

Energy and Urban Planning
Towards an Integration of Urban Policies

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Doctoral thesis in **Environmental Engineering, XXV cycle**

Department of Civil, Environmental and Mechanical Engineering, **University of Trento**

Academic year **2011/2012**

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Trento, Italy

2013



Aknowledgements

My Ph.D activity has been supervised by Professor Bruno Zanon (Department of Civil, Environmental and Mechanical Engineering, University of Trento) and supported as members of the external panel by Professor Paulo Pinho (Department of Civil Engineering, CITTA, University of Oporto) and Paolo De Pascali (Università di Roma, La Sapienza).

I would like to express my gratitude to the supervisor of this thesis, Professor Bruno Zanon, for his support and kind encouragement throughout the years of my study. I would also wish to express my appreciation to Professor Paulo Pinho and Paolo De Pascali who facilitated the research through their provision of valuable advice and information.

I am deeply indebted to Professor Ezio Micelli for his comments to the earlier draft of the theoretical framework of the thesis and interesting discussion about property rights as policy tool and the application to Italian context. During my stay in the Cambridge University, Department of Land Economy I had a chance to debate about land development processes, mechanism and property rights theory. I am grateful to Dr. Barbara Havel for her support and especially I am very grateful for inviting me to the University of Cambridge, where I had a possibility to meet people with similar research interest. I am also deeply indebted to her, who was pre-examiners of Parts 3 and 4 of my thesis, for comments which improved the quality of my work. Sincere thanks go to Ilaria Delponte (University of Genoa) and Francesco Musco (IUAV) who supported me during the research process, in particular concerning Part 2 and Part 3 of my work, and to Guido Codecasa (Politecnico of Milan) for his comments to the Part 3 of the thesis and Anna Simonati (University of Trento) for her suggestions regarding Part 4.

I want to address a special word of gratitude to the COST Action TU0602 JRN members. We shared most of our early research activities towards Europe and this was certainly enriched by their friendship and to whom I am deeply grateful.

Finally, I owe everything to my family. This work is dedicated to the persons who received less attention than deserved during its writing, and in particular to my parents, Giulia, and David.

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Preface

This book reflects the research conducted at the Department of Civil, Environmental and Mechanical Engineering at the University of Trento from autumn 2009 to the first part of 2012 and at the Department of Land Economy at the University of Cambridge in the second part of 2012. In the meantime, I also actively participated as early stage researcher at the Junior Research Network of the COST Action TU0602 “*Land management for urban dynamics*”, I took part to several national summer schools and international workshops and I presented and discussed my work in a number of national and international conferences. Furthermore, Professor Zanon and I organised in November 2011 a seminar, titled “*Energia, Strumenti Urbanistici ed Efficienza. Una Nuova Questione Urbana?*”, with the aim of debating the partial results of the research. The output of this moment is a book that will be edited by FrancoAngeli in 2013.

Thanks to these multi-disciplinary experiences and collaborations, I conducted research in the field of urban and regional planning and sustainable development, particularly concerning the relationship between energy efficiency, urban governance and land-use management using analytical methods based on planning, public policy analysis and urban economic approaches. The period at the Department of Land Economy at the University of Cambridge strenghted my economic background related to urban environment, especially planning regimes and policies linked with climate change mitigation and adaptation policies. On the other hand, collaborations with researchers at Politecnico of Milan allow me to go further in the public policy analysis applied to urban planning and policy systems.

The main outputs of this research period are:

Verones S., Zanon B., (forthcoming), *Energia E Pianificazione Urbanistica. Verso Una Integrazione Delle Politiche Urbane*, FrancoAngeli Editore, ISBN 978-88-204-1731-4, Milan

Verones S., (forthcoming), *Questioni energetiche e le risposte della pianificazione: successo o fallimento? Il caso Italiano*. In: Verones S., Zanon B., *Energia E Pianificazione Urbanistica. Verso Una Integrazione Delle Politiche Urbane*, FrancoAngeli editore, ISBN 978-88-204-1731-4, Milan, pp. 21-54

Zanon B., Verones S., (2013) *Climate change, urban energy and planning practices: Italian experiences of innovation in land management tools*, *Land Use Policy*, 32, 343-355
Paper selected for UN-Habitat's BLP Database website; the trial version is available on <http://bestpractices.at/database/>.

Verones S., Tulumello S., Rubino S., Delponte I., (2012), *An Italian Urban “Fashion”: The Urban I Programme as a Catalyst for the Institutional Planning Shift*, *Italian Journal of Planning Practice*, Vol. 2, Issue 2, 66-95

Verones S., (2011) *Urban policy and novel challenges: an Italian discussion on energy and city*, in: Tira M., van Krabben E., Zanon B. (eds.) *Land Management for Urban Dynamics. Innovative methods and practices in a changing Europe*, Cost Action TU0602, Maggioli editore, pp. 329-342.

Font, N., Goley, J., Verones, S., (2010) *Analysis Tools to evaluate the land mobilization process, the case of Gland*, COST Action TU0602 - *Land Management and Mobilization in Europe: Regimes, Policies and Processes - A Comparison. Framework Applied to Gland, Switzerland*. Ed. Lachance-Bernard N., Pinto N.N., Havel B. and Ploegmakers H., Ecole Polytechnique fédérale de Lausanne and Department of Civil Engineering of the University of Coimbra, Lausanne, ISBN 978-972-96524-4-8, pages 91-103.

CHAPTER 1: Introduction

1.1. The context: energy issues as challenges for urban planning

The causes and effects of climate change have long been debated by scientists, opinion-leaders and politicians, and there is consensus that the risks are of paramount importance, thus soliciting urgent actions in the perspective of a low carbon society, which entails reducing the impact of human activities on the climate by abating greenhouses gases (GHG) emissions and reducing fossil fuel consumption. This perspective involves many actors in different fields and particularly this challenges the organisation and management of the city and the urbanized space, which are the places where most of the GHGs are produced and where energy is consumed (Campbell, 2006; Gossop, 2011; Romero-lankao, 2012). The impact is caused mainly by the use – generally in an inefficient way – of fossil fuel energy to manage the built environment (heating, cooling) and transport (Owens, 1984, 1992a, 1992b).

It has been affirmed that “[c]ities are part of both the problem and the solution” (Lindseth, 2004, p. 328), and therefore “[m]uch of the necessary action will have to take place at the level of the city where half of the world’s population lives” (Gossop, 2011, p. 495).

In this framework, spatial and land-use planning has to play a crucial role, but it is required to overcome the diffuse rhetoric - disguising unsustainable practices, in order to devise relevant strategies and to elaborate effective tools for the implementation of appropriate policies and plans (Betsill & Bulkeley, 2006; Bulkeley, 2006, 2009; Wilson & Piper, 2010). Whereas much of the progress identified in recent years in the construction sector towards more sustainable practices and products was a response to EU policies, the same cannot be said for the definition of consistent and specific regulatory framework in the majority of the European national planning systems about urban energy planning. Initiatives are currently being taken at different levels, from the international one to the national and the regional ones, but operative tools are still lacking, reducing the effectiveness of strategies and programmes involving the built environment. At first sight, it seems possible to conclude that, in comparison with the building scale, the urban scale is attracting much less attention from decision-makers, politicians, officials and practitioners. The activation of low carbon policies and measures requires renovated spatial planning practices (Biesbroek, Swart, & Van Der Knaap, 2009; Laukkonen et al., 2009; Priemus & Davoudi, 2012), as well as the use of effective implementation tools (Betsill & Bulkeley, 2006; Bulkeley, 2006, 2009; Gossop, 2011; Oliveira & Pinho, 2010; Wilson & Piper, 2010). The achievement of a low carbon society depends not only on the energy performance and sustainability of the new and existing building stock but also, to a significant extent, on the energy performance and sustainability of the urban organisation and infrastructure. A first problem to be addressed regards the efficiency of energy use in terms of buildings and plants performance (the ‘nearly zero energy buildings’ perspective); a second one concerns the urban form (urban sprawl control, in particular) and solar exposure, which affects energy needs and production potentials (Ratti, Baker, & Steemers, 2005; Ratti, Raydan, & Steemers, 2003; Steemers, 2003); and a third one regards mobility (Naess, 2003, 2005). All these aspects are closely interrelated and involve other urban planning issues, such as urban density, the presence of an appropriate mix of activities (reducing local mobility), the role of green areas (mitigating summer heat), and the effectiveness of public transport (Banister & Anable, 2009; Romero-lankao, 2012; Wilson & Piper, 2010; Wilson, 2006). In this perspective the attention must be shifted from the building scale to the urban one in order to support not only the refurbishment of single buildings but the reorganization of worn-out districts, the appropriate selection of development areas, the improvement of mobility, the reduction of heat island effects, etc. In general, there is a sound knowledge basis allowing to draw up better plans for development areas and to build them appropriately, but the crucial issue regards the already built-up areas, which account for the majority of energy consumption and are difficult to refurbish (Itard & Klunder, 2007; Power, 2008). Not only an urban level framework is needed – even to support a piecemeal improvement process building by building - but an appropriate framework of public policies and planning regulations is required in order to make an appropriate use of policy tools, to select redevelopment areas, to provide updated infrastructure networks.

Moreover, it is unquestionable that energy and land use are related and that the operationalization of this planning theme involves and modifies the traditional approach to land and building value formation, property market and thus, strategies and tools for property mobilization. The agenda of land management research and practice must therefore be innovated, firstly by overcoming the divide between energy and urban planning (Dente, 1996), and secondly by applying new implementation tools incorporating saving and production energy goals based on appropriate indicators that measure efficiency and effectiveness. This has slowed down the inclusion of such a theme into a more general theoretical framework of urban governance, not addressing the complex relationships between energy performance and urban morphology and between energy issues and land use and its management. The progressive weakening of planning responses to environmental (and energy) concerns clearly emerges from the main disciplinary traditions. Despite few

local cases showing rather advanced and ambitious zero carbon targets and policies, the translation of environmental awareness into planning design and implementation phases is far from straightforward (Bulkeley & Betsill, 2005). Owens and Cowell (2002, pp. 24–25) argue that:

“ [...] despite the firm place of sustainable development on the national agenda, and its diffusion into plans and policies at all levels, there was still, by the end of the 1990s, a sense of implementation deficit. Real changes on the ground – to the nature and form of development, or to the intensity of conflict over land use – were not readily discernible, or at least could not unambiguously be identified as sustainable in practice.”

Planning practices are progressively being characterized, and not only in Italy, by new methods based on public-private partnerships in search of equity and effectiveness in the planning process, and they can include new objectives in terms of urban quality and energy efficiency. The urban space management toolbox is characterized by a variety of instruments. Regulation and authoritative tools are traditionally used in Italy, both because of its urbanism tradition and the Roman law system (Tira & Zanon, 2011), but public-led and top-down actions have largely proven to be no longer politically and economically viable (Kearns & Paddison, 2000) because of the scant consensus on authoritative tools (such as expropriation, but also regulation) and due to the shrinkage of public money. Moreover, the effectiveness of regulation tools regards only some of the processes to be activated, and the involvement of households and the mobilization of economic operators require market-based mechanisms making it possible to balance or to trade local advantages and disadvantages, including those connected with energy – and GHG emission – factors. In fact, the emergence of energy issues has modified even the mechanisms of urban land rent, because values increasingly involve energy factors: solar exposure, proximity to urban activities, possibility to connect buildings to energy waste re-use systems or to co-generation plants, etc. The agenda of land management research and practice must be innovated, firstly overcoming the divide between energy and urban planning, secondly applying new implementation tools incorporating saving and production energy goals based on appropriate indicators measuring efficiency, effectiveness and feasibility. Usual top-down, public-led actions are no longer politically and economically viable. New methods based on public-private partnership are progressively adopted in search of equity and effectiveness of the planning process. These practices include new objectives in planning practices, in terms of urban quality, equity and energy efficiency. This perspective requires the redefinition of usual methods for development rights assignment, and the activation of new planning procedures based on the assessment of actions in terms of performance instead of conformance to pre-defined rules.

The focus of the study is the analysis and evaluation of the ‘performance’ of energy planning responses focusing on the planning process and on the strategies and tools for planning implementation. In particular, the research presents the Italian experience in this respect, taking as research subjects the municipal energy plan (*Piano Energetico Comunale*) and a new plan implementation mechanism based on the assignment of extra land development rights (*bonus volumetrico* or *incentivo volumetrico* or *credito volumetrico*, depends on the regional legislations) in view of the inclusion of energy saving goals.

1.1.1 The energy efficiency potential of cities

Urban energy efficiency measures in building and travel sectors provide enormous potentials to reduce CO₂ emissions in Europe and in Italy. From an urban standpoint, the question lies in understanding if and how the energy consumption of existing buildings and the consequent amount of emissions, can be influenced through spatial planning strategies and urban policies. Hence, it is internationally recognized that the existing housing stock represents the Europe’s largest source of emissions and the more effective energy efficiency potential, accounting for 40 % of the total energy use in the EU.

It is currently understood that the energy demand of buildings, dominated by space heating for the residential stock, is influenced to a high extent by the building characteristics, in particular by building materials performance and building system efficiency rather than building design, and occupant behaviours. On the other hand, the nature of the energy problem has a multiple dimension and, although the models usually adopted tend to consider exclusively buildings as self-defined entities (Ratti et al., 2005) and the effect of urban geometry on energy consumptions still remains understudied and controversial (Alberti, 1999), it is not possible to neglect the existence of a phenomenon that occur at the urban scale. In a context of increasing concerns about the environmental and economic consequences of energy consumption, since the 1970s, a growing number of urban scholars have addressed the relationships between the physical/spatial characteristics of cities and the travel and building energy performance, the two major energy-consuming sectors. Many of these urban studies have concluded that some characteristics of urban morphology, such as urban and population density, the mixed land use and others, affect the energy performance of buildings and travels.

Notwithstanding the criticism from several research streams about how the correlations have been demonstrated, scholars generally agree that achieving better energy performance of the building sector, especially of the existing stock, has to involve the current planning practice and the physical/spatial characteristics of cities in order to maximize the availability of sunlight and reduce the heat infiltration due to dominant winds. These two mechanisms of thermal transmission are therefore also dependent on physical characteristics of urban areas in addition to the building design, materials and systems and to the occupants' behaviour.

The aforementioned considerations highlight a multi-causal situation at different scales where the physical/spatial characteristics of cities play a role to be considered. Actually, the measurement of the urban factors that influence the building energy performance is complicated. Nevertheless, quantitative and qualitative hypothesis suggested that positive results, which can be obtained by means of appropriate building technology and the use of updated technical systems, could be insufficient to achieve high-energy standards, such as in the bio-climatic and passive building examples, due to the urban form and inappropriate urban densities. Consequently, this indicates the necessity to consider, in designing spatial planning strategies and policy for urban energy efficiency, the complexity of the relations between the building and its energy performance. Urban factors, such as the building solar exposition and the housing density, have to be incorporated into a general framework oriented to achieve better energy efficiency of cities, focusing on the existing building stock in terms of 'urban potential'.

