activities (Batel et al. 2013).

In case of RES energy infrastructure, a successful process of public engagement is not inevitably connected with more acceptance since it may produce an actual support to the project and/or a convinced acceptance, or even neither of the two, when resulting in the so-called zero option of abandoning the project (Ravazzi and Pomatto 2014).

The main factors that seem to influence the level of acceptance for RES projects and that should be taken into account in designing engaging strategies can be grouped into three main categories. *Personal factors* refer to the socio-demographic characteristics (structural profile) of the public to be involved such as age, gender, and social class. *Sociocultural factors* refer to the perceptions of the project by the public (cognitive profile) by taking into account the degree of awareness and understanding about the proposed project, the political and environmental beliefs and concern, the

place attachment and the perceived fairness and levels of trust in experts and institutions; *contextual factors* refer to the projects specificities and the context within which it should be developed (material profile) and relates technological factors (i.e. the scale of the project: micro-single building or household level, meso-local, community or town level, macro-'power station' level) and institutional factors (ownership structures, distribution of benefits, adoption of participatory approaches to public engagement). In addition to these *static* factors, attention should be paid to the process of implementation of the project in terms of strategies, actors and resources and the interaction among them at different levels of the energy system (Devine Wright 2007; Devine Wright et al. 2017).

RES infrastructures can determine undesirable land transformations, such as the consumption of soil, the micro-level deterioration of pre-existing ecosystems and the alteration of the landscape as well as various types of harmful or disturbing emissions (Puttilli 2014). Local negative externalities connected to infrastructures development can be objectively assessed only partially and often combine material aspects and symbolic aspects. As mentioned above among the factors for public acceptance (*place attachment*) the territory in fact does not simply correspond to an objectively given physical environment, as it regards also the articulated set of material and symbolic elements that are linked to the interaction of the social groups living in that area. This also means that these social groups are endowed with an emotional attachment to the territory and that part of their social identity is linked to it. A project can interfere with the sense of attachment and with the territorial identity of local communities and consequently with the awareness of local actors to be able to play an effective role in decision-making processes (Maggiolini and Pomatto 2016). Nevertheless, "place attachment need not inevitably be associated with negative attitudes or oppositional behavioral responses" (Devine Wright 2011), and "research on place attachment should be open to multiple possible relations between attachment and acceptance".

What is interesting to consider when dealing with public acceptance of RES is that even if it is a process mainly associated with positive images (energy sustainability, green economy and political autonomy from providing alternatives from fossil fuels), at the same time local conflicts on RES plants are a widespread phenomenon often driven by people in favor of RES. Large coalitions that opposed at local level against RES projects include citizens' committees and the same environmental associations, which also generally support the use of renewable energy (Puttilli 2014).[1]

Figure 17.1 offers a general scheme of the possible relationships among public engagement and public acceptance, taking into consideration these factors and their ontological differences. A number of different conditions (Institutional settings, social aspects, knowledge, and the peculiarity of the project) play the role of inputs and shape the development and results of a public engagement process. The process itself should be designed by taking into account these conditions in order to involve the relevant actors, through the most effective tools, towards the most relevant objectives, considering the existing processes and relationship in the public to be involved. The first effects (outputs) of the engagement process could be the modification of the initial inputs/conditions themselves so that a circular process of reinforcement may emerge. In other words, all along the engagement process the public may evolve (in terms of knowledge, awareness and motivation in participation) in such a way that the process itself could be reinforced. The final result of the process (outcome) may vary in a quite wide range of opportunities from a mere acceptance to a more convinced support and even to a reinforcement of the conflict or to a zero option, that is abandoning the project.

