Building Professionals Facing the Energy Efficiency Challenge

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1 Tipee is a technology platform dedicated to building restoration and has been awarded the Appel à Manifestations d’Intérêt (AMI) (call for expressions of interest) from the ADEME, “Energy Positive Neighborhoods and Buildings and islands with a minimum carbon balance” as part of the “Investments for the Future” initiative launched by the French government at the end of 2009. Tipee is also funded by the European Regional Development Funds (ERDF) and is part of the national Grenelle Building-Energy Platforms, from the Sustainable Building Plan. http://www.plateforme-tipee.com/plateforme-batiment-durable-tipee/Université de La Rochelle, LaSIE Laboratory, Agglomeration Community of La Rochelle, Cluster Eco Habitat, Novabuild, Alliance 2i, IRSTV, group Ridoret, CTICM, Eiffage Construction, Soprema, Ateliers Megumi & Associates, Saint Gobain, Cel, RCP, AIA Studio Environnement, Case Home.
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Introduction

Building Professionals Confronting Energy and Environmental Quality Challenges: Outlooks on a Changing Field of Skills and Practices in France

The reduction of energy consumption and the improvement of energy performance are now critical goals for builders actively involved in the production and management of buildings, whether in the renovation of existing building stock or the construction of new buildings. A significant arsenal of standards, labels and certifications (the HQE, Haute Qualité Environnementale, and the RT 2012\(^1\), Réglementation Thermique 2012, generalizing the BBC, the Passiv’Haus, Minergie, Beapos...) has been put in place to try to ensure greater energy efficiency in buildings, creating new constraints and fields of possibility for the building industry stakeholders.

Since the beginning of the 2010s, the evaluation of a number of pioneering operations and the widespread usage of so-called “high performance” solutions has been launched. As a result of this, many discrepancies have now been found between the theoretical, calculated, and expected energy performance for an operation and the actual nature of the results that can be observed in the field. The work presented here comes in addition to approaches taken via the evaluation of technical devices and systems, or works on the divergences between the expected and actual forms of building occupancy. It addresses this assessment by allowing the professionals who manufacture and manage these buildings to share their points of view.

\(^1\) Haute Performance Energétique (HPE), which can be translated as High Energetic Performance and Réglementation Thermique (RT) which means the thermal regulation.
This book presents the results of a survey conducted on French professionals engaged in specific implementations of high performance energy techniques in the building industry over a period of several years. We present the results of the survey of professionals, and a selection of testimonials from professionals (in the appendix). With roots in different and complementary disciplinary backgrounds (i.e. the social sciences, civil engineering and architecture), the three authors have thus compiled a crosswise reading of the processes through which the issue of energy challenges is brought up to date using specific cases in the production and management of buildings. The testimonials allow us to trace the biographical trajectory and create a profile of the interviewees, and then to review some of their main achievements.

Therefore, the first objective of this work is to provide the reader with deeper knowledge of the professional expertise, skills and practices’ evolution dynamics that are taking place at a time when a response is ordered to contemporary energy challenges (energy efficiency, reduction of energy consumption and energy transition), in the design, construction and management of the existing building stock. How should the knowledge, expertise and relationships among professionals and between professionals and others be reconstituted, and what strategic positions are observed among building professionals? Its second goal is to allow practitioners, teachers, researchers, students at architectural schools, engineering schools and universities of different disciplinary backgrounds to benefit from feedback and the reflexive efforts of actors, some of which arise as precursors and with the benefit of hindsight with regard to their practice. To this end, the approach taken involves bringing to light the practical problems encountered in the field by participants in the building industry, as well as the mechanisms and resources for the effective improvement of the manufacturing and management of buildings which they have mobilized in response to energy-related issues. These professionals question the processes of design, construction and management as well as constructive mechanisms, technical systems and the relationship with users and their ways of living in these buildings.