1.1.2 Global issues, local responses

The pace and implications of climate change and world energy consumption are the subjects of scientific research and political debate since the 1970s. In those years some scientists started to sound the alarm about climate conditions, and in particular about the global warming. They pointed out that in the 1960s and 1970s the concentrations of carbon emissions in the atmosphere had increased, but it was only in 1988 that the United Nations Environment Programme and World Meteorological Organisation established a specific agency, the Intergovernmental Panel on Climate Change (IPCC). The IPCC First Scientific Assessment Report, published in 1990, confirmed the progress of global warming and the role of human activities in it. In particular, it asserted "*the balance of evidence, from changes in global mean surface air temperature and from changes in geographical, seasonal and vertical patterns of atmospheric temperature, suggests a discernible human influence on global climate*", mainly due to "*a natural greenhouse effect [...]; emissions resulting from human activities are substantially increasing the atmospheric concentrations of the greenhouse gases: CO₂, methane, CFCs and nitrous oxide*" (Houghton, Jenkins, & Ephraums, 1990).

Global warming is strictly connected to the energy issue, as the Fourth IPCC Report has stated it. Almost 90% of the world's energy is supplied through the combustion of fossil fuels, and every time we burn these fuels we release carbon dioxide into the atmosphere. This is the principal component of the greenhouse gases (GHGs) that are responsible for warming the planet. Energy use and climate change are therefore two sides of the same coin. Energy-related greenhouse gas emissions are accounting for 80% of the total emissions, with the largest emitting sector being electricity and heat production, followed by transport. In 2005, the residential sector in Europe accounted for 26.6% (EEA, 2008) of the final energy consumption. It is one of the sectors with the highest potential for energy efficiency increase.

Since the 1990s international priorities have switched from the grey agenda, aimed at sustaining the economic growth based on industrial production, to the green agenda, which includes environmental issues and takes care of the use of resources and the effects of human activities. In particular, the issue of climate change was included in the commitment for a sustainable development, and an array of actions, at diverse levels – from the international to the regional and local ones – started to be promoted. To be quoted in particular are the UN Framework Convention on Climate Change (UNFCCC) agreed on in 1992 in Rio de Janeiro, the Kyoto Protocol Treaty, agreed on in 1997, the initiatives of the European Union aimed at the reduction of the contribution of the European continent to the global warming.

European actions regard different strategies are oriented at a sustainable development, an efficient use of resources, a smart and environment friendly growth. This is the perspective of the Sustainable Development Strategy, as well as of 'Europe 2020', the wider strategy for a smart, sustainable and inclusive economy, the support to the 'Roadmap 2050' (European Commission, 2010) of the European Climate Foundation, aimed at achieving a low-carbon economy in Europe, in particular keeping global warming below 2°C. This implies that "*the world will need to halve its emissions of carbon dioxide and other greenhouse gases by 2050 (compared with 1990 levels). Developed countries will need to reduce more – by 80-95% by 2050*".

As far as energy is regarded, a number of initiatives are being taken. The strategy 'Energy 2020' (European Commission, 2011a), affirms, "*Energy is the life blood of our society. The well-being of our people, industry and economy depends on safe, secure, sustainable and affordable energy. At the same time, energy related emissions account for almost 80% of*

the EU's total greenhouse gas emissions". It confirms therefore the targets '20-20-20' defined in 2007 by the European Council, aimed at reducing greenhouse gases by 20%, increasing renewable energy to 20% and making a 20% improvement in energy efficiency. The document stresses anyway the poor level of national documents and the lack of effective local strategies, both in energy production and distribution and in efficiency improvement programmes and actions. Another document, the Energy Efficiency Plan (European Commission, 2011b) affirms that "*Energy efficiency is at the heart of the EU's Europe 2020*" and supports the improvement of efficiency in the fields of buildings, industry and transport.

Other European initiatives regard research and regional development. A recent document (European Commission, 2011c) remembers the role of the regional level in the 'Europe 2020' perspective, also for improving the use of resources and reducing greenhouse gases emissions. It remembers, in particular, "*up to 75% of CO₂ emissions are generated in cities*". At the national level, a number of initiatives have been taken, reflecting diverse sensitivities and marked by diverse approaches. To be stressed is the link with spatial planning which is emerging in some experiences, in particular in the United Kingdom (ODPM, 2004).

Although a good share of the GHG gases and energy use is connected to the urban form, to the quality of the urbanized space and to private car mobility, the urban dimension is attracting much less attention than the that of the building. The role of spatial planning in mitigating the effects of emissions and adapting the current urban conditions is clear and internationally recognised. In developing an adaptation framework, the local level is often seen as the level at which effects of climate change will fundamentally manifest and which will ultimately need to respond appropriately (Adger, Arnell, & Tompkins, 2005; Smith, Burton, Klein, & Wandel, 2000). According to Biesbroek et al. (2009) and Campbell (2006) spatial planning can be the strategic framework where both mitigation and adaptation measures are positioned in the broader perspective of sustainable development.

Without a doubt, cities "*have emerged as key players in the governance of climate change*" (Bulkeley, 2006, p. 29). As such, understanding urban governance is a crucial aspect of understanding cities and their capacity to deal with urban energy issues because it is related to measures of quality of life, as well as the quality and spatial organization of urban places, distributive justice, environmental well-being, and economic vitality (Healey, 2007). In addition, the large cities of today have recently been facing the major challenge of massive urban complexes, which create further need for proper governance (P. Healey & Upton, 2010).

The inclusion of the energy considerations into the planning process in order to achieve a better sustainability of urban environment has grown the awareness that spatial and urban planning can be the strategic framework where both mitigation and adaptation measures are positioned in the broader perspective of sustainable development. The role of the urban environment in the environmental crisis – and at the same time in the well-being of people and communities - has received specific attention at the European level since the early 1990s, with the elaboration of the Green Paper on the Urban Environment, then the promotion of the Aalborg Charter (1994) and the Aalborg Charter +10 (2004).

Therefore, urban policies are critical and are crucial factors in bringing the governance of global environmental problems to urban contexts (Betsill & Bulkeley, 2007; Biermann & Pattberg, 2008; Bulkeley & Newell, 2010; Okereke, Bulkeley, & Schroeder, 2009). It has become apparent that local authorities in all countries have a critical role in energy efficiency and production questions and in mitigating and adapting to climate change (Satterthwaite, 2008).

In Great Britain the Stern Review (2006) assessed the economic effects of climate change, and highlighted the potential of spatial planning – at every level - in facilitating climate adaptation. Most recently, the 4th IPCC Report (2007) identified what adaptation measures can be used for settlements, in particular standards and regulations that integrate climate change concerns into design, land-use policies, building codes and insurance. It stressed also that spatial planning could play a role as a mediator between competing demands in the way land is managed and used. Other well-known initiatives are those promoted by ICLEI, association gathering cities and local governments involved in sustainable development actions. Climate change is one of the strands on which this institution is more active. A local level initiative, supported by the European Commission, is the Covenant of Mayors, which promotes the involvement of local authorities in fighting climate change, in particular actively working for meeting the 20% reduction of CO₂ through "increased energy efficiency and development of renewable energy sources". The key instrument is the elaboration of a Sustainable Energy Action Plan (SEAP) and the subsequent monitoring process of how it is applied and how the measures adopted really achieve the targets.

1.1.3 Urban energy issues, land use and management tools

Empirical and theoretical researches on the spatial requirements in pursuit of greater energy efficiency and locally energy production have been mainly focused on urban forms and in particular on factors as compactness, urban density and

mixed land-use. These three themes establish significant relationships between the hypothetical optimum land use, discussed in a number of empirical and theoretical studies, and the capacity of managing and achievement it through land management tools, seeking to influence energy consumption and production from renewable sources.

Firstly, the process to make cities more compact by providing building densities and urban compactness can, on the one hand, support district heating or combined heat and power systems and, on the other hand, conserve the open land and encourages the regeneration of rundown urban areas. This implies the containment of urban development and the consolidation of existing one through the redevelopment of land at higher densities, infill in back land and gardens, and extension to existing buildings. Secondly, there are strong evidences (Banister, Watson, & Wood, 1997; Ratti et al., 2005; Steemers, 2003) on the influence of urban form density on energy consumption mainly related to sunlight and daylight availability and the consequent betterment of solar gains and chance to use active solar mechanisms as solar and photovoltaic techniques. The shape and orientation of plots, the assignment of particular land use and the urban design can significantly contribute more than others to direct and indirect effects, such as energy consumption and urban microclimate. Mixed land use, finally, and the proximity of housing to all types of facilities and services, in addition to the improvement of urban quality, are considerable potentialities for fostering the reduction of car dependence. The dependence of travel, in particular average travel distance and frequency, from job concentration and mixed-land use is debated and variables. The high concentration of workplaces, shops and other facilities is usually positively associated with the limitation of number of trip and the use of alternative meanings, such as bicycle and foot.

The physical relationships between urban policy in pursuit of better energy efficiency and land use appear clear and widely recognised and debated. Less attention is given to the role of land use and land management tools in the implementation of such urban policies and in the capacity of making land and building available for intended (re)development projects. The mobilisation of existing property rights in land and building or/and the proper assignment of new property rights in land affect in a relevant way the realisation of public objectives. Property market plays a significant role in creating, altering and allocating the built environment and this can not be forgiven by the policy approach in this perspective.

A number of empirical studies about the influence of energy themes and factors in the process of price formation, the modalities of transaction of property and, as a result, the land and property value, has been carried out. The introduction of mandatory energy performance standards and certification systems for buildings has permitted certain properties to have higher appraisals, contemporarily with stagnation in the property market. In particular, the literature focuses on cases with energy or environmental labels, such as LEED in U.S. and others in European Union and discusses the premium, in terms of higher rent or/and higher market value, for energy efficiency buildings. These facts enable new policies to be designed for effective implementation and with realistic knowledge of the constraints. In theoretical terms, the mechanisms of urban and agricultural land value formation could be also influenced when a change in land use can be foresee as a consequence of needs for energy efficiency and on-site energy production from renewable resources and innovative energy distribution technologies.

1.2 Aim of the study

The aim of the study is two-fold. Firstly is to increase the knowledge about the role of existing urban policies in tackling cities' energy issues in order to reduce GHG emissions. The local scale, despite considerable variations in Europe, is the most appropriate political jurisdiction with institutional competencies for bringing about the necessary measures. At the same time, it shows the more promising downscaling experimentations of supranational policy strategies and objectives. The local planning responses all around Europe are quite different. Actions include the adoption of energy efficiency targets in building and services, the promotion of spatial and transport planning policies to reduce the need to travel, and planning policies for energy efficient developments and more renewable energy sources. However, the general trends, also in Italy, are to interpret urban energy questions in local planning measures as a sectorial field of action and this influences both the mode of urban governance and the related policy and planning tools. The analysis and evaluation of the 'performance' of energy planning responses with a focus on the planning process and on research objectives and strategies and tools for planning implementation. In particular, the research presents the Italian experience, taking as research subjects the municipal energy plan (the *Piano Energetico Comunale*) and a new plan implementation mechanism based on the assignment of extra land development rights (*bonus volumetrico* or *incentivo volumetrico* or *credito volumetrico*, depends on the regional legislations) in view of the inclusion of energy saving goals.

Secondly, the research intends to contribute to the discussion on the connections between cities' energy issues and land development process, namely the role of land mobilization tools in the achievement of public goals in view of greater energy efficiency and production. The study focuses on the relationships between energy efficiency, urban governance

and land management and tries to understand if energy-sensitive planning requires new methods based on public-private partnership and how the design of new practices, which replace the traditional command-and-control planning mechanism, can affect the energy planning success. In order to investigate this relationship the study considers the existing urban policy, that is the reward-based mechanism recently introduced in the Italian legislative scenario, the actions taken as results of that policy and an alternative approach: spatial planning through property rights in land. The on-going public action intends to carry out an energy building retrofit strategy by the assignment of additional land development rights. At first sight, this use of property rights in land as a policy tool appears to have a reduced efficiency and effectiveness. On the other hand, the deconstruction of the idea of rights in land led to the discussion on partial property rights in land development processes and the creation of markets and/or submarkets of them. Energy issues, property rights in land and planning and development can be, therefore, interrelated if the perspective is slightly changed. The study focuses mainly on one sector (housing sector) and one aspect (energy efficiency), although this is one of the key research aspects on climate change mitigation and adaptation strategies, and environmental sustainability of the urban environment. The decision to treat this particular aspect is aimed at providing a conceptual model that can be expanded and adapted in order to include other environmental issues related to this.

1.3 Research problem definition

The problem is formulated as follows:

- (a) What actions at the local level are being taken in response to energy efficiency matters in cities, and what are the main obstacles to achieving carbon savings, using the Italian municipal energy plan as example?
- (b) is stronger market intervention possible and necessary for improving energy efficiency in the existing urban areas in Italy, and how can this market stimulate policy approach contribute to the environmental relevance of local actions, using the reward-based mechanism as example?
- (c) considering the unsuccessful attempts in achieving the desired goals, how is possible manage existing lock-in situations by applying a property rights approach in terms of policy tool, and where and when the application of the rights system makes sense, using the renovation of existing building stock as example?

1.4 Research questions

The problem is supported by three primary research questions and six subsidiary questions, which will be addressed in 3 sections through 8 chapters:

- (a) What actions at the local level are being taken in response to energy efficiency matters in cities, and what are the main obstacles to achieving carbon savings, using the Italian municipal energy plan as example?
 - a.1 Would this planning approach be likely to produce an effective, efficient and integrated response strategy for reducing global greenhouse gas emissions in urban settlements (Part 2)?
 - a.2 What barriers lie behind the inertia regarding energy efficiency and low carbon supply of energy-sensitive urban planning process (Part 2)?
- (b), Does energy-sensitive planning require new methods based on public-private partnership and how can this market-stimulating approach contribute to the environmental relevance of local actions, using the reward-based mechanism as example?
 - b.1 Are stronger market interventions possible and necessary for improving energy efficiency and supporting energy generation from renewable sources in the existing urban areas in Italy (Part 3)?
 - b.2 How can the design of new practices, which replaces the traditional command-and-control planning mechanism, affect the effectiveness and the efficiency of the energy planning success (Part 3)?
- (c) Considering the unsuccessful attempts in achieving the desired goals, how is it possible to manage existing lock-in situations by applying a property rights approach in terms of policy tool, and where and when does the application of the rights system make sense, using the renovation of existing building stock as example?
 - c.1 What are the conditions under which the assignment of extra land development rights can delineate an efficient and effective market, besides political will (Chapter 9)?

c.2 What should be the mix between planning, regulation and market in saleable property rights and how and by whom the market should be structured and managed (Chapter 9)?