It is worth to underline that in order to effectively engage the public, properly designed and structured activities should be carried out, as ordinary citizens have in general very few opportunities to make their voices heard in the formulation of a public policy or intervention (i.e. RES project) and the forms of collective action may need social and institutional requirements (e.g. level of education, income, political and environmental awareness, competitive political system), which can't be considered as universally distributed (Maggiolini and Pomatto 2016). However,

over the last decades, a series of tools that can be adopted by public administrations to allow citizens to take part directly in the formulation and implementation of policies and projects have been developed and implemented. *Participatory processes* that aim to enable citizens to press on public administrators to take care of their needs and *deliberative processes* that aim at promoting an open and in-depth discussion between citizens who have different or opposing ideas, points of view and interests, in order to develop solutions in a constructive way (Bobbio et al. 2017). Both these approaches, that can be operationalized by many different tools need some basic requirements to be effective: careful planning, public sharing of information, mediated respectful discussions, formal methods of recruiting participants (e.g. random selection or targeted selection), bringing together expert knowledge and profane knowledge; assistance of professionals experts in group dynamics (Ravazzi and Pomatto 2014).

2 Public Engagement as a tool towards responsible innovation

The importance of engaging the public in the innovation process has been increasingly recognized also within the institutional framework at different levels. Public engagement exercises are often being used as tools for the design of energy innovation path in several Countries across the world, from New Zealand to the Philippines, from the Netherlands to Canada (see for example, Manzella et al. 2019). In the European Union, the tradition of public participation within the research and innovation process – energy technologies included – has been institutionalized within the so-called Responsible Research and Innovation (RRI, Figure 17.2) framework, with the ultimate goal of aligning the techno-scientific developments to the needs and the expectations of society.

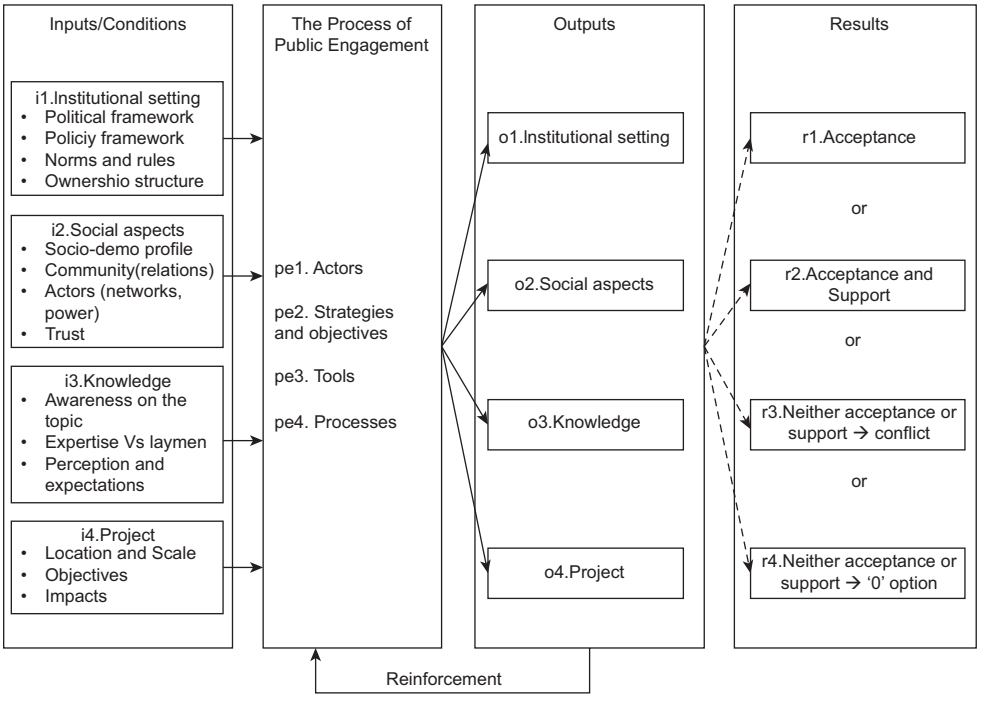

Figure 17.2 A scheme of the public engagement process: inputs, outputs, and results (our elaboration on the basis of Batel et al. 2013; Ravazzi and Pomatto 2014; Devine-Wright 2007[2])

Several definitions of RRI have been provided. According to von Schomberg (2013),

> Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products in order to allow a proper embedding of scientific and technological advances in our society.