Chapters 1 to 3 offer the reader the chance to take a look at energy-efficient buildings: this part of the book presents the context of the survey conducted and its main results. The chapters focus on the stumbling blocks, barriers and the factors leading to failure, but also on the mechanisms and resources that enable builders in practical work situations to build energy-efficient buildings. A cross-cutting analysis of the feedback on the work situation and the professional’s careers allows for features that define the pioneers and the successes of the operations to be identified. To this end, this part of the book analyzes the competencies (knowledge, expertise and tools, relational and inter-professional dynamics) and the way in which they are updated in the practices of active members of the building industry.
In the appendix, we give the stakeholders involved in the implementation of energy performance solutions a chance to share their views and ideas. Their work is a testament to their critically important capabilities given their experience and the ways building and production are being reinvented, and in many cases, a keen awareness of the knowledge possessed and uses made by the building’s occupants. These actors carry out various activities in the construction chain (project owners, project managers, project administrators, designers, technicians, workers, maintenance providers, etc.). They work within structures that are representative of the diversity of the current manufacturing methods of buildings.

On the basis of their feedback, the challenge in creating this work is to question the logic of innovation, to shed light on the dynamics of learning and the renewal of professional skills. What are we able to learn from these stakeholders in order to think more effectively about the design and implementation of energy performance, in taking into account the constraints, practices, representations and perceptions of the participants in the construction chain, whether they are professionals or inhabitants? What are the mechanisms and stumbling blocks for more effectively bringing together the issues of lifestyles in the design, implementation and maintenance of buildings to ensure better energy performance?

2 For example, independently or within large industrial groups.
1.1. Stakeholders for understanding the challenges of energy, the climate and the environment

1.1.1. The virtues of active building professionals entering into participation

1.1.1.1. From buildings...

In France, the “building” field currently finds itself at the center of public policies, in particular the TEPCV Law\(^1\), which positions the building sector as one of the main drivers for achieving energy efficiency objectives. In fact, this sector, a sector responsible for 44% of France’s final energy consumption\(^2\), is also a significant contributor to the economy (7% of GDP). As a result, the challenges involved in the construction and restoration of buildings are the focus of many actions in different domains: in politics, regulation, research, but also in terms of practices regarding programming, design, manufacturing and the management of real estate assets.

In this sense, building corresponds to a spatial scale that is particularly pertinent for thinking about the response strategies that companies can put in place to combat climate change and reduce their use of non-renewable resources. The solutions that

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1 The law related to the transition of energy sources for green growth in France.
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builders implement in this sector to reduce energy consumption therefore involve major social, political and scientific issues in order to observe, understand and improve the adaptation of societies and territories to the environmental challenges of the 21st Century.

In light of these issues, over the past 30 years, many studies and investigations in France have generated knowledge on particular points identified as impediments to improving the energy performance of buildings: wall insulation materials, ventilation, heating and cooling systems, etc. In parallel and often in collaboration with researchers, stakeholders from throughout the construction industry have sought to respond to these issues regarding economic and energy efficiency, and in a broader sense, to the environment, producing buildings that are “efficient”, “economic”, “green”, “sustainable”, “frugal”, “low consumption”, “passive” and “positive energy”, often by making an entry using implementations that are pioneering or considered “exemplary”. Studies have also focused on characterizing these implementations. An action campaign was carried out in 2011 on a set of roughly 10 buildings built within the framework of Europe’s Concerto program to compare the projected energy performance for these buildings and the energy performance measured after their construction [ENE 11]. The Agence Qualité Construction (Construction Quality Agency)\(^3\) has also conducted a major nationwide survey on a large number of buildings since 2010 to analyze the sustainable construction experiences, and has regularly published updated reports and information sheets on the points to take precautions against and the good practices to be implemented [AGE 14]. In 2016, the Agency also published a report specifically focusing on the prevention and remediation of the risks of radon and another report specifically on bio-sourced materials, to take stock of the experiences from Alsace.