To answer the first question, current energy planning process, housing policies, regulations and fiscal instruments in four case studies in Italy will be analysed and evaluated in an 'as is' policy analysis (Part 2). The second research question will be addressed in the second empirical part of the thesis, which analyses and evaluates the recent introduction of a reward-based mechanism using land development property rights in the Italian legislation, in two case studies (Part 3). The third research question will be addressed in conclusion of the thesis, Part 4, in particular Chapter 9, in which the energy problem will be re-framed applying a property rights approach, in accordance with the need of renovation actions on existing housing stock.

1.5 Research Hypotheses

The main hypotheses addressed in this work are essentially about tensions, conflicts and interactions between emerging approaches about spatial (and energy) planning and the ways in which these are currently practised. The work expects that testing them by case studies would enable a greater knowledge of energy-sensitive planning dynamics and a conclusive exploration of the possible alternatives and improvements of current approach.

Hypothesis 1: Governance versus government in energy planning

The transition between a fordist to a post-fordist economy is entrenched to great social and cultural consequences and gigantic spatial transformations within the urban field (Fillion, 1996). The growing specialization of urban spaces, the fragmentation of urban tissues, the emergence of new and typical urban forms allows to consider the 1970s as the beginning of a period of general transformation of the urban forms, not yet concluded (Martinotti, 1993).

Such phenomena have been faced by the public sector with growing difficulties due to the fiscal stress connected with the de-industrialization processes. Neo-liberal trends and the crisis of planning models made concepts like the decline of nation states, the fragmentation of the decision-making processes, the prevalence of the multinational private sector decisive to explore contemporary policies (Shaktin, 2002). In this context, the models of local actions have changed and "*urban management cannot be understood these days in terms of 'top down' or 'command and control' models of governance*" (Patsi Healey, Cameron, Davoudi, Graham, & Madanipour, 1995, p. 18), also regarding energy, climate change and energy efficiency, as Bulkeley and Betsill (2005) pointed out.

Briefly, three readings follow from this. Firstly, decentralization processes and the changing nature of national state in an enlarged European Union have reshaped the relationships between national and local levels (Zanon, 2010), defining new models for public action and a number of new policies were developed (Seixas & Albet, 2010). The coexistence of a plurality of scales, actors and political arenas defines a "*multi-level game*" (Gualini, 2003), in which the local level is the scale that maintains a fundamental role to shape both urban economic and the quality of urban life, managing land property rights and regulating land regimes. Multilevel governance is currently recognised as a possible interpretation of the changing relationships between institutional levels and it is largely analysed also in terms of environmental and climate change governance (Betsill & Bulkeley, 2003; Bulkeley & Betsill, 2005).

Secondly, new forms of political interactions, considering both the growing effects of large international institutions on day-to-day people live and the ability of people to influence them (Beauregard, 2005). Gualini (2002, p. 33) argues "*the challenge for governing and managing action becomes that of co-production, of the pursuit of joint results from the activity and initiative of multiple social actors.*" Consensus building practices and the general shift from normative to strategic planning are deeply interconnected with such readings.

Thirdly, the increasing (but debated) consideration of the roles of state and market in planning is as a response to the need of more effective and fair local actions, in reflection of the changed relationships between public and private parties (Kearns & Paddison, 2000) and to the limitations in financial resources of public authorities. The involvement of private sector in the realisation of certain planning goals is strongly related to that trend characterized by a government that becomes a less active regulator, and instead becomes a facilitator of new developments that are preferably realized by the market (Spaans, Van der Veen, & Janssen-jansen, 2010; van der Veen, Spaans, & Janssen-Jansen, 2010). Novel instruments are introduced to manage the plan, in which the agreement takes the place of authoritative tools (Micelli, 2011a), in the perspective of consensual spatial planning (Urbani, 2000). In addition, despite growing windfall profits created by private development and urban metabolism, a limited growth of the public city and the consequent need to

invent new mechanisms of action capable of capturing the added value, redistribute yields and use them to ensure both the public and private investments (Camagni, 2011; Micelli, 2011a) is evident. On the one hand, some implementation devices, aware of urban economics principles, adopt an approach that seeks to realise certain planning goals by re-delineating and reassigning property rights (Coase, 1960; Webster & Wai-chung Lai, 2003), such as the transfer of development rights in U.S. (Kaplowitz, Machemer, & Pruetz, 2008; Pruetz, 2004) and the equalisation, compensation and density bonus in Italy (Micelli, 2002, 2011b; Pompei, 1998), only to mention few examples. On the other hand, with the intention to regulate and organise the administrative and private action and the fair distribution of added value, the financing of public actions is pursued by public-private agreements (Codecasa & Ponzini, 2011).

Within this context, the work expects that the conflicts and interactions between different contemporary perspectives would differently affect the response of public authorities to energy efficiency needs, influencing, on the one hand, the way in which local public actors structure the process and, on the other hand, the way in which the leading local role is exercised through the shape of local planning instruments.

Hypothesis 2: Rhetoric versus reality in energy planning

City rating systems such as Green City Initiatives and Smart Cities show examples of relevant local governments with a long tradition in the fields of environmental policy and sustainability and the achievement of real goals in the abatement of greenhouse gas emissions and energy efficiency. The scores of cities in Scandinavia, in general very close to the top positions, show that the achievement of public objectives requires efficient and effective urban strategies, following a long process of learning, thus overcoming the limitations and barriers to local governments' implementation of actions (Betsill & Bulkeley, 2006; Bulkeley, 2009; Wilson & Piper, 2010). The city of Stockholm has a long and unbroken tradition of ambitious environmental efforts since the mid 1990s. In recent decades, the city has addressed a number of objectives in the reduction of the climate impact. Similarly, Copenhagen has addressed environmental issues and sustainability since at least 1970s.

Despite these exceptions, scholars increasingly recognize that the strength of adopted plans is not necessarily correlated with the implementation of their contents, and that research is needed to understand the degree to which policies are being implemented after plans are adopted. The progressive weakening of planning responses to environmental concerns clearly emerges either from the main disciplinary traditions and the data analysis.

Despite regional and local governments across the world have elaborated a wide variety of actions and plans to address sustainable development, climate change or energy concerns, the translation of environmental awareness into development and implementation of these often goals is far from straightforward (Bulkeley & Betsill, 2005). They recognise (2005, p. 56) an “ [...] *apparent gap between the growing rhetoric of the importance of sustainable cities on the one hand and the reality of urban development planning and transport on the other*”.

Within the dominant rhetoric context of energy efficiency, sustainable and climate change urban policies, the research hypothesises that the increased awareness of environmental issues and the shift in demand for energy efficient sectors would boost novel voluntary forms of local responsibility, influencing the way in which authorities tackle, the issues of the growing energy consumption and greenhouse gas emissions.

Hypothesis 3: Role of local spatial planning and land-use management strategies in achieving energy efficiency goals

The achievement of a low carbon society depends not only on the energy performance and sustainability of the new and existing building stock but also, to a significant extent, on the energy performance and sustainability of the urban organisation and infrastructure. Furthermore, scholars agree that energy demand and supply is closely related to land use and that the realisation of this planning goal should take into account the consolidated approach to land and building value formation, property market and thus, strategies and tools for property mobilization. In this concern, the Italian mix of regulation and financial instruments has been recently changed by the introduction of a market-based policy tool in view of greater energy efficiency and production from renewable resources.

Whereas much of the progress identified in recent years in the construction sector towards more sustainable practices and products was a response to EU policies, the same cannot be said for the definition of consistent and specific regulatory framework in the majority of the European national planning systems about energy-sensitive urban planning. The urban scale is attracting much less attention from decision-makers, politicians, officials and practitioners, in comparison with the building scale. The relations between urban energy planning and spatial planning and the role and potential of land-use management and tools for the achievement of low carbon society are still underestimated. The most appropriate

political jurisdiction and institutional competencies lay at the local scale that, at the same time, shows the more promising downscaling experimentations of supranational policy strategies and objectives.

Considering the Italian 'urbanism tradition' centred on urban design, the conflicting influences between different institutional levels about energy matters and the lack of knowledge concerning environmental issues and its implications for urban environment, the work expects that no substantial changes have occurred in the way in which environmental issues have been addressed in the last two decades, and this would influence the results. Then, the introduction of pro-market instruments, such as financial and economic support for upgrading residential buildings and technical equipment, giving rise to new markets and a constellation of sub-market, would influence a distorted perception of local administration about its own role. Public authorities should bear in mind that they always affect private decisions by exerting an influence in shaping the rules of market and how it is accessed. And lastly, the work expects that the recent introduction in the local tool-chest differently shaping the assignment of additional land development property rights in view of greater energy efficiency and energy production from renewable sources would influence a novel approach to the energy planning process and the way in which the strategies are implemented.

These hypotheses will be tested by applying two research methods to two case studies, the municipal energy plan (Part 2) and the reward-based mechanism (Part 3). Each of these cases is considered in order to understand how to improve energy planning process and energy planning instruments and tools.

1.6 The research approach

Although only Italian case studies have been chosen, the work is intended to be of interest to an international audience. The relations between urban energy planning and spatial planning and the role and potential of land-use management and tools for the achievement of low carbon society are still underestimated. By exploring the Italian trend the research intends to develop an interdisciplinary approach able to overcome the traditional sectorial interpretation, fostering the comparison and contamination with other field of research and practice. Energy policy and planning area is considered less as a new environmental policy and more a new urban policy.

In the Part 2 the 'traditional' interpretations of energy planning will be discussed together with less conventional perspectives, in order to suggest a novel theoretical framework to explore the results of energy planning instruments at disposal. On the one hand, in the reading of studies since the early 1970s, planning theory, political science, environmental and public economics have dealt fragmentarily and separately with the reasons behind the implementation gap in planning process, not considering the idea accumulated in the study of other policy fields an institutional arrangements. On the other hand, a new phase of the urban debate has recognised as determinant components, the questions about the efficiency of the planning action in the policy process. In particular contributions come from public policy analysis and planning theory, and by the public economy discipline. In this regard, the policy approach (among others in the Italian context: Balducci, 1991; Bolocan Goldstein et al., 1996) has challenged the comprehensive planning model, prompting questions on the efficiency of the entire planning process. As far as contributions by economists are concerned, they focus on the relationships between public interventions and the relationships between market and state, considering in particular the externalities that occur when the market fails to attain Pareto efficiency. On the economic side, land-use plans, standards and norms are tools by which the government and communities deal with the problem of externalities, and they are good examples of command-and-control regulations used by the public authority to intervene in the market. To be stressed is the poor efficiency of authoritative urban planning implementation tools (Micelli, 2002) intended to correct the negative externalities that involve the city. This rich theoretical framework permits to define some units of analysis, categories of limits of implementation recurring in the interdisciplinary debate, that are the basis for the definition of evaluation strategy.

Part 3 connects the recent Italian experience in energy implementation with the topic of property rights and land development rights devices, framing them within the topic of urban development policies. The Italian 'urbanism tradition' is centred on urban design, and local plans provide for the preliminary assignment of land-use rights to be respected by a subsequent conformance control when development permits are requested. In recent decades, policymaking and urban planning have witnessed a significant proliferation of policy tools shifting the mainstream institutional paradigm from government to governance (Seixas & Albet, 2010). New consensual methods based on public-private partnerships are being progressively adopted in place of the traditional authoritative mechanisms (Spaans, Janssen-Jansen, & Van der Veen, 2011). As a result, in combination with the push for reform of the national and regional planning legislations, several mechanisms have been trialled "*with contracts among different institutional tiers or between public and private actors, with grants, special purpose vehicles, marketable building rights or potentials, mixed*

agencies” (Ponzini, 2011). This Part 3, in particular the chapter 6, scans the international debate and the Italian experiences on innovative devices based on a different approach to the relation state-market, in terms of re-delineating and reassigning land development rights, with particular attention to the planning and legal systems in which they have been developed (in particular, legal systems originating in Roman law, presents in the continental Europe, and the main variants of Anglo-Saxon law, in particular North-American law where TDR is conceptualized). In the analysis and evaluation of Italian novelty this is combined with the considerations on energy and urban organisations and on the spatial requirement to maximize energy saving and on-site and distributed energy production.

Part 4 intends to present the results of the interdisciplinary analysis and evaluation of the relationships between urban energy planning and spatial planning and the role and potential of land-use management tools for the achievement of low carbon society, following the research approach of the work. Furthermore, Part 4, namely sections 9.5, 9.6 and 9.7, discusses the limitations of the current policy and planning arrangement from an alternative perspective: the spatial planning through property rights, considering property rights in land as a policy tool. Considering the neo institutional economics and the property rights theory in the understanding of the built environment, the study emphasises the innovative capacity of this approach of achieving public objectives in a close collaboration between public entities and private actors.

1.7 Research methods and techniques

After the development of the theoretical framework in order to frame the research topic and to establish the research objectives, the choice of the most appropriate research methodologies is a fundamental stage.

The empirical and contemporary aspects that characterise this work have led to the selection of the case study methodology as the main research strategy for collecting empirical evidences. Accordingly with Yin (1994, p. 13), the choice of the case study methods is justified by the nature of the research questions. Yin asserts “[I]n general, case studies are the preferred strategy when “how” and “why” questions are being posed, when the investigators has little control over events, and when the focus is on a contemporary phenomenon”. “How” and “Why” intend to explain, reflect the investigation on links between events. Investigating if the policy, plan, programme had worked (or not) are undoubtedly “why” and “how” questions.

The empirical analysis, in Part 2 and in Part 3, uses multiple sources of evidence: documentations, in particularly legally binding documents and reports available on-line, targeted interviews, focused directly on case study topic using semi-structured and open-ended interview models. The use of different sources permits to arrive at the convergence of evidences (Tellis, 1997a, 1997b) thanks to the provisions of multiple measures of the same phenomenon. This is what is called data triangulation by Yin (1994) and it is the techniques to generalise the findings to a wider and external context and in a theoretical way. The development of a rich theoretical framework, by the review of relevant literature, becomes the vehicle to do it and to state the conditions under which a particular phenomenon is likely to be found.

Both Part 2 and Part 3 contain more than one case study. The study has been used a multi-case design, 4 cases for Part 2 and 2 cases for Part 3, carefully selected so that each analysis accordingly with the replication logic presented by Yin (1994) either a) predicts similar results or b) predicts contrasting results but for predictable reasons. The choice of the case has followed both the specific purpose within the overall scope of inquiry and the necessity to design a methodology that can be conducted with other and different cases.

Using multiple sources of evidence and having developed a rich theoretical framework, the analysis of case study evidences, on the one hand, is approached by data triangulation (Yin, 1994), on the other hand, follows the theoretical propositions that led to the case study analysis. The objectives and design of the case study analysis are based on such propositions (different for Part 2 and Part 3), which in turn reflect a set of research questions, reviews of literature and new hypothesis. These propositions have shaped the data collection and, therefore, have given priorities to the particular choice of research techniques and the formulation of interview model.