In order to "tak[e] care of the future through collective stewardship of science and innovation in the present" (Stilgoe et al. 2013), four key dimensions of responsibility to be considered in research and innovation processes are identified:

1 *Diversity and inclusion* means early involvement of a wide range of actors and publics in R&I practice, deliberation, and decision-making to yield more useful and higher quality knowledge. This strengthens democracy and broadens sources of expertise, disciplines, and perspectives.
2 *Anticipation and reflection* means to envision impacts and reflect on the underlying assumptions, values, and purposes to better understand how R&I shapes the future. This produces valuable insights and increases our capacity to act on what we know.
3 *Openness and transparency* means to communicate in a balanced, meaningful way methods, results, conclusions, and implications to enable public scrutiny and dialogue. This benefits the visibility and understanding of R&I.
4 *Responsiveness and adaptive change* means to be able to modify modes of thought and behavior, overarching organizational structures, in response to changing circumstances, knowledge, and perspectives. This aligns action with the needs expressed by stakeholders and publics (RRI tools).

Many more theoretical definitions could be provided, however it is clear that the upstream public engagement (i.e. the involvement of citizens from the first stages of the innovation process) plays

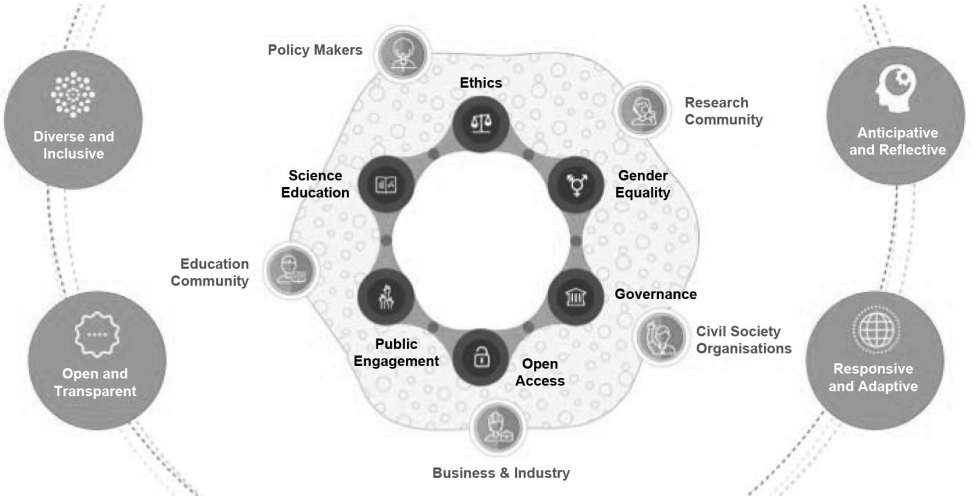

Figure 17.3 Responsible research and innovation: dimensions, actors, and key elements

Source: Adapted from www.rri-tools.eu.

a very important role in the game. Not by chance, public engagement is considered by the European Commission as one of the key elements of RRI, together with ethics, open access, gender equality, science education, sustainability, and social inclusion. Of course, public engagement is also adopted beyond the RRI framework, as it is crucial also for other approaches and methods (social innovation, inclusive business, shared value, B-corp, etc.).

The adoption of a participative and socially aligned approach is not only a matter of values, ethics or democracy. RRI approach has a lot of beneficial impacts on society as a whole, including the economic sphere. The next paragraph focuses on the economic relevance of engaging the public in research and innovation processes at different levels (i.e. individual company level, polling and community level and political economy level).