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3 “The Construction Quality Agency (French acronym: AQC, “Agence Qualité Construction”) is an independent organization created under France’s association law 1901, financed by the voluntary contributions of its members, as collected by insurers. It brings together all professional construction organizations around a single goal: to prevent defects in construction projects and to improve the quality of construction.” The AQC carries out three main goals: it observes professional practices, prevents risks, and provides information about these issues. To carry them out, it relies on representatives of the organizations in question, and on external authorities/experts, consultants, specialized journalists, graphic designers, designers, economists, sociologists, press representatives and other similar professionals. The AQC is equipped with a Construction Quality Observatory, which forms “the foundation of all work” with tools and resources to “discover and analyze poor practices, to prevent serial defects, and to guide future actions”. Preventive measures and the spread of useful information is carried out by the AQC’s own communications media (articles, booklets for professionals, letters, CD-ROMs, speeches, press releases, etc. and by various vectors: printed and electronic letters, its bimonthly journal Qualité Construction, meetings and symposia, trade shows, its website) and through professional organizations. Source: ACQ website: (www.qualiteconstruction.com).
in 2015\(^4\) [AGE 16a, AGE 16b]. In this way, “green” office buildings have been analyzed, calling into question their real performance with regard to their estate value and certification [CAR 11]. Summarizing the conclusions of the measures carried out by Enertech, Gaetan Brisepierre, a sociologist specializing in energy, continued the investigation to question the social and organizational processes that explain the discrepancies between the purported performance and the actual performance in three pioneering low-consumption buildings [BRI 13]. Within the framework of the ADEME-Employment Service project initiated in 2008 and expanded to more than 30 employment centers in France, the Project Building Branch Group (composed of ADEME, Employment Service, Metropolitan Council of Nantes and the local government agencies for Enterprise, Competition, Labor and Employment (Directe)). These agencies also conducted a study in 2013 to observe the real practices of construction sites on six social housings with positive energy in individual houses and the re-qualification operation of a building containing 106 social housing units “Moulin Lambert” as well as a renovation project for 176 dwellings in the Malakoff district, of which the leasing agency is Nantes Habitat [GRO 13].

These studies led to two main conclusions. They found significant shifts and the observation of excess consumption by comparing the theoretical energy performance, given by the project owners and designers, and the actual energy performance, measured in the buildings after their completion and their occupation. They stressed the broadness of the range of the factors causing the discrepancies and excess consumption, which involve the entire chain of participants in the building’s construction: perfectibility of forecast models problems, misconceptions, faulty work on the construction site, maintenance adjustment problems or technical systems which are not suitable for the uses and lifestyles of the inhabitants [BES 14; BRI 13]. The reasons for this may be simplified to include in most cases either the design of the building, its construction, or its users (and their behaviors); a closer analysis shows that the connections within this chain are very closely linked and that only a vision that is able to encompass all these links will allow for progress to be made.

\(^4\) This report, developed as part of a partnership between the Breton Sustainable Building Network and the AQC, summarizes the remarks on the experiences taken from Brittany in 2015. It reviews the points to be cautions of and lists the solutions observed to reduce the risk from radon [AGE 16a]. [AGE 16b] which summarizes the remarks on the experiences taken from Alsace in 2015, gives points to be cautions of in the specific case of the use of bio-sourced materials used in high performance construction, particularly in the case of renovation, and a series of good practices to observe in order to optimize the use of these materials.
Example of the REX performance buildings unit (2010-...)

The REX system of review, the Construction Quality Association is characterized by the magnitude and diversity of the sample studied. Initiated in 2010 and still in progress at this time, the investigation covers 750 pioneering operations within mainland France and the DROMs (French overseas departments and regions). The sample it targets includes both new buildings (55%) and renovated buildings (45%), including different types of buildings with low consumption levels and/or high environmental quality (commercial buildings, communal buildings and individual houses), whether labeled or otherwise and also takes into account a significantly diverse array of geographical locations, with constructions studied in rural and urban areas. The objective of this survey of these groundbreaking buildings is to identify both (1) the “defects” - that is, the “negative qualities that impact the expected performance and prevent the achievement of the objectives initially modeled (consumption, comfort, sanitary quality, etc.)”\(^5\), as well as (2) the “good practices” observed in these constructions.

The REX performance buildings unit operates on the basis of a form of cooperation with the member resource centers of the BEEP network (French acronym for: Built Environment Space Pro). The results obtained locally from the field are capitalized and updated regularly in different versions of reports and thematic data on various topics available on the AQC site.

Box 1.1. Example of the REX performance buildings unit (2010-...)