Yin (1994, p.111-115) proposes three approaches to data elaboration:

- (1) *“relying on theoretical propositions”*: focuses attention on the data that allow an assessment of the theoretical propositions of the research;
- (2) *“thinking about rival explanations”*: variation of the first strategy in which the centre of attention are the information needed to formulate new explanatory hypotheses;
- (3) *“developing a case description”*: case study of the structure is designed in a descriptive way, around the main issues are left to emerge as useful or otherwise related to a generalized understanding of the phenomena.

The proposed methodology addresses a largely new issue in the planning discipline and it wants to be seen as a first approach that could be the basis for further reflections and refinements. For these reasons it was decided to use a

methodology that includes more strategies, with the aim of testing the validity of the parts of the research in producing or not the expected results: to provide sufficient evidences to the theoretical construction and the need rethinking of the discipline that seeks to promote.

Part 2 analyses and evaluate the municipal energy plan in the Italian context using four case studies: Bologna, Modena, Trento and Venice, in order to catch the wider variety of interpretations across Italy, highlighting strong and weak points of local authorities actions, and fostering a critical discussion on planning responses to energy questions and their relationships with the evolution and improvement of urban government. The evaluation proceeded making use of two sources of evidence. The first one, based on legally binding documents and reports, explores the instruments focusing on three different categories:

- MEPs carried out following the Protocol of Enea;
- MEPs carried out following the Protocol of Ambiente Italia;
- MEPs with some innovative characteristics;

in which, all the 4 MEPs in Italy can be recognized.

Secondly, the exploration of the Municipal Energy Plan Italian experience has made use of semi-structured interview with local planners, (a series of pre-determined questions were used), to corroborate the evidences resulting from first level of evaluation and the prepositions by the literature review. Interviews are meant to allow deepening of the study and to enable an understanding of the main elements and causes that affect local energy plan results.

The cases have been selected considering the cities in which a municipal energy plan has been developed within the Italian provincial capitals, matching one or more of the above-mentioned categories. In addition, it was determinant the actual presence of combinations/mixes between policy, plans and programmes dealing with the planning and management of urban sustainability, climate change and energy efficiency and production. This in order to maximize what can be learned (Tellis, 1997).

Within this context, Bologna and Modena were selected a-priori because of the presence of some specific and innovative characteristics, whereas Trento and Venice were chosen for the peculiar geographical, legislative, financial context and for the similar approaches following national protocols.

According to the replication logic, the same elements are analysed for all the four case studies: efficiency, effectiveness and integration. The phase of analysing case study evidences follows the theoretical units of analyses highlighted in the literature review. After having compared and discussed the empirical evidences between the case studies, these were generalised.

This part is of great importance in the logic of the whole research since it is meant to investigate on “how” and “why” the results of local planning responses to energy concerns are not in line with the expectations. How the plan does work (or does not) and why efficiency, effectiveness and integration criteria raise fundamental inputs for further discussions.

Part 3 analyses and discusses the use of innovative local implementation tools based on land development rights for the achievement of energy efficiency goals, recently introduced in the Italian legislation system (2009 and 2011). The regional translations of national law are generally completed, but few and standardised regulations are available at the moment at the municipal level. The analysis involved documentary research at the national and regional level, as well as the study of national and regional legislations, and their first applications at the municipal level. In this particular context, Trento and Bolzano-Bozen, with their peculiar legislative system (the Province of Trento and Bolzano-Bozen are autonomous and have exclusive legislative power in energy and planning areas) and their policy experience in energy (and sustainability) area within a number of pioneering projects and initiatives, have been selected as case studies.

The sources of evidence are documents and reports and open-ended interviews with officers and city managers at the provincial and municipal levels. Concerning documentary analysis, the investigation concerned firstly the provincial legal basis and then the Building Codes of the municipalities of Trento and Bolzano-Bozen, in addition to reports of Provincial Agencies (Agenzia CasaClima – KlimaHouse Agentur) or Local Research Institutes (Eurac), as in the case of Bolzano-Bozen. It has to be considered that no information and data on actual implementation of these novel devices are systematically collected by the public administration, in addition to the legal provisions. Consequently, a series of open-ended interviews at regular intervals with local experts, planners, officers and city managers can permit to consider its evolution. One of the objectives of interviews is also to collect the opinions of the respondents on the new measures introduced at the provincial and local systems as compared with the old system of energy policy tools and to explore the first applications and requests for near future in municipal areas. Adopting replication logic, Trento and Bolzano-Bozen will be analysed under some successful elements highlighted in the national and international literature on experimentations of land development rights. Similarly to the strategy adopted in Part 2, the Part 3 will compare and will discuss the empirical evidences between case studies and will generalise these in themes.

In conclusion, Part 4 offers a critical analysis of the work done and the conclusions of the research. The analysis of data collected in the light of theoretical frameworks and the drafting of the conclusions will be the subject of this Part. It is

useful to refer to the theory of case study analysis. In accordance with the approaches proposed by Yin (1994, p.111-115) for data elaboration ("*relying on theoretical propositions*", "*thinking about rival explanations*", "*developing a case description*") the proposed methodology includes more strategies, with the aim of testing the validity of the parts of the research in producing or failing to produce the expected results since the work addresses a largely new issue in the planning discipline and it wants to be seen as a first approach that could be the basis for further reflections and refinements. Accordingly, in the previous Part 2 and Part 3, the results and the evidences of case study analysis (in particular in the chapters 5 and 8) are presented. In Part 4 the intention is to combine the analysis and the evaluation of the two 'steps', the municipal energy plan as example of energy planning instrument at the local level and the reward-based mechanism as innovative land-management tools in pursuit of energy saving. In addition, to conclude, an alternative approach to the same issues will be presented.

1.8 Organisation of the thesis

Part 1 starts with a reconstruction of the connections between energy and urban organisation and the implications for urban planning and policy in the current context, and this is followed in Part 2 and Part 3 by an analysis of the urban practices dealing with energy efficiency and production, both in the planning process (Part 2) and in the land-management tools (Part 3), with reference with the relevant, and interdisciplinary, literature. Part 4

The main intention of the work is to discuss why and how energy issues must be strongly interrelated with urban policy area by tracing relationships between energy, spatial planning and land use tools. If the first connection is the subject of a growing body of literature, the role of planning system in the strategic coordination of markets and potential in land-use planning is still underestimated. As Owens (1992a) points out, "*planning influence land-use patterns and therefore some aspects of energy demand [and production] in the longer term*". The analysis of land management strategies and tools in operationalizing planning themes become key elements to properly investigate how rhetoric commitments are translated into real changes.

In the two Parts, emphasis is placed on the potentiality of these sectorial practices to be included into a more general framework of urban governance, encouraging the development of parallelisms with more debated research streams and urban experiences. The practices to deal with energy efficiency and production are here presented and discussed in detail in Part 2 (municipal energy plan instrument) and in Part 3 (land development rights bonuses with energy aims) so as to understand their functioning, the use of local public authorities make of them and their role in the current context.

Part 4, in conclusion, offers a critical analysis of the work done and the conclusions of the research. In addition, this Part discusses possible futures based on property rights as a policy tool.

Part 1 deals with the theoretical concepts. This sets the basis of the research by introducing as key-concepts the interactions between the spatial organisation of society and energy demand and production, and the implications and constraints of energy concerns for policy and planning. The interactions are described in their different parts, dwelling on their efficiency and production in the light of the current trends in energy/urban planning literature. The implications and constraints are then defined by specifying their peculiarities, the approaches proposed for attaining them, and the main shortcomings encountered also in current practice. This allows to place energy planning and policy in the broad context of urban policy area.

Part 1 consists of one chapter. Chapter 1 gradually zooms into the field of energy demand and production and frames the research topic that is tackled by this work. Subsequently, a literature review is performed that scans through both the scientific publications and the planning practice. It results in the assumption that, in relation to energy efficiency, building-level interventions are not sufficient and should be extended by area-level interventions and related spatial planning policies. The results of the review are commented and are the basis for the formulation of planning and policy themes and the research objectives.

Part 2 presents the analysis and the evaluation of the energy planning instrument currently in force in Italy, the municipal energy plan (MEP), within its specific contexts. Part 2 aims to investigate the capacity of public administration to deal with energy concerns and achieve results using the instrument at disposal and it seeks to understand the factors upon which the successful (or not) outcomes seem to depend on. The role of this part is of great importance in the logic of the present work. In fact, Part 2 is intended to analyse and evaluate the whole (energy) planning process highlighting the weak and strength points affecting the implementation phase.

Part 2 is developed in three chapters that reflect the logic sequence: theoretical framework, methodology and applications, results and discussion. Owing to that sequence, each chapter takes the move from the findings of the previous one. Chapter 3 critically presents and discusses the general tendencies in interpreting urban energy questions in local planning measures, showing how no substantial changes have occurred in the last two decades, as well as no

changes in the theoretical framework have been proposed. As a result, considering energy less a sectorial field of action and more an urban and planning policy, Chapter 3 proposes a new theoretical framework comparing the 'traditional' interpretations of energy planning with less conventional perspectives, to explore the results of energy planning instruments. The evaluation strategy moves from the adoption of categories of implementation limits, more recurring in the interdisciplinary debate, to the design of related evaluation criteria: efficiency, effectiveness and integration. Chapter 4 provides a description of the case study selected to test the evaluation strategy and the methodology for the analysis. The application is the municipal energy plan in Italy and the case studies are four cities: Bologna, Modena, Trento and Venice. The chapter describes the characteristics of the different cities and contexts, as well as the main features of the MEPs to be analysed in this Part.

The choice of these case studies reflects different local systems and contexts in which diverse objectives are attached to various plans and the peculiar Italian approach to such an instrument. Hence, the design of MEPs has been largely supported by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) and Ambiente Italia Research Institute with two methodologies (Protocols) that have generally standardised the MEP across the peninsula. The four cases are analysed through documents and interviews with officers and local planners. Chapter 5 presents the results of the analysis by comparing the case studies and discusses certain critical issues emerging from the Italian cases, including the environmental relevance of measures, the increasing process of standardization, the redefinition of the role of the local authorities, and the relationships between public institutional projects and the influence of civil society in participating to decision-making and implementation process. Finally, the conclusions highlight how the multiplicity of disciplinary approaches taken to understanding the performance of energy planning instruments permits to identify emerging questions.

Part 3 discusses the use of novel land-management tools, and the prospect of replacing public-led interventions with market tools in view of the inclusion of energy savings and climate change in plan implementation procedures in the Italian context. The recent introduction in the Italian national legislation of an implementation practice based on the assignment of extra land development rights, and the translation into regional systems and the first experimentations at local level allow to discuss about the shift from urbanism tradition to governance approaches and to test the application of an reward-based mechanism as non-financial implementation tools for energy planning goals. The part 3, after the development of a rich theoretical framework, presents the Italian (short) local experience in this respect using two case studies: Trento and Bolzano-Bozen. As in the previous Parts, the municipal level is preferred for their strong centres of local autonomy that retain jurisdiction over land-use plan and land-use regulation and potentially have a key role to govern energy as an urban issue.

Similarly to Part 2, Part 3 is developed in the three following chapters that reflect the logic sequence: theoretical framework, methodology and applications, results and discussion. Chapter 6 correlates the theme of energy saving and production in urban areas with land management strategies and property mobilization tools, placing it within the wider topic of urban development policies. After having traced the connections between land and building value formation, property market and the need for energy efficiency and on-site energy production and innovative distribution technologies, the chapter discusses how the transformations in (other) urban themes have implicated (and implicate) innovation in land management tools. The innovations in tools and modes of land management are presented firstly in the international debate, focusing on devices based on a different approach to the relation, state-market and public-private (in particular tools using land development rights), and then in the Italian experience (the perequazione and compensazione). Studies carried out about International and national experimentations permit to identify the most recurrent elements of successful results that are the propositions on which analyse the chosen application and related case studies. Chapter 7 presents the recent introduction into the Italian national legislative framework of additional development rights allowing private properties to be extended so as to re-start the economy and promote energy efficiency. Although the majority of Italian regional laws already recognised additional land development rights or 'density bonuses' in order to support private interventions of an urban and environmental kind, the introduction in local regulation is still in progress. It is clear that the topic is very current. In this particular context, Chapter 7 presents the case studies of the municipalities of Trento and Bolzano-Bozen, with their peculiar legislative system (the Province of Trento and Bolzano-Bozen are autonomous and have exclusive legislative power in energy and planning areas) and their policy experience in energy (and sustainability) area within a number of pioneering projects and initiatives.

Chapter 8 discusses the results of two Italian local cases, comparing them and generalize the findings for the national context. Some considerations emerge. Firstly, the allocation criteria generally does not consider spatial requirements under energy concerns (urban density, urban compactness and presence of on-site renewable sources of energy) and the assignment of land development rights as incentive does not take into account the building's age and obsolescence. Then, legislative and economic aspects, as well as the capacity of leadership of planning authorities, the consistency and stability of mechanism and the internal and external coherence are discussed.

Concluding, Part 4 presents and discusses the results by answering the research questions and testing the research hypothesis. To answer the first question, current energy planning process, housing policies, regulations and fiscal instruments in four case studies in Italy were analysed and evaluated in an 'as is' policy analysis (Part 2: Chapters 3, 4 and 5). The second research question was addressed in the second empirical part of the thesis, which analysed and evaluated the recent introduction of a reward-based mechanism using land development property rights in the Italian legislation, in two case studies (Part 3: Chapters 6, 7 and 8). The third research question will be addressed in conclusion of the thesis, Part 4, in particular Chapter 9 (Paragraphs 9.5, 9.6 and 9.7), in which the energy problem will be re-frame applying a planning approach through property rights, in accordance with the necessity of renovation actions on existing housing stock.

PART 1: ENERGY AND SPATIAL STRUCTURE. THEMES FOR URBAN PLANNING AND POLICY

CHAPTER 2: Energy and the city

2.1 Introduction

This chapter aims at introducing the topic of the research, by focusing on the key concepts of the interaction between urban dimension and energy demand of buildings and energy supply from renewable energy sources. In particular, it will be clarified what physical factors of cities are greatly associated with building energy needs in the literature, what physical variables influence the efficiency of low carbon technologies, and finally, what spatial requirements and what themes for urban planning and policy can enhance the use of energy from cities. The chapter is structured as follows. Section 2.2 deals with the challenges and the opportunity of energy issues in cities. It describes the questions to be considered, the institutional levels involved, the first experimentations, their effectiveness and efficiency. Section 2.3 tackles the concept of spatial dimension of energy consumption and demand by providing an overview of the issue and by reviewing the approaches proposed in the literature, as well as their main shortcomings. In Section 2.4, the relationships between effectiveness of energy supply and the role played by the physical organisation of cities is described. The section also summarises the main findings of academic literature in this perspective. Section 2.5 presents the results of the literature review by discussing three main debated themes concerning the urban form: compactness, density and mixed land-use.