3 Economic relevance of public engagement

3.1 RRI and public engagement as firms' competitive strategy

As the growing literature and the increasing number of empirical case studies in the field show, RRI can help companies to address many challenges for their competitiveness: build and understand their community; identify new products and improve the existing ones; anticipate eventual ethical concerns and social perplexities; increase the trust of the end-users and their network; access new funding opportunities; building a critical mass in their sector (Van de Poel et al. 2017; Lees and Lees 2017; Flipse et al. 2015; Scholten et al. 2015). Furthermore, several project funded by the European Commission under the Horizon 2020 framework in order to support the implementation of RRI within the industrial realm (e.g. SMART-map,[3] PRISMA,[4] COMPASS[5]) provide concrete experiences and suggestion in the field. Here in the following some main contributions on this topic are presented that, even if not focused on energy field, provide useful insights on the potential of RRI approach applied at the micro level of individual firms.

As Van de Poel (2017) argues, RRI is gaining attention in the academic community, but it has not yet been systematically included in the innovation process of companies themselves. In order to put RRI in practice, the author proposes a conceptual model that is mainly composed of three elements: *the broader context* within which company operates that even if usually neglected is relevant to the extent to which RRI strategies depend on the resources and the market the company has to deal with; *the distinction* between the strategic and the operational level of RRI that is relevant in order to avoid to move too quickly to the formulation of RRI activities without a robust strategy aligned with the more general strategy of the company with specific identification of the area of impacts of the company on the society; *RRI outcomes* and the definition of key performance indicators (KPIs) to monitor them.

Talking about responsibility within the industrial realm often brings into play questions upon the commonalities and the differences between Responsible Research and Innovation and corporate social responsibility (CSR), the first usually considered more ambitious and forward looking for a series of reasons (e.g. RRI intervenes from the very first stages of the research and innovation process; focuses on the anticipation of R&I impacts on society and environment; aims at doing good to society and not only avoiding harm, etc.). Despite the differences between the two approaches, several experts in the field consider the CSR departments as key "places" for the implementation of RRI within companies. The main message of van de Pol's contribution is that companies don't need more tools for RRI, but a more comprehensive view that integrates RRI with company CSR strategy and activities and with company's general business strategy. In this framework, companies should focus, in particular, on selecting the specific societal dominions

where they can profitably add value instead of generally considering the full spectrum of RRI activities.

More focused on the competitive potential of Responsible Innovation (RI), Lees and Lees (2017) present a case study on New Zealand sheep dairy (NZSD) starting from the consideration of the lack of practical model of implementing RRI at enterprise level. The author looks at RI as a powerful tool to support the competitiveness of a firm from the *resource based view* (RBV) perspective that focus on competitive advantage as the implementation of a value-creating strategy not simultaneously being implemented by any other current or potential competitor. RI can bring relevant contribute to face this challenge as it helps in shaping innovations with attention to their ethical acceptability, sustainability and social desirability thus resulting in a way for improving the willingness of stakeholders and consumers to collaborate. Through a comparative France-New Zealand case study, the author shows that the best option for the NZSD industry to pursue a differentiation strategy whereby it creates and sells a product that better satisfies customer needs over its rivals focused on customer responsiveness, innovation and quality products. These strategies also contain some aspects of RI as they are closely aligned with responsiveness and innovation that meets ethical, social and environmental issues. The differentiation strategy based on this approach allowed NZSD to attain a competitive advantage more than a low-cost strategy by focusing on RI outcomes as a distinctive competency that can support a competitive advantage. In this way, the industry can develop economically at the same time as achieving more responsible outcomes.