1.1.1.2 .... to manufacturers

The research that we have conducted is part of the efforts to continue these works in greater depth, regarding the construction of buildings in response to contemporary energy challenges. For a more in-depth understanding of actual practices in the field carried out in previous works, we chose to shift the focus away from the buildings to instead take a look at their manufacturers, by conducting a survey of the professionals who produce, manage, maintain and renovate these buildings. The entry into this field by other participants allows for a building-scale update to be made to an approach that investigations and studies began to experiment with at the scale of cities or urban projects, such as the exploratory research conducted by Cyria Emelianoff and Ruth Stegazzy on the pioneers of the sustainable city in Europe [EME 10], the exploration of the impact of sustainable urban development on professional practices [SYM 08], the exploratory survey conducted by Pascale D’Erm on the actors of the ecological transition (elected officials, companies, related actors and citizens) in different cities in France [DER 14] and forms part of a continuation of initial exploratory studies begun at a building-sized scale on certain professional groups [BES 11, COL 07, GRU 12 MOL 14a, ZEL 10].

From our perspective, the appearance of these new actors offers several advantages. First of all, it allows us to complement and surpass the approach used to carry out previous work, or of participants interviewed regarding particular operations. Indeed, over the course of their careers, some of the pioneering industry members we interviewed have worked on over 300 operations. The choice to work in this way, on the basis of the observations from these professionals and not solely on the results from experiences obtained in specific operations, ultimately allows us to examine a much larger array of creations. Interviewing the professionals with regard to their professional trajectories, the full range of their experiences and their productions, on their concept of performance and energy-use reduction, and on their analysis of the sustainable manufacture of buildings, allows us to bring together their point of view on all of the productions they have carried out. Furthermore, their points of view on their colleagues and other actors’ practices are also compiled, opening up new insights into the exploration field in terms of the manufacture of sustainable, high performance and energy saving buildings. The appearance of new actors who carry out concrete implementations of building constructions thus makes it possible to conduct a qualitative survey to present clearer representation and to deliver a broad-ranging analysis of the specific practices that are put into place stemming from the sustainable construction field, the players’ positioning, the difficulties they encounter and the resources they mobilize in order to build, manage and renovate buildings.

This pragmatic entry by the actors and their points of view also allows us to go beyond the technical considerations of a project and to examine certain social dynamics in greater detail, which still have not been widely explored, in order to analyze how to build for performance and energy savings: the professionals experience and skills construction and evolution within projects requiring experience and the skills of the professionals through the course of projects, the progression of their practices, the challenges of projects and the learning processes, as well as the spread of knowledge and models over the course of their careers. This involves critically examining how the formation of careers, professional paths, the knowledge and experience solidification process and the successive reformulation and readjustment on which they are built over time occurs. Thus, in addition to technical, architectural and urban planning concerns, the analysis of building construction and sustainable cities in response to contemporary energy challenges is ultimately enriched by questioning the fundamental challenges relating to the sociology of the work and the professions involved. By analyzing the professionals’ testimonials, it allows us to collect feedback on the true nature of work in the construction field within specific work situations and to identify the barriers, specific challenges, resources and strategies that the key players in the transition of energy usage and the fight against climate change are trying to use on a functional basis within a micro-territorial scale, the scale of the spaces that we live in and make use of on a daily basis.
1.1.2. Context and interrelationships around energy-related challenges: the positioning of building professionals

1.1.2.1. The territorial reorientation of challenges related to the environment, climate and energy

Examining the issue of the energy challenges faced by building professionals leads to a broader discussion of the farther-reaching social and political contexts in which these professionals interact, and which they seek to address. The energy challenges are addressed as and in relation to elements that respond to broader environmental issues, which are strongly correlated with climate challenges. The appearance of construction professionals as part of this issue allows us to question the territorial reorientation of challenges involving energy, climate and environment challenges that play out on a crucially important scale: the scale of the spaces where we live out our lives, carry out our daily business, in the buildings we inhabit, where we live. It therefore calls on us to question the very tangible translation of the many energy, climate, environmental and sustainable development policies onto a micro-territorial scale. At this building-sized scale, the actions implied by commitments made at higher territorial scales, whether metropolitan, local, regional, national, European or international must be scaled down. Diagnostics, commitments and legislative arrangements made internationally (COP, IPCC, etc.), domestically in France (National Climate Plan, Grenelle Law, the Energy Transition Act and Thermal Regulation), regionally and locally (Regional Climate Air Energy Schemes, Climate-Air-Territorial Energy Plans, Territorial Coherence Schemes, Local Urban Plans, Local Housing Programs, etc.) directly or indirectly affect the...
operations of construction professionals. Some observers have pointed out that this local transposition is very often carried out through “intensive recycling” and responses to climate change that are often focused on the energy issue, and that “performance”, “economical”, or “green” buildings play a major role in these local strategies to respond to more global climate challenges [CHA 10; TAV 16]. Thus, this building-size scale represents one of the last scales of territorial reorientation and transposition of these commitments made in environmental, climate and energy issues and perhaps one of the most tangible scales of implementation, the ability to make solutions operational.