2.2 Energy in cities: challenge and opportunity

It is estimated that currently more than half of the world's population is living in cities, and urbanization is expected to continue worldwide for the coming years (OECD, 2010). Within the EU, high levels of population density and urbanization are common characteristics in most countries, where over 70% of the population lives in cities. This trend is expected to continue reaching 80% by 2030, though the EU's population will not increase in the following decades (IEA, 2008). European cities are usually compact, despite with different features. The urban form of these cities is strongly conditioned by their history, which in terms of form positively influences their energy demand in comparison with American towns. Major events such as the First and Second World War strongly impacted on the current tissues of cities. Many were devastated and a large share of the building stock was destroyed. This prompted to the construction of entirely new city blocks and the complete renovation of large urban areas during the 50s and 60s. Many of these buildings and open spaces were not significantly modified until today. Thus, a large share of the built environment in Europe is about 50 years old (about the middle of its lifetime), presenting poor thermal conditions, as energy was extremely cheap in that era. During these two decades, there was also a boom of social housing, both in the Western and Eastern Europe, often without proper urban planning and with very low thermal performances. As a result, cities represent concentrations of economic and social activity that produce emissions of greenhouse gases, in particular carbon dioxide. Given that *“by some estimates, cities account for 78% of carbon emissions from human activities”* (Stern, 2006, p. 457), commentators and urban policy-makers have highlighted the potentially significant role that cities might play in addressing the climate change/energy efficiency challenge.

Cities expanding in size and population pose crucial challenges to the environment, of which energy is part as a natural resource, and to the quality of life. Urbanization is closely linked to concentration of economic activities and production (OECD, 2010). The fact that cities gather a large share of the population makes them responsible for also a large part of the CO₂ emissions and therefore makes cities crucial elements to achieving the EU energy policy targets. Final energy consumption in the EU-27 recorded slight annual deviations between 1999 and 2009 (Eurostat, 2012). The largest growths were observed in services sector (14%) and transport (8%), whereas energy consumption by households showed a moderate increase (2%) and energy consumption by the industrial sector declined by 15%. In 2009, the transport sector consumed almost a third (33%) of EU-27 final energy, an increase of 2 percentage points since 1999. In contrast, the share of the industrial sector decreased from 29% in 1999 to 24% in 2009. In 2009, energy consumption by households and services accounted for 27% and 13% of the total respectively. Between 1999 and 2009, EU-27 final energy consumption in households presented slight annual changes. In 2009, natural gas consumption covered 39% of the total energy needs of households, an increase of 4 percentage points since 1999. The share of electrical energy also grew from 21% in 1999 to 24% in 2009; while the share of oil products was 15% in 2009, a decrease of 6 percentage points compared to 1999. Atmospheric carbon dioxide concentrations are now at their highest level for million years, and global temperatures have increased by about 0,6 C in the last 150 years. However, by reducing emissions this only addresses a part of the matter. Even if the global emissions are reduced to zero over the next decade (not a realistic scenario, in any

case) the impact on towns, cities and urban systems will remain for decades: higher temperatures, increased flooding and/or droughts, more extreme weather events, and a limitation on resources.

In Europe, where 80% of the population already lives in cities and where up of the 80% of the energy is consumed, it is clear that the community level is ideally suited to both climate change mitigation and adaptation. This is also the level where the impact of climate change is most visible and where energy implications of spatial organisation of the society are linked to economic and financial aspects as well as every sector of our life and affect International and European political decisions. As a result, cities are the place where most energy services are needed and are therefore ultimately responsible for the use of energy resources. Buildings (including residential and services) and transportation generally represent most of cities' direct energy demand, i.e., between 60% and 80% of the overall consumption. The amount of energy demanded from both sectors is strongly linked to characteristics, such as the climatic conditions, the urban density and morphology, the practices of the building construction, the main economic activities and cultural habits, which are peculiar to each city.

In an increasingly urbanizing world with emissions producing activities concentrated in cities, the question whether the local level might intervene in order to reduce its impact remains a significant one. The effects of natural hazards, including climate change will fundamentally manifest at the local level and these will ultimately need to respond appropriately (Adger et al., 2005; Smith et al., 2000). Considering the link between the rising levels of greenhouse gases, the climate change and the human-related sources and sinks of carbon dioxide, it is clear that actions must be taken including the adoption of energy efficiency of buildings and services, the promotion of spatial and transport planning policies to reduce the need to travel, and planning policies for energy-efficient development and more renewable energy sources (Agyeman, Evans, & Kates, 1998). Cities are, therefore, in addition to an energy consumer, an energy actor. It is an opportunity to enhance the local approach to the interventions for the main energy-consuming sector and to the building capacity. There are governance issues that prompt the city level as an appropriate one for action. Local authorities have responsibilities regarding land-use planning and management of resources that interfere with the main activities in a city, its urban form and the use of resources. It influences directly the needs for transportation and establishes a pre-condition for the potential of energy efficiency of buildings. Therefore, since city authorities directly affect the sectors responsible for the largest share of energy use (buildings and transportation), their responsibilities must also include the management of the energy demand. Energy issues in relation to climate change ones are increasingly becoming a concern in spatial planning. Bulkeley (2006) seconds this by stating *“that there is a growing sense that spatial planning not only has an important role in addressing the causes and impacts of climate change, but that it is increasingly required to do so”*. Spatial planning deals with e.g. land use, transport, water and housing, all issues which are linked to climate change mitigation and adaptation. For example Bulkeley (2006) states that *“most of UK emissions fall within the domestic and transport sectors, over which, to date, little action has been taken and within which spatial planning has a key role to play. Likewise, the predicted impacts of climate change—of storms, flood events, sea level rise, and changes in biodiversity—are issues about which spatial planning decisions can effect vulnerability and resilience to change.”* The possibility of coordinating urban planning with the energy management should be seen as an opportunity to link the needs of energy services and the supply possibilities through a customized approach considering the optimized use of natural gas, as the cleaner transitional fossil fuel, in co- or tri- generation based urban networks and, also, the locally available renewable resources, namely, from the sun and biomass.

Moreover, city authorities are themselves energy users, through buildings and municipal fleet ownership, public lighting, street lights, etc. This constitutes an opportunity for environmental responsible public procurement leading by example. Additionally, cities are the administrative level closest to people. This allows for a better understanding of the social and cultural dynamics, favouring the adaptation of the city and its energy services to the population needs.

Nevertheless, it is important to consider that city authorities have to act within the boundaries of policies defined at higher levels. The concentration of people and economic activities as well as the high level densities that characterize urban areas constitute an opportunity to the innovative forms of organization of energy supply and demand. Thus, cities can also work as a test market for certain innovative technologies and/or policy actions (Kern & Alber, 2008). Cities have the competences and authority needed for the implementation of demonstration projects in order to test the social response to certain technologies, such as electric vehicles and smart metering. Besides their key role through the efficient management of energy demand, cities can also act to promote the use of locally available renewable energy resources (RES), even if the issue of on-site renewable energy sources is not specific for urban areas.

For instance, in 2010, renewable energy for heating and cooling in the EU-27 accounted for 14.3% of total energy used for heating and cooling (Eurostat, 2012) with a significant increase from 9.6% in 2004. Increases in industrial sectors as well as in services and residential use (the buildings sector) contributed to this growth. Solar panels for domestic hot water production, namely, substitute the supply of electricity or gas (supply energy) while reflecting the expression of a decision from the demand side. Today there is a vast set of renewable technologies, some clearly suitable for urban areas,

such as solar thermal for hot water, and others that benefit being installed outside cities' boundaries, such as large-scale solar PV and thermoelectric or wind farms for electricity generation. The suitability of these technologies also depends on the resources available locally or within the city hinterland.

2.3 Energy and urban organisation: tracing connections

Although the analytical models generally adopted and the interventions usually performed tend to consider buildings as “*self-defined entities*” (Ratti et al., 2005), the energy problem is multi-dimensional and should be extended by area-level interventions and related spatial planning policies. What emerges by a growing body of literature is that urban morphology counts, together with the features of land-use in affecting the performances of buildings and need of travel. Central to these debates have been the implications for energy use within urban areas, and the consequent scope for reducing emissions of greenhouse gases, given the debate around the dependence of energy demand on the form of urban development, its location and density and its design (Banister et al., 1997; Owens, 1984, 1992a, 1992b). Studies since the 1970s have investigated, by using empirical surveys, theoretical researches and computational models, the relationships between energy and urban patterns. Several authors have hypothesized that alternative aspects of urban patterns could have differential effects on energy demand. It is clear that, in the absence of a comprehensive theoretical framework on the interactions, cumulative and synergistic effects between the impacts of these different urban aspects, it is not possible to generalise individual results to make convincing conclusions. The influences of the urban form on energy demand and the feasibility of alternative systems of energy supply and distribution are still understudied and controversial, although such relationships have been devised since long (Alberti, 1999). Thus, how to achieve the targets of reducing CO₂ emissions is still debated and literature provides little evidence to support or detract one or another position.

Actually, the energy demand of buildings is dominated by space heating, and it is influenced by construction materials and occupants' behaviour in the use of energy systems and by the effects of urban heat island on the need of space heating and cooling consequent to the winter urban warmth and the summer heat stress (Oke, 1988a), accounting, accordingly with Baker and Steemers (2000), for a 80% variation in energy consumption. If the cumulative effect of all factors can lead to a total variance of 10-fold, Ratti et al. (2005) wonders if urban geometry is the factor missing. On the other hand, two mechanisms of thermal transmission, passive solar gains and heat infiltration are connected with spatial determinants of urban areas, and they interact with the building's design, construction materials and systems, and the occupants' behaviour. Heat infiltration, in particular, in comparison with passive solar gains, thanks to the mandatory energy performance standards on building envelope, can slightly be affected by physical characteristics of urban areas.

Providing further reflections, urban form affects the energy demand of building and transport sectors and influences the chance to perform energy from renewable resources on site, such as the installation of solar and photovoltaic panels, or to consider alternative technologies of energy supply and distribution at district level. One of the main arguments in support of the spatial dimension of energy is the vernacular urban form in extreme climates. This reveals a strong link between environmental forces and design response and between the latter and the use of natural energy for heating or cooling. The urban structure of Marrakesh in Morocco demonstrates the typical hot-arid urban response of narrow streets and courts to provide shade. The urban character can become dominated by a specific climatic opportunity to improve environmental conditions. This could be exemplified by the wind scoops which dominate the urban horizon of Hyderabad in Pakistan, all facing the prevailing clean, cool sea breezes as the land mass heats up during the day, and turned away from the hotter, vitiated winds. It is clear that urban form had had and should have a significant role to play in moderating extreme climates to create a more amenable environment. Obviously there is no single solution and there is no universally optimum geometry for the almost infinite combination of different climatic context.

Quantitative (among others: Ratti et al., 2005) and qualitative analyses (among others: Owens, 1984, 1992; Steemers, 2003; Naess, 2005) suggest that the positive results which can be obtained by using appropriate building technologies and updated technical systems, run the risk of being insufficient to achieve high-energy standards owing to inappropriate urban forms, densities and land-use patterns (see table 1.1).

Steadman (1979) qualitatively discusses the energy implications of different models of urban development, considering both density and form. He focuses not only on residential building, but also on transport sector and commercial buildings, seeking an holistic approach. With respect to density, he concludes in two different ways, which depends on the sector. For buildings, low-density living allows opportunities by the use of renewal resources, such as solar gain, whereas, for transport, very high-density living reduces travel energy demand.

Table 2.1: Literature Review

		QUANTITATIVE-BASED RESEARCHES	
		Simulation Studies	Aggregate Analysis
BUILDING ENERGY USE AND URBAN FORM	QUALITATIVE-BASED RESEARCHES	(MJ Breheny 1992a)	(Diappi 2000)
		(MJ Breheny 1992b)	(Rylatt, Sj Gadsden, and Lomas 2003)
		(M Breheny 1996)	(Stuart Gadsden et al. 2003)
		(Cullingworth 1990)	(Ratti, Raydan, and Steemers 2003)
		(Owens 1984)	(Ratti, Baker, and Steemers 2005)
		(Owens 1992a)	(Ratti et al. 2000)
		(Owens 1992b)	(Robinson and Stone 2004)
		(Owens and Hope 1989)	(Robinson 2006)
		(Owens 1986)	(Robinson et al. 2007)
		(Alberti 1999)	(Steemers, Baker, and Crowthe 1998)
		(Alberti and Marzluff 2004)	(Hawkes et al. 1987)
		(Jenks, Burton, and Williams 1996)	(Li et al. 2006)
		(Williams, Burton, and Jenks 2000)	
	(Steemers 2003)		
TRANSPORT ENERGY USE AND URBAN FORM		Banister, Watson, and Wood 1997)	(Rickaby 1987)
		(Banister and Anable 2009)	(Rickaby, Steadman, and Barrett 1992)
		(Handy 1996)	(Mitchell 2005)
		(Stead and Marshall 2001)	Steadman, J. P (1979) Energy and patterns of land use. In: Watson, D. (Ed.) Energy conservation through building design McGraw-Hill, p246-260
		(Ewing and Certero 2001)	Steadman, J. P., Holtier, S, Brown F., Turner, J, De La Barra T, and Rickaby P A (1998). An integrated building stock, transport and energy model of a medium sized city. Report to the EPSRC, 7pp.
		(Certero 1998)	(Nass 2005)
		(Newman and Kenworthy 2000)	(Nass 2003)
		(Va and Senior 2000)	(Holden and Norland 2005) Transit Cooperative Research Program, Report 39: The Cost of Sprawl- Revisited, 1998

Owens’s book (1984) presents a theoretical and empirical discussion on the dynamic interactions between energy systems and the spatial organisation of society outlining links at different scales, considering the possible effects of energy constraints on the urban and regional trends and the possibilities to modify urban form to reduce transport and space heating requirements.

Similarly, in 1986 the author (Owens, 1986) theoretically addresses the question of integration of energy issues into the land-use planning process, firstly, defining the connection between energy consumption and urban form, secondly, pointing out the role of the policies aimed at improving energy efficiency. Her analysis of energy/spatial structure relationship highlight scale, from the regional to the local, and the related structural variables and it is more in-depth than others. They affect energy requirement in different ways, following building morphology and the urban geometry.

Owens’s paper (1992b) focuses on the relationship between energy consumption, urban form and planning. The range of possible energy-efficiency measures in urban areas is reviewed. The review starts at the most local intra-urban scales and builds up to a consideration of strategic land-use and transport planning. Considerable progress could be made on these issues, Owens argues, considering insulation at the building scale and layouts and orientation at the micro-urban level. Moving up to the urban scale, the author considers the possible role of CHP schemes in some circumstances. She argues that potentially the biggest contribution for the reduction of energy consumption and pollution is to minimise the need for travel. She acknowledges that, at particular high-density, the energy consumption benefits may begin to be outweighed by the side benefits arising from congestion. It is suggested that a form of ‘decentralised congestion’ might be particularly efficient.

Breheny’s contribution (1992) proposes to promote throughout Europe high-density compact cities since they are environmentally desirable, reducing travel distances and delivering a higher quality of life. The author gives arguments

for the end to urban sprawl and for the promotion of mixed land use in order to recreate intensive, innovative, culturally rich, urban milieu.