Instead of proposing theoretical and descriptive approach, Flipse et al. (2015) built an operational tool aimed at helping innovators to operationalize RRI in industry. The rationale behind this effort lays on the intimate nature of "wicked problems" that characterize research and innovation (R&D) practice in industry as there is usually no clear definition of the starting problem and innovators have to cope with technical, economic, and social levels that result in complex and uncertain decision-making. In practice, tool development started from the assessment of past successful innovation projects in light of RRI-relevant elements in order to clarify if and to what extent RRI may influence success of innovation. Key performance indicators (KPIs) and their interrelations may be identified which contain social and ethical components relevant from an RRI perspective, and a database of 72 completed projects evaluated on each of the eight KPIs was assembled. By using structural equation modeling (SEM) the authors assessed the relations between the KPIs and through an agent-based simulation model fed by SEM results, they replicate and validate the interaction detected among KPIs.

It is important to remark that the exploitation of RRI potential as a competitive advantage at company level requires the mobilization of a large number of societal actors (from citizens to decision-makers, including funding agencies, professional associations, research and academia, etc.), bringing into play the need to approach RRI as an ecosystem at the different levels of the innovation process and building communities of practice.[6]

3.2 Public engagement and energy market at the local scale: polling and communities

When moving from the individual level of the enterprises to the meso-level of a delimited geographical area (e.g. region/cities) the role of citizens in shaping and influencing the energy sector may gain relevance through diverse engagement solutions, within which the most promising are deliberative tools and energy communities.

A seminal contribution to explore the potential of public deliberation is provided by Luskin et al (1999) that carried out an experiment of deliberative polling in Texas as a way to collect and share knowledge among the people so that a more effective energy policy can be designed on

the basis and with the aim of satisfying better informed public preferences. A win-win situation when the public raises in awareness and receives more targeted services and the administration is able to take informed decision. The initiative of polling was taken by the Public Utility Commission (PUC) that asked to all electric utility companies in the state of Texas to take customer preferences into account in the periodic integrated resource plan (IRP) aimed at meeting the territory's current need. The problem with collecting meaningful preferences lays in general on the fact that most people simply don't have enough knowledge about specific issues and in the electricity field public knows even less about them than about most other important policy issues. The polling involved eight utility companies and 800–1,500 customers per utility that were interviewed by telephone and invited to a deliberative weekend, an example of the deliberative processes mentioned in Section 1.2. Each deliberative mainly consisted in a structured presentation of the topic and of the rules of the event, a moderated discussion among people divided in small groups of around 15 participants and some plenary sessions, where the participants could put questions developed in the small groups to panels of experts. At the end, the same questionnaire submitted in the pre-deliberation telephone survey was administered to the participants.

The deliberative poll is in general a useful tool for eliciting more informed and thoughtful public opinion and may affect the course of public policy even if an indirect, hard to measure and presumably small way. But in Texas polling on energy market, policy making was directly affected. Deliberation leads to recognition that renewable technology cannot meet a very high proportion of electricity needs in the short term but strengthen support for including renewable energy as part of a long-term strategy. Large investments in wind energy have been made in West Texas, directly and consciously as a direct result of these deliberative polls.

Based on the direct and active engagement of citizens in the energy chain (production, distribution and consumption) Energy communities (ECs) have been gaining relevance as one of the most powerful tool to support energy transition. The EU Clean Energy Package recognizes the centrality of citizens that in the next future should have "a better choice of supply, access to reliable energy price comparison tools and the possibility to produce and sell their own electricity",[7] thus moving from being passive consumers to be active prosumers who also produce goods or services for sale in the energy market.

Energy communities are important for the transition towards a more sustainable and just energy system for at least two reasons: on the socio-technical side they allow the exploitation of RES that are implicitly more decentralized with respect to the fossil fuels; on the economic side they help in finding the needed resources to develop RES technologies (Bauwens 2016; Walker and Devine-Wright 2008) and influence energy prices and providing services with a direct impact on the justice of the energy sector in terms of inclusion of disadvantaged people, security, transparency.[8]

It has been estimated that the need of investments in renewables sources and technologies aimed at stabilizing greenhouse gas will range from USD 2,850 billion to USD 12,280 billion for the period 2011–2030.[9] Governments are unable to provide such a financial effort, and so it is necessary to include other resources from business, households, and civil society within which ECs seem promising (Bauwens 2016).