Figure 1.1. The tangled web of the various planning documents that impact energy and climate challenges. The point of the arrow indicates the document to be taken into account or with which the other document must be compatible, in cases where the PLHs and PDUs are not included in the PLUs. For a color version of this figure, see www.iste.co.uk/molina/building.zip

Figure adapted from “Décryptage de la loi de transition énergétique - Gouvernance énergie-climat : que dit la loi de transition énergétique” (“Decoding such, set the general rules of land use in the territory in question. By default, PLUs are now inter-communal, except for communes that decide otherwise.
10 The local housing program sets out the objectives of housing policy for a period of at least 6 years within an inter-communal territory. The property-related component of the local housing component (French acronym: PLH) aims to strengthen its operational aspects and the implementation of community-defined actions. The PLHs can now be integrated into the PLUs.
Thus, the solutions conceived for the upper territorial subdivisions enter into operation, take shape, materialize, acquire substance and sometimes also fail, are aborted or are questioned by the players within the territories. Therefore, the construction sector and the professionals who work in it form a scale and groups of participants in a privileged position to analyze this context. Their input makes it possible to observe and understand the transposition of climate, energy and environmental challenges to the micro-territorial level, the processes of appropriation, the adaptation to environmental, climatic and energy-related ordinances, as well as the resistance to changes by other important figures in society. Also, our research is carried out within the context of the extension and continuation of the work undertaken on the territorial reorientation of issues of sustainability, the environment, the climate and energy issues by social science researchers from different disciplinary backgrounds, whether political scientists, geographers or sociologists, observed at different territorial scales [MOL 12a; RUD 16, SCA 10; TER 15; VIL 09, ZUI 10]. Beyond the issue of shedding light on the production of buildings within a contemporary context, our research also intends to provide a contribution to the analysis of the political commitments trajectory and their local micro-transposition, their dissemination at the building-size scale and the social processes of appropriation, adaptation and resistance or impediments put in place by the professionals who produce, manage and transform these buildings.

1.1.2.2. Building industry participants subjected to draconian orders

Understanding these territorial reorientation issues and these scale interconnections is not only necessary but fundamental to obtain a deeper understanding of the dynamics at play within the building-size scale in the reduction of energy consumption in buildings. The work of multi-scalar contextualization that we carried out was inspired by what some researchers have previously advocated for in terms of sustainable development policies [HAM 10, PEC 10]. Our investigation allows us to better understand how much the manufacturing and management of construction within a contemporary context makes reference to and updates challenges of an environmental, political, social and economic nature that are also at play on larger territorial scales. Thus, building professionals emerge as the main linchpins at work in the territorial reorientation of climate and energy challenges. They seem to be seen as some of the best-equipped fighters (with shovels, pickaxes, hammers and screws) in the struggle against climate change and the energy transition. They are important actors who are responsible for carrying out the translation of climate and energy commitments into practice. International, national, regional and local public policies in environmental, climate and energy-related issues, which in practical terms translate into the strengthening of thermal
regulations, the increasing number of standards, labels and certifications and the complexity of urban planning documents, place significant, real-world constraints on construction professionals and set limits on the range of actions they may choose to carry out.