With regard to the quantitative-based researches, some aspects of the relationship between urban form and energy use both in the housing and transport sectors have been proposed by different authors.

From the building side, one of the first studies on energy demand and urban pattern about the building sector is the work of Steemers and Baker, which has been developed since the 1990's. For domestic buildings, the energy demand is dominated by space heating and it is the sector in which more energy saving and efficiency could be obtained. Solar gains affect space-heating demands influenced by the typology of urban settlements and morphology. In order to investigate the energy performances of buildings, they studied three factors: density, availability of sunlight and ratio of envelope area : floor area.

In a review of the issues related to housings, Steemers (2003) concludes that energy arguments for and against densification of cities are finely balanced, and the choice depends on infrastructure issues, for instance the opportunities for the buildings to share energy networks. However, as solar obstruction angles increase above about 30°, densification becomes unattractive from an energy efficiency perspective. Energy consumption is related, in fact, to urban geometry and availability of sunlight and daylight on building facades. As noted by Givoni (1989) “*The outdoor temperature, wind speed and solar radiation to which an individual building is exposed is not the regional ‘synoptic’ climate, but the local microclimate as modified by the ‘structure’ of the city, mainly of the neighbourhood where the building is located*”.

Ratti et al. (2005) explore the effects of urban geometry on energy consumption using a digital elevation model (DEM). The research argues that the surface-to-volume ratio does not describe the total energy consumption in urban areas whereas the ratio of passive to non-passive zones seems better indicator. The value found that the variation of energy consumption on urban geometry is relatively small (10%), especially when compared with the impact of system efficiency and occupant behaviour, but respectable if considered the potential impact. This study approximates the relationships between the various urban factors assuming that they affect energy consumption independently. In other words, the research does not consider influence between them in order to simplify the relations. As previously debated, the problem is a multi-variable one, where interactions of various kinds occur.

Table 2.2: A matrix showing a set of variables related to urban form to be taken into consideration when designing for each climatic zone of the planet

Aspects of urban form	Climate type and associated risks
	High temp High humidity Strong winds Flooding
Land coverage	
Distance between buildings	
Average height of buildings	
Street layout and orientation	
Vegetation and tree coverage	
Location and size of parks	
Space between buildings	
Topography	
Relation to other nearby topographic features	
Soils	
Proximity to large bodies of water	

Source: author's elaboration from Robinson et al. (2007)

Following quantitative researches about urban morphology and radiation availability, as an influential indicator of energy demand, by using an innovative simulation model thanks to larger computational resources, Robinson et al. (2007) describes the development and application of a new tool aimed at the analysis of the effectiveness of morphological forms in utilizing available climatic resources and in moderating the climate. Starting from the hypothesis that urban microclimate influences building energy demand and the synergetic exchanges between buildings and resources, authors discuss the four key classes of model, Microclimate, Thermal, Stochastic and Plant, selected and adapted for this environmental modelling tool a set of variables (table 2.2). From the case studies of the Olympic Village in Athens and the Czech apartment block emerge some current limitations to SUNTOOL. In particular, the synergetic energy exchanges between buildings are not modelled as well as the production of energy from the renewable energy technologies. In addition, the influence of the local thermal microclimate on the energy of buildings is not represented.

From the transport sector side, although a polarisation of the debate around compact city or polycentric city, the reality is far more complex. Much of the available empirical analysis has tended to be rather simplistic in its approach, with the data being open to several interpretations, and causality is usually unproven. The complexity, in the physical sense of the built environment, revolves around at least four separate themes—population size, density, jobs–housing balance and mix of use, and location. Much of the existing empirical evidence is thus limited. Simple bivariate relationships (such as

density and travel) are most often analysed, few research studies consider the wide range of likely urban form and socio-economic influences on travel, and nearly all are based on cross-sectional data, showing just one ‘snapshot’ of results in time. In paragraph 2.3.2, the work briefly considers the literature in more detail, structured around four broad themes.

2.3.1. Building energy consumption and urban complexity

The review of the literature (among others, Owens) highlights the variation of the significant structural variables at different scales, from regional to building one. Different aspects of spatial structure affect energy requirements at different scales building design factors and thermal characteristics of building materials at building scale as well as the occupant’s behaviour, solar gains, microclimate conditions of site, site layout and orientation at the neighbourhood scale, and the land use pattern and communication network at urban and regional level.

Focusing in this paragraph on the energy needs of building, accounting for the 30% of the European energy consumption, the investigation aims to identify urban factors by approaching the analysis from a building perspective. The combination of the literature and European Directives about building physics and empirical researches and urban simulation models shows clearly that built form can have an effect on energy requirements both for heating and cooling.

The International Standard UNI EN ISO 13790:2008 is one of a series of calculation methods for the design and evaluation of thermal and energy performance of buildings. It presents a coherent set of calculation methods at different levels of detail, for the energy use for the space heating and cooling of a building, and the influence of the recoverable thermal losses of technical building systems such as the heating and cooling systems. The technical specification UNITS 11300/1 sets out the procedures for the national application with reference to the monthly method for calculating the thermal energy needs for heating and cooling. The general equation that defines the energy flow is as follows (1):

$$Q_H = Q_V + Q_T - \eta_U (Q_I + Q_S)$$

The calculation procedure is then specified in winter conditions (2) and summer ones (3):

(2)

$$Q_H = Q_T + Q_V - \eta_h (Q_I + Q_S)$$

Q_H : ideal heating needs

Q_V : ventilation and infiltration heat transfer from inside to outside in case of heating

Q_T : heat transfer from inside to outside in case of heating

η_h : utilisation factor

Q_I : internal gains

Q_S : solar gains

(3)

$$Q_C = Q_I + Q_S - \eta_c (Q_T + Q_V)$$

Q_C : ideal cooling needs

Q_V : ventilation and infiltration heat transfer from outside to inside in case of cooling

Q_T : heat transfer from outside to inside in case of cooling

η_c : utilisation factor

Q_I : internal gains

Q_S : solar gains

Among the four energy flows of thermal transmission, Q_V , Q_T , Q_I and Q_S , passive solar gains and heat infiltration appear as more clearly connected in the academic debate with spatial determinants of urban areas, and they interact with the building’s design, construction materials and systems, and the occupants’ behaviour. Heat infiltration, in particular, in comparison with passive solar gains, thanks to the mandatory energy performance standards on building envelope, can

slightly be affected by physical characteristics of urban areas. On the other hand, heat transfer in case of space heating seems more influenced by construction materials and occupants' behaviour in the use of energy systems and by the effects of the urban heat island (UHI) on the need of space heating and cooling consequent to the winter urban warmth and the summer heat stress (Oke, 1988b).

Table 2.3. shows the most common reference sources, namely EU Directives and academic literature, that have dealt with energy requirements for buildings in winter and summer seasons. As can be seen, table 2.3. provides the review of literature by highlighting the main evidences about factors affecting energy needs. According to the energy flows described there, the paragraph presents firstly Q_v , Q_T , Q_I and Q_S , following the thermo physics equations, that describes heat fluxes in the building, and the variables that model the urban environment and the discussion about them in the relevant building physics literature, then the same is debated in accordance with the evidences from urban literature, especially urban simulation models.

Thermo physics simulation modelling researches, such as by TRNSYS and ENERGYPLUS models, and observational studies affirm that solar gains can largely influence the thermal energy balance of building both in summer and winter season as emphasized by the methodology for the calculation of energy needs adopted by European Community Countries proposed by CEN standard EN ISO 13790:2007. Building designers should take into account that the most effective thermal insulating glazing systems, as the triple glazing windows are also characterized by low solar transmittance. This could be useful to control solar gains during the summer season and to reduce cooling energy use, but in winter the reduction of solar gains can overcome the reduction of thermal losses and increase the energy needs. Besides to solar transmittance, the size and the orientation of the windows could have a large effect on the energy use of buildings. The right design of a modern low energy building is then a careful trade-off among the properties of the different components, its collocation and its orientation. This is very important for the optimization of the solar gains (Gasparella, et al., 2011).

Persson et al. (2006), analyse the influence of window size on the energy balance of low energy houses, calculating winter and summer energy use for different orientations of a terraced passive house with triple glazing's windows in the climate conditions of Gothenburg (Sweden). As regards the building orientation, they find analogous trends for the winter and summer energy use and show a certain improvement in winter performance when reducing the area of the south-facing windows. This could be due to the higher opaque envelope insulation and to the particular climatic condition of Gothenburg, with lower solar radiation and lower external temperatures and to the higher set point temperature, which enhance the relevance of the window thermal losses with respect to the opaque envelope losses and to the solar gains. Poirazis et al. (2008) analyse the effect of glazing features and surface on a large office building, simulating the energy performance with different orientations, control strategies and internal layout for the climate of Gothenburg. Eskin and Turkmen (2008) calculate the effects on energy performance of parameters like the climatic conditions, insulation, thermal capacity, aspect ratio, colour, shading, window systems and area, ventilation rates and control strategies for a office building in four climates in Turkey. The effects of window size and type were considered mainly for their impact on the cooling energy and peak load.

Concerning the effects of urban form on energy demand of buildings, notwithstanding the recurrent criticism due to the difficulties of demonstrating correlations among complex phenomena (Alberti, 1999), urban scholars generally agree that energy performance, especially in terms of the availability of sunlight and the reduction of heat infiltration due to dominant winds, is influenced by the physical characteristics of urban pattern. One of the first studies on energy demand and urban pattern regarding the building sector is the work of Steemers and Baker, which has been developed since the 1990's. For domestic buildings, the energy demand is dominated by space heating and this is the sector in which more energy saving and efficiency could be obtained. Solar gains affect space-heating demands influenced by the typology of urban settlements and morphology. In order to investigate the energy performance of buildings, they study three factors: density, availability of sunlight and ratio between the envelope and the floor areas.

As previously discussed, the importance of a building solar exposure has long been emphasized in mid-latitude contexts, and numerous studies have demonstrated the improvement in solar gains (and consequent energy savings in winter) if the facade is appropriately oriented in order to maximize sunlight availability and if there are no obstruction buildings and overshadowing (Banister et al., 1997; Littlefair, 1991, 2001; Ratti et al., 2005, 2003; Steemers, Baker, & Crowthe, 1998; Steemers, 2003). Shadows cast by buildings and urban trees can limit the solar access of facades and rooftop solar-energy systems, including photovoltaic panels and thermal collectors. Site layout is the most important factor affecting solar gains, and it involves both urban and building factors. In this concern, topography works as independent "external" variable and mainly affects the sunlight availability mechanism due to the shadow of mountains and hills, and the consequent limited parts of territory available for certain types of energy-sensitive policies and interventions. Obviously it also depends on the urban green in terms of vegetation cover. This can offset infiltrations thanks to the wind-shielding effect of trees (fairly small compared to the shading effects) (among others the works of Akbari and Taha). In cold

climate, where space heating is predominant with respect to cooling, the wind-shielding effect of trees can substantially reduce heat-energy use in buildings (Levinson, Akbari, Pomerantz, & Gupta, 2009).

Table 2.3: Literature Review: urban and building factors influencing thermal mechanisms

ENERGY FLOWS	FINDINGS					FACTORS		
	Type of source	Scholar	Indicator	Explanation	Value	Urban Pattern	Building Design	Building Materials
PASSIVE SOLAR GAINS	EU Directive		$F_{sh,ob}$	Shadow effect reduction factor		Road width and orientation Building height Topography		
			A_{sol}	Solar ray capture area on k-esima surface			Building and windows orientation	
			$F_{sh,gl}$	Solar gains reduction factor for mobile shade systems			Mobile shade systems	
			ξ_{gl}	Transmittance of solar energy in the transparent part of the component				
PASSIVE SOLAR GAINS	Scientific Literature	Ratti et al, 2005	UHA	Urban Horizon Angle	$H/W=\tan(UHA)$			
		Stemers, 2003	OSV	Obstruction sky view	The OSV can be derived from the above UHA by averaging on each façade values taken from the opposite facades	Road width Building height	Building orientation	
		Watson & Johnson, 1987; Robinson, 2006	SVF	Sky View Factor	The ratio of the radiation received (or emitted) by a planar surface to the radiation emitted (or received) by the entire hemispheric environment			
		Akbari and Taha	Urban vegetation coverage			Tree Coverage		
HEAT TRASFER (heating)	EU Directive		H_T				Surface-to-volume ratio (*)	✓
	Scientific Literature	Owens, 1986		"built form with a low surface area to volume ratio can reduce intrinsic energy needs"			Surface-to-volume ratio (*)	

		Ratti et al, 2005		"to minimise heat loss need to minimise S/V but this implies a reduction of the building envelope exposed to the outside environment and the consequently reducing of daylight and sunlight"			Passive-non passive zones	
		Backer & Steemers, Ratti et al, Roberts		passive-non passive zones (LT method)			Passive-non passive zones	
		Atmospheric models		Heat transfer building-atmosphere-building		Urban Canyon Geometry Building Density	Building height	Surface albedo Thermal mass
	<i>EU Directive</i>		H_T				Surface-to-volume ratio (*)	
HEAT TRANSFER (cooling)	<i>Scientific Literature</i>	Atmospheric models	UHI	Urban Heat Island (Heat transfer building-atmosphere-building)		Urban Canyon Geometry Green Density Building Density	Building height	Surface albedo Thermal mass
		Urban Literature	UHI	Urban Heat Island (Heat transfer building-atmosphere-building)		Green Density Building Density		
VENTILATION AND INFILTRATION HEAT LOSSES	<i>EU Directive</i>		H_V	Heat Transfer for ventilation and infiltration	Wind speed			
	<i>Scientific Literature</i>	Oke, Givoni				Road width and orientation	Building height	
		Akbari, Pomeratz and Taha, 2001	Urban Tree coverage	Wind-shielding effect		Tree Coverage		

(*) current practices in Italy (Provinces of Bolzano, Trento, Region of Lombardy) use EP_i (Primary Energy)

Source: authors' elaboration

Furthermore, there are strong evidences (Ratti et al., 2005; Banister, 1997; Steemers, 2003; Steemers et al., 1997) on the influence of urban density on sunlight availability and the consequent betterment of solar gains and chance to use active solar mechanisms as solar and photovoltaic techniques. It has been highlighted since the earlier pilot bio-climatic projects in according to the vernacular experiences. Considering the Oke's works on urban energy balance (Nunez & Oke, 1977; Oke, 1988b) and the studies on the energy performance of buildings in winter and summer seasons (Compagnon, 2004; Hachem, Athienitis, & Fazio, 2011; Rylatt, Gadsden, & Lomas, 2003) and on solar access (Levinson et al., 2009), a focus on the singular variables of the phenomenon allows to understand how and why the urban and building factors influence passive solar gains. Table 1 shows the most recurrent conditions for sunlight availability. Size and shape of plots, road width, and building height affect the extent of sunlight availability and they express concepts such as urban canyon and urban density. Special attention is devoted to road orientation, building orientation and windows orientation in order to maximize sunlight availability, as well as urban trees to shade and cool the south or west sides of buildings and foster the offset or reverse of heat-island effect.

