



**Imaginaries and instruments: conceptual tools for
problematizing responsible innovation**

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Imaginaries and instruments: conceptual tools for problematizing responsible innovation

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Abstract

One objective of the Working Group on Built-in Renewable Energy and Architecture of the Observatory for Responsible Innovation is to clarify the conceptions of responsibility that underpin various approaches to the interface between renewable energy and architecture, through a series of encounters and debates with experts in energy policy in 2012. The Working Group itself counts on a variety of backgrounds among its members: architecture, decision-making, urban planning, innovation expertise, public administration and academic research. This work's point of departure is not a fixed definition of responsibility but rather the identification of issues that should be made available for political discussions, an objective crucial to democratic societies. This question is addressed through *imaginaries* and *instruments*, two useful concepts for framing the debate. This policy paper provides a repertoire for describing the modes of responsible innovation in architecture and renewable energy. It signals key political issues related to this topic, key entry points for identifying the challenges associated with a democratic discussion of what it means to innovate responsibly in architecture and renewable energy.

Approach

We tackle the question of responsible innovation in architecture and renewable energy by addressing two dimensions: imaginaries about the future and instruments that can bring about change. The former seeks to make explicit the imaginaries about the future that sustain collective representations in the socially responsible potential of built-in renewable energy sources. The latter focuses on the instruments that construct, manage and/or evaluate innovations in architecture and renewable energies. These instruments can serve as arguments to support specific policy recommendations and as tools to bring about desirable imaginaries. The relation between instruments and imaginaries can be thought of as an articulation between devices constructing short-term futures, and visions determining long-term evolutions. Collectively, imaginaries and instruments contain implicit assumptions about responsibility. For instance, by including or excluding elements in calculations, modeling enacts a version of responsible innovation. It is such assumptions that we seek to make visible as an input to political decision-making.

Discussing imaginaries and instruments leads us to examine different actor groups in the area of built-in renewable energy production. Actor groups include architects, engineers, policy makers, technological companies, energy delivery companies, scientists, and consumers. They are identified through the imaginaries they entertain and through the instruments they produce or draw upon to transform these imaginaries into political arguments for or against built-in renewable energy production.

Imaginarities and Instruments

We have identified a number of different types of imaginaries and associated instruments that we find particularly relevant and interesting for policy discussion. We examine them primarily in the French context. Yet the local analysis also leads us to consider international issues, particularly at the European level, since European regulation plays a significant role in national contexts.

Our use of the term "imaginaries" echoes recent work in the field of Science and Technology Studies (STS) on "sociotechnical imaginaries", defined by Harvard Professor Sheila Jasanoff as "imagined forms of social life and social order that center on the development and fulfillment of innovative scientific and/or technological projects" (see Jasanoff, Kim & Sperling, 2007; Jasanoff & Kim, 2009). In this perspective, imaginaries are directly connected to visions of future developments. They are "at once descriptive of attainable futures and perspective of the kinds of futures that ought to be attained". They are practically enacted in the shaping of technologies, in the definition of public spending and in the identification of legitimate processes of decision-making. As such, they comprise both visions of technological developments and of political organizations. These imaginaries are not abstract constructs that would be disconnected from actual practices. Rather, they are made visible by the actors involved. In the cases that interest us here, these actors might be policy-makers, architects, private companies, consumers, inhabitants, or scientists. But what matters is that the identity of these actors might not be the same from one imaginary to the next.

For our concern here, "imaginaries" define what "sustainability" and "responsibility" mean in practice. It is thus crucial to decipher these constructs, in order to open up the political choices, and, possibly, offer alternative ways of being "responsible". Doing so is practically feasible when considering the instruments that give reality to the imaginaries. Instruments, as we use the term here, are devices expected to shape technologies, individual behaviors, or political decision-making. They can be political or market devices, as they define individual and collective agencies, while organizing social orders (see Barry, 2001; Callon, Millo & Muniesa, 2007; Lascoumes & Le Galès, 2007). Instruments, in our perspective, are

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heterogeneous entities comprising material and non-material components, which organize collective decisions. For example, a device used by the ministry of economy for development provisions is an instrument based on economic modeling, which uses a series of hypothesis about technological development and consumer attitudes, and which gives shape to national policy-making initiatives. Starting the analysis from the instruments is a way of not taking technical and social identities for granted, in order to describe their practical constructions. As such, instruments are useful entry points to identify imaginaries, which can then be conceived as enacted through series of complementary instruments.

We identify four sociotechnical imaginaries, related to different scales of collective action:

- an imaginary of progress and competitiveness,
- an imaginary of technology fix,
- an imaginary of consumer choices and decentralization,
- an imaginary of local sustainable development.

An imaginary of progress and competitiveness

This imaginary is characterized by an attention to economic development and to the connections between technological progress and national competitiveness. It frames a mode of action in which the State is expected to be active in the making of competitive industries. The future, in this imaginary, is envisioned as a road to a better position within the international competition, and green technologies are expected to play a part in it. They are solutions to competitiveness issue, and possibly engines to national growth. Public sector investment in technological energy innovations, if successful, can promote national competitiveness and consequently generate new jobs and hence tax revenue for the country. The Direction Générale de la Compétitivité, de l'Industrie et des Services (DGCIS) calculates, for instance, the benefit of its investments as the potential creation of stable French employment in the coming three years. In other words, social responsibility is primarily about increasing GDP and creating (stable) jobs in the country. This means that the commitment of the public bodies to economic development might switch from "green" technologies to other technological domains, according to the perceived contribution to national competitiveness (the current discussions about shale gas, in France, are telling for that matter): within this imaginary, the problem is not sustainability *per se*, but as a means to reach a leading position in the global competition.