**Figure 1.2.** The changes in energy requirements of heating regulations and labels over time. For a color version of this figure, see www.iste.co.uk/molina/building.zip

1.1.2.3. The ascending dynamics of building industry participants

The context analysis of the building professionals’ actions regarding energy issues underscores the importance of the logic of descending scales and the enforcement at the micro-territorial level of international, European, regional and local-level decisions and commitments. However, the analysis of the interrelationships in which the participants in the building industry take part would be incomplete if it were merely to observe the significance of the territorial reorientation of environmental, climatic and energy policies and limit itself to examining only the submission of these actors to ordinances emanating from higher territorial levels. On the basis of the revelations of our inquiries, some strategies for ascending the territorial scales of building industry participants may also be observed.

The survey of building professionals confronting energy-use issues has revealed, in effect, that some participants also make commitments at higher territorial scales. In fact, the professionals seek to play a role in the planning of decisions and actions in environmental, climate and energy-related matters. Their purpose is thus to influence the future framework of their own professional activity. Building industry participants (industry leaders, architects and engineers) partake in the formulation of territorial energy climate plans at the local level, as an earlier survey had revealed in
Building project managers also took actions, such as participating in the creation of Regional Climate Air Energy Schemes. Others have been called upon to participate in the development of national public policies, as the architect Yves Lion recalls in his testimony, which recounts the story of his adventure during the Grenelle Environment Forum. Finally, the interviews between 2014 and 2016 highlight the role played by pioneering professionals in the sector, trend setters who have also spearheaded significant actions to impact the construction and advancement of heating regulation, seeking in this way to influence the decisions taken at national level, as told in the testimonies of Alain Bornarel and Franck Dimitropoulos in the appendix of this book.

Ultimately, the analysis of the stakeholders and interrelationships involved in the energy challenges reveals the extent to which a two-way dynamic is at work, and all the more so in sustainability planning [BER 14]:

– the importance of top-down processes, which reflect how the territorial reorientation of environmental, climate and energy-related issues are forcefully imposed on building professionals by means of ordinances requiring energy-related challenges to be addressed, performance to be improved and energy consumption to be reduced;

– and at the same time, the development of bottom-up strategies, which make use of the mobilization and organizational capacity of these building industry members, in which they actively engage in the development of urban, regional, or national strategies in terms of energy and environmental matters, the outcomes of which will influence the framework of their own practices.

11 Molina G. (scientific coordinator), The program Planifier pour ménager le climat en Midi-Pyrénées. Paysage institutionnel, positionnements d’acteurs et recompositions des compétences professionnelles (Planning to save the climate in Midi-Pyrénées. Institutional landscape, positions of participants and recomposition of professional competences), 2011, program co-financed by the Maison des Sciences de l’Homme et de la Société of Toulouse and POPSU France. This interdisciplinary program between geographers, political scientists and sociologists was carried out in collaboration between the LISST-Cieu (UTM/CNRS – UMR 5193) and the LASSP (Institute of Political Studies, Toulouse) with the active collaboration of its director Julien Weisbein and Claire Danjoie. Primarily targeting the mechanisms of public action to combat climate change that were created within state, regional and local services and authorities (regional climate, air and energy guidelines – (Schéma Régional Climat Air Énergie – SRCAE, and local climate, air, energy plan – Plans Climat Air Énergie Territoriaux –, etc., this project questioned the way in which professionals and institutions organized themselves and distributed the roles to be carried out in responding to this issue. By addressing the climate issue through an approach to the positions and skills (positions, construction of the climate issue) of the institutional and professional players and their potential changes, it has therefore allowed us to probe the re-composition of the professional spaces and the distribution of places between different groups of players at regional and local level, which lead to ordinances to combat climate change.
An environmental crisis that shows itself in many ways:

- Depletion of resources,
- Climate change,
- Increase in energy costs,
- Degradation of eco-systems,
- Air quality...

Table 1.1. Summary: The building sector and its participants, an important scale to study the interrelationships of scales surrounding the environmental, climate and energy-related challenges.

This representation of the scalar challenges allows the reader to conceptualize the interrelationships through a mapping of these relations from the global to the micro-territorial levels. It allows for a better understanding of the complexity of the climate and energy issues that face building professionals.