The heat transfer mechanism between buildings (building-atmosphere-building) has received less attention in thermo physics studies. In thermo physics simulation models atmosphere is a boundary condition, whereas the focus is on the

characteristics of buildings. On the contrary, atmospheric simulation models primarily focus on the atmosphere, describing buildings as a boundary condition. The two types of models are complementary. In particular, the second type of models provides interesting possibilities to analyse the relationships between the UHI, heating and cooling needs in terms of heat transfer between buildings and the atmosphere.

Differently from building physics, recent urban meteorology studies tried to investigate the complex energy balance of the city-atmosphere system. It can be written, following Oke (1982, 1988a):

(4)

$$Q^* + Q_f = Q_h + Q_e + Q_s + \Delta Q_a$$

The terms on the left-hand side are the energy inputs in the canopy system. Q^* is the net radiation, i.e. the sum of the net solar short-wave and long-wave radiations. It is usually positive during the day and negative at night. In urban areas, an additional heat source, the anthropogenic energy flux, Q_f , comes from human activities, such as vehicular traffic, space heating, air conditioning or releases of heat by industries. On the right-hand side, Q_s represents the storage of energy in the building materials or in the ground and roads. It is usually positive during the day, while at night Q_s becomes negative. Finally the available energy ($Q^* + Q_f - Q_s$) goes to the atmosphere as vertical turbulent exchanges of sensible heat (Q_h) or of latent heat (Q_e).

In order to more accurately model the physics of the urban canopy, new concepts in surface modelling have been developed since the 1990s. These models aim to solve the surface energy balance (4) for a realistic 3D urban canopy. These models are based on a geometry (urban canyon) which, even if it is simplified, is reasonably close to the reality that they aim to represent. Since they are composed of both horizontal and vertical surfaces, they are more able to capture the special energetic behaviour of the urban canopy (Masson, 2006). Concerning the influence of anthropogenic fluxes on urban microclimate, meso-scale studies have been conducted in large Japanese cities. Ichinose et al. (1999) concluded that anthropogenic fluxes explain the areas of maximum UHI in Tokyo. Urano et al. (1999) evaluated the impact of the anthropogenic heat releases height, and conclude the UHI near the surface would be reduced concentrating all people in taller buildings, because less heat is accumulated there. However, they only considered the effect due to anthropogenic heat input, while the radiative and energetic impact accompanying taller buildings also need to be evaluated. Kolokotroni et al.'s contribution (2008) looked at the potential of physical characteristics in mitigating UHI in London during summer. The research uses six on-site variables: aspect ratio, surface albedo, plan density ratio, green density ratio, fabric density ratio and thermal mass. Surface albedo appears as the most critical variable that determine the daytime and nocturnal changes in outdoor air temperature. Salamanca et al. (2010; 2010) coupled an urban canopy parameterization model (UCP) with a building energy consumption model (BEM), in order to evaluate and calculate the impact of air conditioning systems on the energy consumption and the interactions between the outdoor temperature and the waste heat from the air conditioners adequately. De Munck et al. (2012) found that a consequence of the UHI in summer is an increase in the use of air conditioning in urbanised areas. A coupled model consisting of a meso-scale meteorological model and an urban energy balance model was used to simulate and quantify the potential impacts on street temperature. The comparison between the scenarios with heat releases in the street and the baseline case without air conditioning showed a systematic increase in the street air temperature, and this increase was greater at night-time than daytime.

Field campaigns supported some urban scholars theoretical considerations about UHI. Accordingly, development patterns affect the formation of UHIs in complex ways (Rong and Ewing, 2007). Sprawling urban areas have less concentrated heat sources but also have more motor vehicle travel and resulting higher fossil fuel combustion (Bento, Cropper, Mobarak, & Vinha, 2003; Burchell et al., 1998; R. Ewing, Pendall, & Chen, 2003; Kessler & Schroeder, 1995). Large-lot housing has more pervious surface and tree canopy than small-lot housing, but also has more impervious surface and un-canopied area because of larger houses, longer driveways, and bigger yards. It is not clear whether large- or small-lot housing generates more radiant heat per unit (Stone & Rodgers, 2001). Like the impact on housing stock, the impact of urban form on the formation of UHIs is ambiguous and calls for empirical analysis. Previous researches found that UHI effects are strongest in compact areas, leading to an increase in cooling degree-days and a reduction in heating degree-days.

To sum up, Table 2.4 outlines the main factors influencing thermal mechanisms as a result of the literature review previously discussed. Urban physical characteristics, building design and thermal properties of materials differently affect the various thermal fluxes in and out the building. The building approach here applied is useful in terms of investigation methodology.

Table 2.4: Summary: urban and building factors influencing thermal mechanisms

FACTORS			
	<i>Urban factors</i>	<i>Building design factors</i>	<i>Thermal properties of materials</i>
PASSIVE SOLAR GAINS	Topography (*)		
	Road width	Building orientation	
	Road orientation	Building height	✓
	Size and shape of plots	Windows orientation	
	Tree coverage		
HEAT TRANSFER (Heating)	Urban Canyon Geometry	Surface-to-volume ratio	✓
	Building Density	Passive-non passive zones	
HEAT TRANSFER (Cooling)	Urban Canyon Geometry	Surface-to-volume ratio	✓
	Green Density	Passive-non passive zones	
	Building Density		
VENTILATION AND INFILTRATION HEAT LOSSES	Road width		
	Road orientation	Building height	✓
	Tree Coverage		

(*) Independent variable

Source: authors' elaboration

2.3.2. Transport energy use and the city

Concerning the influence of urban factors on the need of travel (and the consequent energy demand), both theoretical and empirical studies do not come to a converging conclusion. While most studies have investigated how commuting is influenced by urban form, some studies have given attention to the correlation of everyday non-work-related travel and urban form. However, little attention has been paid to the possible relationship between long leisure-time travel by car and plane, and the design and location of residential areas within the city. These, in accordance with the reviews performed by Banister and Hickman (2006, p. 278) and Cervero (2003) and the researches of Naess (2011; 2003, 2005), reach that it is not possible simplify the reality into determined trends. The key debates within the literature in this field, evolving around whether and to what extent travel behaviour is associated with land use and socio-economic variables, have not produced satisfactory and detailed analysis (Banister & Hickman, 2006, p. 282). Hence, adopting the 'INUS condition' concept (insufficient but non-redundant parts of a condition which is itself unnecessary but sufficient for the occurrence of the effect), introduced by the Australian philosopher Mackie (1965, quoted in Naess, 2005) and applied to planning research by Naess (2005, p. 173), the urban variable has to be considered as "*an insufficient but necessary part of a condition which is itself unnecessary but sufficient for the result*", resulting from the consideration that social and economic factors (i.e. car ownership, employment, population groups) mainly regard the influence of the travellers' attitudes and lifestyles, as drivers of residents' well-being and activity possibilities. Furthermore, conclusions of some studies – in particular model simulations – highlight the limitation of such theoretical framework on variables regarding energy use, since focusing on separate correlations. Naess (1997) concludes that the following characteristics are favourable for reducing energy use per capita: high population density for the city as a whole; high density within each residential area; centralised settlement within cities and towns (i.e. higher density in the inner part than on the fringe); centralised workplace location; low parking capacity at workplaces; decentralised concentration at the regional level; and, a high population for each city. Based on empirical evidence, Naess (1997) claims that these characteristics are favourable in cities as different as Paris, London, New York, Melbourne, San Francisco, Copenhagen and Frederikshavn (Denmark). In addition, he claims that those studies rejecting the influence of urban structural factors in general, and the prospect of the compact city in particular (Naess, 2005).

The assumed relationship between population density and fuel consumption proposed by Newman and Kenworthy (1989), who concluded that high-density cities consume less energy, has been the basic premise behind the prescription for higher density. This relationship has been discredited as the causality cannot be attributed solely to density determining fuel consumption; it has been demonstrated that density plays a small part in energy consumption if the price of fuels and other automobile travel costs, relative to income, is included in the analysis (Gordon, 1997). Echenique et al. (2012) suppose that a more plausible causal explanation about travel needs and urban density is that in those cities that have cheap travel, people tend to travel further in order to have more living space, and prices are lower outside central areas. As a result, the authors argue that transport cost is the cause of density rather than density being the cause of lower fuel consumption. Thus, within the wider urban environment, density has an important role to play, but this role is enhanced when combined with other factors such as mixed uses, safe and secure places, community, open space, green space, and quality of development. The dependence of travel, in particular average travel distance and frequency, from job concentration and mixed-land use is debated and variables. The high concentration of workplaces, shops and other

facilities is usually positively associated with the limitation of number of trip and the use of alternative meanings, such as bicycle and foot. Residential location relative to the city centre, the proximity to public transport and road networks and services, influences the travel pattern.

Banister and Hickman (2006, p. 283) state, “*in terms of the particular influences that transport has on land use and urban form, there are clear influences on trip length, speed and mode choice. There is less impact on the frequency of travel*”. As Naess (2003, pp. 158–159) claims, the gains of this physical characteristic include “*shorter trips from home to work and service facilities, better opportunities for linking different trip purposes, and shorter trips when visiting friends and relatives living in the same city*”.

Boarnet and Crane (2001) argue that the relations between the physical characteristics of city and travel consumption must be treated as a hypothesis, rather than a fact. They evaluated a number of case studies and the evidences about a connection between urban design and travel behaviour are rather inconclusive: “*Land use and urban design proposals, if they influence travel behaviour, do so by changing the price of travel*” (p.103). The authors come to a rather surprising conclusion: “*very little is known regarding how the built environment influences travel*” (p.4). From a meta-analysis of studies, Ewing and Cervero (2001) conclude that increasing density itself has only a marginal impact on reducing travel. Table 2.5. shows evidences from empirical studies that highlight some connection points between urban form and energy demand for transport sector.

Holden and Norland (2005) find that two significant land use characteristics, both related to distance, affect energy used for everyday travel. First, the distance to the city centre is important and this result is in line with others (Naess, 2003, 2005). Then, the distance to the local sub-centre (accessibility to private and public services) correlates with the extent of everyday travel. However, authors affirm “*neither density nor local mix has a significant effect on the energy used for everyday travel*” (2005, p. 2156). Accordingly, high density and high local mix must be combined with proximity to a centre offering everyday services to bring about a reduction in energy use for everyday travel.

Table 2.5: Literature Review

URBAN FACTORS	REFERENCES
Population density	Newman and Kenworthy (1989), Næss et al. (1996), Fouchier (1998) and Næss (1993) Newman and Kenworthy (1999).
Location of facilities (mixed land use – concentration of facilities)	Hanssen (1993), Dasgupta (1994), Næss and Sandberg (1996) and Hartoft-Nielsen (1997), on the location of workplaces; and Hanssen and Fosli (1999) about the location of shopping malls
The provision of road and parking capacity	Engebretsen (1996), Mogridge (1997) and Næss et al. (2001)
Residential location relative to the city centre (*)	Mogridge (1985), Newman and Kenworthy (1989), Synnes (1990), Duun (1994), Schipper et al. (1994), Næss et al. (1995), Fouchier (1998), Hartoft-Nielsen and Nousiainen (1999), Røe (1999) and Næss and Jensen (2004a).

(*)This relationship has in particular been attributed to the high concentration of workplaces, shops and other facilities traditionally found in the historical urban centres (the distance to the city centre)

Source: authors’ elaboration

Although the controversial evidences, the main conclusion is that living close to the city centre does contribute to reduce traveling distances and the use of cars, thanks to the concentration of workplaces, public services, facilities and cultural and entertainment places and the proximity with public transport and cycle lanes networks.

2.4. Energy supply and spatial organisation of society. Implications and constraints

At urban scale, the use of renewable energy sources (RES) may contribute to reduce dependence on non-renewable sources or on electricity imported from outside with economic advantages deriving from specialisation in technologies for the exploitation of RES or for energy efficiency and commercialisation. RES can generate forms of organisation in which local actors may play a decisive role, maybe through complex forms of self-organisation of local actors up to a level at which the territory behaves as ‘collective actor’ (Bagliani, et al., 2010).

Although the substantially positive role of RES is widely acknowledged, a number of literature contributions highlight the many financial and market barriers that may, in some cases, determine economic unsustainability of the plants for the exploitation of RES. Pepermans et al. (2005) distinguish between market barriers that are intrinsic operational aspects of energy (and other) markets and those that arise because of market failure. These include cost-effectiveness, technical barriers, and market barriers such as inconsistent pricing structures, institutional, political and regulatory barriers, and social and environmental barriers. Some barriers may be specific to a technology, while some may be specific to a country or a region. Barriers were briefly discussed in the IPCC second assessment report, and the IPCC third assessment covers the barriers in details. Furthermore, the authors argue that, unlike fossil fuel technologies, the efficiency of

renewable technologies is generally very site specific. Accordingly, the design of the built form and service systems determine the potential for renewable energy supply and the use of low carbon technologies (Cheng, Hargreaves, & Steemers, 2011). Many of the renewable and low carbon energy technologies available today (such as solar thermal, photovoltaic, micro-wind turbine, heat pumps, CHP, etc.) have already been in development for several decades. However, the knowledge concerning the integration and optimization of these technologies in buildings, with respect to built form and the spatial layout, is limited. In the current planning practice, the decision about the built form for a particular target density is often driven by a combination of economic, social and cultural factors. The final form however would ultimately govern the potential of renewable energy sources that could be exploited on-site. In order to foster the inclusion of an energy-sensitive planning and urban policy approach, the design of the built form, its energy implications and the potential for renewable and low carbon technologies needed to be considered together with other non-environmental factors in an integrated manner. When employing distributed energy schemes in cities, the accessible space for the energy systems, in particular solar technologies, could put some limitations on how much power is available from these in respect to demand. For example, city centres with high rise buildings have much less self-production possibilities than detached houses. Whereas for high power density sources such as bioenergy or waste based co-generation such restrictions would be less important, though other siting restrictions may exist.

In pursuit of achieving net zero energy building (ZEB), photovoltaic panel, solar thermal panel, ground source heat pump (GSHP) and central heating power (CHP) technologies are the main technologies considered in this work. Table 2.6. provides a general view and the requirements of these technologies, in terms of available area, preferred location and energy needs. Micro wind turbine is not considered in this study owing to the limited wind potential in urban areas as well as micro hydro turbine for the limited probability to have head of water and constant flow rate in cities. Furthermore, closed landfills or brownfields can be potential sites for solar energy harvesting depending on their geographical location. Technical feasibility of solar energy harvesting on landfills depends on compatibility of the solar systems with the existing landfill components, specifically cap with the foundation needs of the solar panels. The amount of solar energy received by a surface depends on the geographical location as well as orientation of the surface.