ECs are extremely heterogeneous. They can be aimed at managing energy production/distribution, demand response or energy storage and they can have many diverse practical implementations such as renewable energy generation, community hall refurbishments, collective behavior change programs but they share the nature of being citizen-led initiatives which propose collaborative solutions thus bringing public engagement to top-down policy initiatives (Seyfang et al. 2013).

An important distinction can be made between *communities of locality* and *communities of interest* with the former being particularly linked with local development processes while the latter refers

to groups of dispersed people with a common interest such as investors in a cooperative project. As engagement may be defined and measured in terms of the volume of financial investment made and the degree of participation in the governance of organizations (Bauwens 2016).

From a strictly economic perspective, ECs are generally owned by their members and present different model of ownership than conventional business such as (cooperatives, development trusts, charity) that may be seen as more or less inclusive and collective (Walker 2008). Another relevant difference with the traditional private enterprise is that net earnings are usually divided among members not according to their shareholding but according to the volume of transactions they have conducted with the firm. Finally, as the profit distribution is formally constrained by ECs' statue and rules, maximization of return on capital may not be a key objective (Bauwens et al. 2016).

3.3 Public engagement as a perspective for political economy

Finally, public engagement may also play a relevant role as a component of a more general perspective in defining political economy strategies such as in the case of delivering of public services and in defining R&D policies.

Co-production as a way to delivery more targeted public services represents an approach to administration that, following and updating the tradition of new public management, NPM (Hood 1991), pushes the involvement of end-users as the main element for improving efficiency and efficacy of actions of public administration. Until the late 1980s, public services were considered as activities which professionals carried out to achieve results "in the public interest". This approach has been challenged by the idea, at the core of NPM, that public services should be designed "to bring about 'outcomes', not just 'results', and that these outcomes should, in large measure, correspond to those which service users and citizens see as valuable, not simply those which are valued by politicians and service managers" (Bovaird and Loeffler 2012). In line with the RRI philosophy, co-production of public services look at them not just as services produced *for* the public but *by/with* the public within the framework of a public sector, which continues to represent the public interest, not simply the interests of "consumers" of public services. In this framework, public sector and citizens should exploit the synergies between their diverse assets and resources to achieve better outcomes at improved efficiency rather than simply services (Bovaird and Loeffler 2012).

Involving end-users move service users from the traditional view of the public as "passive" to active components of service delivery as they are essential in defining service requirements, they have knowledge to be valorized, they can play the role of active contributor to their communities and promoter of the value of the public services they receive and can engage in collaborative rather relationships with staff and with other service users.

End-users (citizens) may be engaged in the coproduction of public services in many different not mutual exclusive) ways such as co-planning of policies (e.g. deliberative participation), co-design of product and services (e.g. user consultation, service design labs), co-prioritization of services (e.g. participatory budgeting), co-financing (e.g. fundraising), co-managing (e.g. community management of public assets), co-delivery (e.g. peer support groups), and co-assessment (including co-monitoring and co-evaluation).

Most of these different profiles can be detected in many of the public-private partnership (PPP) in delivering public services, but an actual co-production of services only occurs where they are both co-commissioned and co-provided (Table 17.1).

Public-value created by engaging citizens can be measured in terms of user value, value to wider groups, social value (social cohesion and interaction), environmental value and political

Table 17.1 Typology of co-commissioned and co-provided services (adapted from Bovaird and Loeffler 2012)

		Level of public engagement in Commissioning	
		Low	*High*
Level of engagement in Provisioning	Low	Traditional	Co-commissioned
	High	Co-provided	Fully co-produced

valued. The first two are traditionally taken into account by the private sector and in traditional procurement approach.

Some barriers that may hinder the development of this renewed public management approach are mainly funding and commissioning barriers, lack of professional skills, difficulties in generating evidence of value for people, risk aversion, and political and professional reluctance to lose status and control.