<table>
<thead>
<tr>
<th>Spatial Scales</th>
<th>Participants</th>
<th>Examples of policies or implementations of climate-energy mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>International</td>
<td>States, IPCC</td>
<td>CCNUCC*- COP</td>
</tr>
<tr>
<td>European</td>
<td>Europe</td>
<td>European Climate and Energy plan (objective 3x20)*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National climate Change adaptation plan (factor 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grenelle Environment Forum (2007)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thermal regulation (RT 2012)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Law on energy transition for green growth (2015)</td>
</tr>
<tr>
<td>Regional</td>
<td>Regions</td>
<td>Regional Climate Air Energy Schemes (2011)*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ecological coherence Schemes</td>
</tr>
<tr>
<td>Local</td>
<td>Local administrative and intercommunal bodies</td>
<td>Climate-territorial-energy plans PCAET (2015)-CFEP (2012), Urban planning/Doc Urbanism: Scot (Intercommunal), PLU, PDU, PLH (communes)*</td>
</tr>
<tr>
<td>Urban projects</td>
<td>Local administrative and intercommunal bodies</td>
<td>Eco-neighborhoods</td>
</tr>
<tr>
<td>Building</td>
<td>France</td>
<td>Thermal regulation (RT 2012)</td>
</tr>
<tr>
<td></td>
<td>Building Professionals</td>
<td>Bioclimatic architecture, BBC, Positive energy building, HQE ...</td>
</tr>
</tbody>
</table>

Dynamics of Scales

Descending Top-down: Territorial reorientation commitments ordinances

Ascending bottom-up: Commitment, Activism, Lobbying

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12 The Intergovernmental Panel on Climate Change (1988), which provides scientific reports to advise governments on climate-related problems.
13 The United Nations Framework Convention on Climate Change (May 1992), which introduced the principle of annual COPs.
15 Established by the Grenelle II law, promulgated on July 12, 2010. SRCAE: Balance: Energy + GHG + air quality from projected scenarios up to 2020.
16 Le Schéma de Cohérence Territoriale (SCOT), which can be translated as “the territorial coherence plan” determines, at the scale of several local authorities, a territorial project to ensure coherence in all the sectorial policies (habitat, mobility, commercial development, environment, landscape...). At the communal level, the French planning organisation is based on the Plan Local d’Urbanisme (Local Plan of Urban planning), le Plan de Déplacement Urbain (Urban mobility plan), and the le Plan Local de l’Habitat (Local Habitat Plan).


1.1.3. **Common themes and the questions of the survey**

Our research problem was therefore aimed at responding to the following questions: how are the professionals in the building industry practical facing energy and environmental challenges in their professional practices? How are they adapting to the rising power of these issues in the construction field? What specific difficulties and stumbling blocks do they run into while in the field, and what resources or tools do they implement to build their skills (knowledge, expertise and know-how) and develop them and what strategies do they deploy to integrate these issues into their professional practices?

To answer this question, the survey of professionals has been arranged around a red line: the retelling of a professional career path, of a singular history with collective dimensions by identifying the most important stages, the noteworthy projects and achievements of each phase, the possible continuities, decision points or reorientations and the decisive meetings and professional networks that have structured it. The survey was intended to explore the connections made with this red line, divided into six broad categories of processes, questions and assumptions:

1.1.3.1. **The construction of professional skills: methods, resources and issues**

This area effectively deals with understanding how building professionals build their abilities, in other words, the knowledge, expertise and know-how needed to build efficient and energy-saving buildings. What are the mechanisms, the tools and the resources on which they are based and what are the specific difficulties, the issues and the stumbling blocks that they run into?

Previous exploratory investigations and informal discussions with professionals within the context of our professional activities provided us with clues to the different catalysts, resources and tools put into use by these participants, which we wanted to ask about in greater depth. We were effectively inquiring as to the respective contributions of the roles played by: initial training, continuous training, experimentation and learning in the field, visits, work sites, the role of key meetings, peer observation, the inspiration of foreign models, “good practices”, readings and travels. We also wanted to specifically ask the question about the models used in the fabrication of high performance or economic buildings. What are the different models implemented by professionals? Are they individuals, devices, projects, achievements, approaches or tools, certifications, labels, standards that serve as models for building and managing these less energy-hungry buildings? What are the methods for the construction, circulation and transmission of these models? The objective was to get a sense of the influence that standardization, certification and labeling have had on the development of the abilities of building professionals who
are currently subject to heightened restrictions, particularly as a result of heating regulations. We wanted to question the processes of standardization, singularization and distinction at work in the construction of the building and the positioning strategies used by the professionals. Beyond the orders to which these participants are subjected via heating regulations and the various forms of standardization, we also wanted to ask about the methods and records of the commitment of professionals, the values underlying them, and to observe the possibility for them to be translated into specific practices.