This imaginary is reflected most remarkably in China's strategy for renewable energies. Here new ideas for how to organize energy solutions are tried out at the level of the city, making it possible to select the most cost-effective solutions before implementing them on a larger

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scale. When it comes to tenders, China's main evaluation criterion is investment costs, not technological superiority. This priority gives Chinese proposals a competitive advantage on their own market and, because of its sheer size, also on the world market. China also holds quasi-monopoly on rare earths, which gives the country significant bargaining power on the world market for photovoltaic (PV) panels and other energy technologies using rare earths. China's public investment approach has contributed significantly to its becoming a world leader in several renewable energy sectors.

In this imaginary, technology development has a life of its own, which needs to be harnessed in order to contribute to national economic competitiveness. The demand side is not the primary interest here. Citizens are expected to provide workforce for national industries but the instruments mobilized to ensure economic competitiveness are not meant to transform their behaviors. These instruments comprise economic models expected to identify the contribution of green technology to national growth and prospective roadmaps expected to foresee potential technological development.

An imaginary of technology fix

The imaginary of national competitiveness might be connected to another one, based on the idea that technology will provide the answer to every social problems one might encounter. In the case of climate change for example, technology might appear as a solution to adapt to the ongoing rise of temperature levels, as well as a solution to counter this rise - e.g. by capturing CO₂ and/or launching geo-engineering experiments. This imaginary of "technology fix" is based on the idea that technology is fundamentally distinct from other aspects of social life, and is to be mobilized by expert knowledge in order to answer issues distinct from technology itself. The instruments that enact this imaginary are based on the mobilization of technological knowledge. For instance, scientists may contend that if thin-film PV technology were developed fully, then all surfaces could be covered in a paint-like substance that produces energy. Or if the PV yield could be improved, PV panels could become fully competitive with other energy sources without the need for public subsidies. Similarly, research in energy storage, architecture, eco-cities and sustainable construction could perhaps bring about novel solutions for the future. Research policy instruments (e.g. research funding programs, such as public funds dedicated to the development of scientific excellence in a specific area of study) thus contribute to an imaginary in which innovative solutions come from the assembly of knowledge components that are developed where the world expertise of this specific component resides.

The imaginary of "technology fix" is clearly visible at the level of the construction site. As buildings are expected to reduce their CO₂ emissions, be more energetically efficient, lower

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their levels of energy consumption, and maybe even produce energy, architects might be tempted to consider technologies as ready-made solutions to pre-defined problems: e.g. innovative materials to improve isolation, solar panels expected to be esthetically integrated in the building structure or more effective heating devices.

The imaginary of "technology fix" is potentially used by actors engaged in energy transition: by constructing quantitative models aiming to prove the possibility of radically new energy mix, they also act as "technology experts" who hope that a scientific demonstration will convince the public of the technological feasibility of a new energy situation. In this latter case as in the other, "responsibility" refers to the correct scientific evaluation, and the crafting of the most appropriate technological solution.

An imaginary of consumer choices and decentralization

Integrating sustainable energy at the level of the building or the eco-area is not necessarily connected to either considerations of competitiveness or technological issues. It also raises issues for inhabitants, and, more generally, users of buildings. An imaginary based on the importance of consumer choices can be identified for that matter. In this imaginary, what matters is the decentralization of the government of the production and consumption of energy to the most local level, possibly that of the individual consumer, who is made an "active citizen" by the virtue of a series of instruments expected to render visible the levels of energy consumption (e.g. smart counters implemented in the individual house), to manage the energy flows, and, more than that, to actively produce energy at the level of the individual habitation. "Responsibility" then, is, in this liberal perspective, a matter of individual choices, and is best attained if information is transparent and opportunities for choices are provided. This imaginary then does not neglect the state of other public actors: they are expected to ensure the functioning of the market of energy, by regulating the circulation of information, and provide feed-in tariffs in order to stimulate the development of energy production devices not yet competitive.

An imaginary of local development

Construction projects are, in practice, embedded in local contexts, where local public bodies and private companies are directly involved. Projects including sustainability objectives might be undertaken by local officials for the sake of urban renovation or in the context of the development of new urban area. In these cases, sustainability is a component of a local development strategy. It might be connected to an explicit objective of CO2 emission reduction, to a more general commitment to the reduction of environmental impacts, or,

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more generally, to the outcome of negotiation with the interested stakeholders. The imaginary is here that of local development as defined by choices of urban development, and constrained by local public finance, and the relationships with close localities.

"Responsibility" in this imaginary, is a matter of local politics, in a broad sense of the term. It includes negotiations with the concerned publics - be they private companies aiming at financial profits, local electoral constituencies, or the various elected or non-elected public bodies. It might be the complicated outcome of multi-level negotiations when an existing urban area is to be renovated, but might also be, in other cases, a relatively straightforward initiative of stakeholders all committed to the construction of new "zero-net-emission" community. A "responsible" approach is then characterized by the construction of a political agreement among these actors. This includes the existing or future inhabitants. The transformation of Tour Bois-le-Prêtre in Paris (architects Frédéric Druot, Anne Lacaton and Jean-Philippe Vassal) is an example of a participatory approach to conception that was adopted to define the technical specifications of a building prior to its renovation. The integration of future practices and uses in the design phase eventually rendered the project less costly and more efficient in terms of its environmental impact.

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