Adopting this approach is a matter of political economy as it is not cost-free. While user and community co-production can achieve major improvements in outcomes and service quality and can produce major cost savings, it is not resource free. Initiating such approaches can involve substantial setup costs and supporting them effectively will usually involve a flow of public sector resources. Co-production may be "value for money", but it usually cannot produce value without money. Furthermore, especially in the case of citizen science and innovation – a lively debate for the development of proper reward for the people engaged in co-design activities is also flourishing.

4 Conclusion

In research and in practice, commercial exploitation of scientific knowledge and public participation in policy making about science and technology are usually distinct. While the "capitalization" of knowledge is framed within innovation and management studies (Leydesdorff and Etzkowitz 1998), "participation" is one of the main focuses of science and technology studies (STS), where it is treated as a form of democratization of the policy making process and of socially nuanced coproduction of innovation. Bridging these two streams allow researchers and decision-makers to explore the interconnections between participation initiatives and economic policy, and the potential economic value of the public engagement in both shaping technological products for the market and preparing the market for the product.

Thorpe and Gregor (2010) consider this opportunity as "a novel situation in the public dimensions of science and technology" to be exploited through the explicit link between communication of science and national policy for investment and innovation in science and technology. At the systemic level of the general economic dynamics (that may be referred at the local as well as at the national or greater level, i.e. European Union) engaging people with R&D may bridge capitalization of knowledge and participatory models thus producing a confluence of knowledge transfer and social relations and in "wealth creation" (Thorpe and Gregory 2010).

Behind this proposal lays the convincement that science and technology are the main forces of production within advanced capitalism of knowledge economy and that the economic mobilization of science influence the institutional and policy context, including participation processes. Participation can be considered as a form of immaterial labor which has been gaining value in the recent decades of evolution of capitalistic model, closing the gap between production and

consumption (i.e. presumption explored at Section 3.2), and between the economy and the communicative public sphere. If contemporary funding institutions wish to support innovation (Jessop 2002), in addition to fund research activities it should institutionalize and implement public engagement in order to take advantage and legitimize in a stable way the post-academic forms of responsible knowledge and innovation production.

Opening to the public and society the streams of scientific research, through the exploitation of the "third mission" of contemporary academies and the collection of diffused and tacit knowledge by the means of public engagement, pushes the encounter between parties from different backgrounds or with differing interests. These processes, as in the case of polling presented at Section 3.2, may be considered also as examples of "deliberative democracy" when applied, for example, in areas of service provision where the public is not able to make their preferences count via the simple choice of consumption. Participation, thus, should not be conceptualized and designed as an alternative to the market, but rather as a complement and a mean for articulating and valorize citizens choice and for driving research and innovation processes.

Notes

1 As an example, in Italy in 2016 there were 359 environmental local conflicts, with more than half in the energy sector (56.7%) followed by the waste management sector (37.4%). Within the energy sector, oppositions were mostly oriented against RES plants (75.4%) and in particular against biomass (43 plants), composting (20), and wind farms (13) (Nimby Forum 2017).
2 The scheme was discussed at Leibniz Institute Conference, Berlin, 16 June 2018.
3 http://projectsmartmap.eu/.
4 www.rri-prisma.eu/.
5 https://innovation-compass.eu/.
6 See also http://projectsmartmap.eu/wp-content/uploads/2018/08/SMART_Map_3Dmed.pdf.
7 http://europa.eu/rapid/press-release_IP-16-4009_en.htm
8 For a review of energy justice concepts, see Jenkins, K., Mc Cauley D., Heffron, R., Stephan, H., Rehne, R. (2016) Energy justice: A conceptual review. *Energy Research & Social Science*, 11, 2016, 174–182.
9 IPCC (2011) *Special Report on Renewable Energy Sources and Climate Change Mitigation.* Cambridge University Press, New York, USA.

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