1.1.3.2. The trajectory of problems and solutions faced by “performance” or “energy saving” buildings: a multi-criteria analysis

Another challenge faced by the survey of the professionals was to provide key reading points to plan out a path toward the solutions: from the identification of a problem to the implementation and the appropriation of solutions to reduce energy consumption in the building. This sought to engage in a ballistic exercise, to trace the path of high performance energy solutions, from the diagnosis and identification of a problem to the evaluation of the solution through the design and implementation phase. The challenge of this adiachronic and multi-criteria perspective is to identify the effects the design is expected to have, and also leads to analysis of drift phenomena further down the line to develop the typologies of the secondary effects and observable adverse effects in the field, which the professionals reported in their testimonies.

1.1.3.3. Energy performance approach

The energy performance approach that they implement for the buildings they construct, manage, or renovate have also been explored. In particular, we have sought to identify and analyze the setbacks, obstacles, mechanisms, knowledge, resources, tools and professional networks they have put into use for this work, the possible models on which they rely, the tools and techniques, and the means for evaluating and assessing the operations in which they participated.

1.1.3.4. The system of stakeholders: general outlook, organization, relationships and positioning

Additionally, the exploration of the social dynamics of the manufacture of “performing” and “energy saving” buildings could not be done without a reflection on the system of actors, the professional groups who take part. Thus, another challenge the survey faced was to develop a general outlook of the system of stakeholders of “performance” or “energy-saving” buildings, the professions represented, as well as intra-professional and inter-professional dynamics (dynamics within professions or between professions) given the diverse nature of the relationships that unite or separate them: competition, complementarity, solidarity,
co-presence, indifference, divergence, conflict, tension, rejection, antagonism, hierarchies, etc. One of the challenges once the panorama was made was also to observe the positioning of each participant on the playing field; pinpointing both its horizontal and vertical positioning in the participant system by identifying its possible backers, competitors, opponents, partners, etc. It also involved identifying the characteristics of the professional activities for each participant.

1.1.3.5. A focus on the relationship of professionals with “users”/“inhabitants”

Various investigations carried out on the sociology of energy have highlighted the insufficient consideration given to future inhabitants as part of the production of performance buildings and the technical systems that make them up [BES 14, BES 15, ZEL 10]. Since the consideration of inhabitants and the ways they live is a key point and a major issue to be put into practice by construction professionals [MOL 14], our intent was to collect the testimonies of the professionals regarding this essential factor. The objective was to be able to simultaneously study:

1) the terminology (vocabulary) used to designate inhabitants and the definition that was given to them in order to analyze the depictions and perceptions of occupants given by the professionals and the way in which they conceived their relationships with these participants and their role in the manufacturing, management and appropriation processes of the building;

2) the knowledge of the inhabitants, the uses of energy and the modes of living that the professionals have built, as well as the possible gray areas and blind spots within this professional knowledge of the inhabitants;

3) the practical mechanisms through which they either integrated or did not integrate the occupants and users in their projects, the time periods and stages of the project with which this integration occurred, the types of relationships, transfers and the modes of communication they employed with the occupants;

4) the assessment of the experiences they created from their relations with the users: the contributions, difficulties and problems encountered and the possible devices for resolution that they had implemented on this issue of relationships with occupants.

1.2. The survey of building professionals in France

To investigate these different aspects of career paths, skills and professional practices, a survey of building professionals was conducted for 3 years (2013–2016) by the three authors: Geraldine Molina, Marjorie Musy and Margot Lefranc. A brief summary of its origins, its contexts and the progress it has made is in order. From June 2013 to June 2014, an exploratory work was carried out as part of the collective