Table 2.6: Low carbon technologies and their requirements

TECHNOLOGY		REQUIREMENTS
<i>Photovoltaic</i>	Roof of space facing SE/SW Landfills/brownfields facing SE/SW	Can export electricity if connected to grid, more cost effective if high on-site demand
<i>Solar thermal</i>	Roof of space facing SE/SW Landfills/brownfields facing SE/SW	Hot water demand on-site
<i>Ground source heat pump</i>	Land area of ground collector or a water source	Building with a space heating (and possibly cooling) demand and low temperature heating system
<i>Central heating power</i>	Communal space	Proportional heat and electricity demand, scope for heat network

Source: adapted from Cheng, Hargreaves and Steemers, 2011

Dwelling density has a significant influence on energy demand per household; however, it is not the only factor that influences the potential for low carbon energy supply. The combination of both dwelling density and site coverage are the crucial urban factors that determine the potential reductions in carbon emissions from these technologies. The examples shown by Cheng, Hargreaves and Steemers (2011) in the case study of the city of Cambridge suggest that medium to low density housing may in some cases enable a greater saving in carbon emissions than higher density development because of the greater amount of space for collection of renewable energy. Mixed-use development comprising residential and commercial activities are beneficial in terms of energy balance as the wide variations in the demand pattern can provide greater energy load diversity. This will help to smooth the load profile, enhance system efficiency and consequently improve financial viability.

Mixed-use development is particularly favourable for technologies such as CHP and ground source heat pump. Similarly, space limitations may exclude the use of large CHP systems within dense urban neighbourhoods. Since large CHP plants can attain higher thermodynamic efficiencies and achieve economies of scale in capital costs, limits on the size of urban CHP plants might therefore restrict the overall efficiency of the urban energy system, potentially making it difficult to reach desired energy-efficiency and carbon-reduction targets. Keirstead et al. (2012; 2012) assess how planning restrictions on the size of combined heat and power systems might impact the overall efficiency of an urban energy system. Using a mixed-integer linear programming model, the authors simulated seven grid cities of 10,000 to 200,000 people under five technology scenarios in the case study of the city of London. The results indicate that the most efficient urban energy systems, from both a cost and primary energy-efficiency perspective, require a mix of both small and medium-sized CHP systems, as well as gas boilers to serve areas of lower demand density in order to satisfy demand at an appropriate scale.

2.5. Spatial responses under energy constraints: themes to be debated

From this growing body of literature, what clearly emerge are peculiar debates and alternative positions on spatial requirements to reduce the energy demand and support the production from renewable resources and other energy supply and distribution mechanisms. Planners and policymakers have debated on two dominant and contradictory theories about urban form: the compact city and the dispersed city. Compaction increases the intensity of urban areas in order to reduce vehicle travel and increase social diversity and urban vitality. Dispersal diminishes the intensity of urban land use to reduce the costs of living and production and reflects the demand for affordable space and less crowding. The high-density development close to or within the city core with a mixture of housing, workplaces and shops, namely the main principles of compact city, correspond to the main arguments argued by the detractors of this form of development. Compactness, urban density and mixed land-use are the three main questions can be mentioned as pivotal for seeking to trace the connection between energy and land use planning and strategies and tools for managing it.

Compactness

Compactness of the built environment is a concept of difficult definition. It has been associated alternatively with population density, net density and mixed land-use city. According with the aims of the work, urban compactness is here associated with a contained urban form, with the tendency to equal distribution and presence of centrality or sub centres (M. J. Breheny, 1992; M. Breheny, 1996; Jenks, Burton, & Williams, 1996; Owens & Hope, 1989). For many planners and scholars, compactness is the crucial typology to be implemented to achieve sustainability. However, the controversial evidences of the studies pro and against compactness orient this study towards more realistic assumptions, based on quantitative evidences. Compaction has been promoted worldwide focusing on much higher densities within cities, mainly in brownfield land, and to invest in public transport. The detractors, in particular economic analysts (Gordon, 2008; Richardson & Gordon, 2001), argue that reducing restrictions on the supply of land clearly reduces its prices, which, in turn, increases its use. As a result, more living space and lower real estate costs are expected. However, recent research in the USA and UK (Echenique et al., 2012; Reid Ewing & Cervero, 2001) suggests that higher density development can have only a marginal impact on reducing car travel.

In a pragmatic way, the reduction of energy consumption can be pursued by providing building densities and urban compactness capable of supporting district heating or combined heat and power systems. The process to make cities more compact by an intensification process that conserves the open land and encourages the regeneration of rundown urban areas implies the containment of urban development and the consolidation of existing one through the redevelopment of land at higher densities, infill in back land and gardens, and extension of existing buildings. The intensification of the built form includes also subdivisions and conversions, and additions and extensions (Williams, Burton, & Jenks, 2000, p. 243).

Furthermore, in relation to the connectivity concept, although key debates within the literature in this field has been evolving as previously debated in 2.3.2, the reduction of dependence on travel by facilitating shorter journeys and inducing greater supply and use of public transport is to be supported by concentration of services, facilities and workplaces.

As Naess (2003, pp. 158–159) claims, the gains of this physical characteristic include “*shorter trips from home to work and service facilities, better opportunities for linking different trip purposes, and shorter trips when visiting friends and relatives living in the same city*”. Burton (2002) suggests considering the “*increase of density of centres and sub centres*’ and ‘*increase of development in existing areas*” as indicators to measure and monitor the urban compactness when this means urban form.

Urban density

Usually strictly associated and connected with the concept of urban compactness, urban density is a largely debated principle. Simultaneously, as previously discussed, it is a critical feature in determining the relation with the energy consumption for space heating and travel energy demand. This is identified with population density (gross density) or built form density (net density). The first one is typically given in inhabitants/km²; the latter is typically measured by the ‘floor to area ratio’ (FAR).

On the one hand, theoretical discussion (Owens, 1984, 1992b; Steemers, 2003) and empirical findings, although controversial, suggest maintaining high level of population density to achieve a generic concept of sustainability in favour of the reduction of transport demand.

On the other hand, and the work adopts this, there are strong evidences (Banister et al., 1997; Ratti et al., 2005; Steemers, 2003) on the influence of urban form density on sunlight availability and the consequent betterment of solar gains and chance to use active solar mechanisms as solar and photovoltaic techniques. It has been highlighted since the earlier pilot bio-climatic projects according to the vernacular experiences. The quantitative-based research with simulation studies and aggregated analysis shows the improving of solar gains (and consequent energy savings in winter season) if the facade is oriented in order to maximize the sunlight availability. Obviously it depends on the climate (hot or cold climate) and the latitude of the site. These findings are reinforced by building physics studies such as BRE (Building Research Establishment) publications reports.

Within the wider urban environment, compactness and density have an important role to play concerning the energy consumption for travel, but this role is enhanced when combined with other factors such as mixed uses, safe and secure places, community, open space, green space, and quality of development.

Mixed land-use

Mixed land use is a common characteristic in dense and compact cities but it cannot be considered an obvious result. Although research here is limited and concentrates on the work journey, a high land use diversity and the proximity of housing to all types of facilities and services, in addition to the improvement of urban quality, are considerable potentialities for fostering the reduction of car dependence. The dependence of travel, especially average travel distance and frequency, from job concentration and mixed-land use is debated and variables. Residential location relative to the city centre, the proximity to public transport and road networks and services, are considered influencing travel patterns. Hence, the high concentration of workplaces, shops and other facilities is usually positively associated with the limitation of number of trip and the use of alternative meanings, such as bicycle and foot.

2.6. Recapitulation

Chapter 2 emphasised that arguments for a conceptualisation of the spatial dimension of energy, not only a matter of energy demand and supply delineated in the building physics, are difficult to defend. The energy problems that appear in urban development cannot be easily explained by using the explanatory variables in the form of imperfect functioning of the urban machine. Hence, although it may appear clear that urban physical characteristics, building design and thermal properties of materials differently affect the various thermal fluxes in and out the building, what are the connections between energy and urban organisation? How do physical features of cities influence the energy demand and the effectiveness of low carbon technologies for energy supply? The building approach here applied was useful in terms of investigation methodology in this perspective. It emerged that thermal mechanisms as solar gains, heat transfer and loss as well as infiltration are differently affected by building height and distance, by road orientation and weight, by the presence of vegetation and trees, in other words by the urban pattern.

Concerning the influence of spatial features on the energy need for travel sector, a converging conclusion is not emerging by both theoretical and empirical studies. The reviews performed by Banister and Hickman (2006, p. 278), Cervero (2003) and the researches of Naess (2011; 2003, 2005), find that it is not possible to simplify the reality into single explanatory variable that alternately consider travel behaviour associated with land use and socio-economic variables. These have not produced satisfactory and detailed analyses (Banister & Hickman, 2006, p. 282). Although the controversial evidences, the mainstreaming conclusion is that living close to the city centre can contribute to reduce travelling distances and the use of cars, thanks to the concentration of workplaces, public services, facilities and cultural and entertainment places and the proximity with public transport and cycle lanes networks. In addition, urban form can affect the feasibility of introducing green technologies for energy supply. CHP, for example, requires a concentration of activities provided by a compact form of development whereas solar and pv panels require relatively low-density development.

The review of the academic debate, especially the more recent findings about the concepts of compactness, urban density and mixed land use, stresses the relatively small differences between options if socioeconomic change and population growth are considered. Principles for energy efficiency should not unquestioningly promote increasing or decreasing level of compaction and urban density without also considering the potential negative consequences. The necessity of

addressing the existing building stock as well as the existing urban areas remains themes to be considered. As a result, the role of cities as energy user is well balanced by their potentialities as energy actor in order to coordinate urban planning with energy management and to define the appropriate city strategies.

PART 2: ENERGY CONCERNS AND LOCAL PLANNING RESPONSES: SUCCESS OR FAILURE? THE CASE OF ITALY

CHAPTER 3: Towards an Interdisciplinary Reading of Local Instruments for Energy Planning. Success or Failure?

3.1 Introduction

This chapter opens the second part of the work. Whereas the first part dealt with energy and spatial structure and with the main themes for urban planning and policy, the second one is aimed at analysing and evaluating the local energy-sensitive planning instruments (the Municipal Energy Plan in the Italian context, in particular). The objective of this chapter is to explain the theoretical perspective of this part and to elaborate an evaluation methodology for the further steps. It provides an outline of current thinking and action in regard to energy concerns and local planning instruments by presenting the concept of energy planning gap, the assumptions of different academic streams, the conceptualization and deconstruction of efficiency, effectiveness and integration principles and the role of public administrations (Section 3.2). This is followed by a discussion about the limits to implementation from a multi-disciplinary approach combining the disciplines of government and environmental planning and the literature of public policy analysis and public economics, which have had at least since twenty years, points of contact with planning (Section 3.3). Finally, this chapter elaborates an evaluation methodology based on an interdisciplinary approach able to overcome the traditional sectorial interpretations, namely the different specific criteria, the main data sources and assessment techniques, and the construction of sub-criteria (Section 3.4). Its applicability will be tested and discussed through a case study analysis. This will be the aim of Chapter 4 and Chapter 5.

3.2 Energy concerns and local planning instruments: traditional approaches versus innovative ones

Stimulated by the energy crisis of the 1970s, the management of energy supply, distribution and use began to be the subject of considerable interest by scholars, national institutions and local administrations (Owens, 1992a, 1992b). Since these pioneering activities, energy questions have always played a crucial role in sustainability policies and programmes and in climate change ones, both in mitigation and adaptation strategies, affecting the production of greenhouse gases emissions.

For governing global environmental problems, it has been largely argued that the municipal level is relevant. The Brundtland Report (WCED 1987), as well the Green Paper on the Urban Environment (Commission of the European Communities, 1990), argue that cities should be central to the pursuit of sustainable development and environmental protection. In the Rio Summit cities were fully recognised as an area of interest with the agreement of Agenda 21, the global action plan for Sustainable Development for the 21st Century, which established the development of processes at the municipal level and promoted the coordination among local authorities. Recently International and European voluntary-based initiatives, such as the C40 Cities and the Covenant of Mayors, stress the fact that cities are important actors for implementing sustainable energy policies and that their actions must be encouraged and supported.

In this context, many scholars (Gibbs, Longhurst, & Braithwaite, 1998) stress the potential for initiatives at the local level for the crucial responsibilities and, in some cases, considerable experience in a number of policy areas recognized in relation to energy consumption and the consequent greenhouse gases emissions. Municipalities have an (highly variable) influence over emissions of greenhouse gases through their roles in energy supply and management, transport demand and supply, land-use planning and development control, building regulation and waste management. Adopting different governance methods (Bulkeley & Kern, 2006), local authorities in some countries (Italy, Austria, Germany and Sweden) directly own local energy companies, provide advice and grant on energy efficiency and production from renewable resources and invest own resources in the reduction of energy demand in municipal buildings. In addition to the municipal responsibilities and competencies, several authors suggest that leadership, human and financial resources and urban political economies are aspects that shape local institutional capacity to face environmental issues (Betsill & Bulkeley, 2006; Bulkeley et al., 2009; Collier & Liifstedt, 1997; Evans, Percy, & Theobald, 2003).

However, cities are not conceptualized as isolated and self-sustaining units but strongly linked with towns and cities in their hinterland, as well as with other cities in the same region and country, in Europe and worldwide. After the Rio Summit and the launch of Agenda 21 processes, and at the same time of the activities experimented by a few pioneer cities, transnational networks of subnational governments have been conceptualized with the aims of exchanging experiences and collaborating on the development of frameworks and planning and management tools in order to support local action plans.

According to the Rio Declaration, similarly, the *Sustainable Cities and Town Campaign* intends to promote long-term action plans by the involvement of municipalities into Agenda 21 processes. While the Aalborg initiative supported the

pursuit of sustainable development, the International Council for Local Environmental Initiatives (ICLEI), one of the largest networks, with its Cities for Climate Protection Campaign (CCPC) fosters local policies and programmes on climate change in order to control carbon emissions.

Recently, European Union has adopted the Covenant of Mayors as a result-orienting measure in which the participating local and regional authorities will formally commit themselves to reduce their CO₂ emission by more than 20 % by 2020 through the development and implementation of Sustainable Energy Action Plan.

With this background, planning systems in different part of the world are trying to address climate change effects with the introduction in planning regulatory schemes of different indicators related both with energy consumes and to land exploitation, to figure out, from one side, possible impacts in terms of mitigation procedures, from the other evaluating the decrease of resilience of built environment. In many cases local, regional and sometimes national authorities are starting to define local energy plans focused on the management of energy flows and, in the better situations, climate action plans that includes in a formal and unique planning instrument initiatives and processes of mitigation and adaptation.

The status of these experiences varies greatly and only in some cases local governments have incorporated climate change and energy efficiency strategies into existing land-use plans. Although many authors (Betsill & Bulkeley, 2003; Biesbroek et al., 2009; Owens, 1992a, 1992b) and International reports (Commission of the European Communities, 2009; *IPCC Fourth Assessment Report*, 2007) have identified spatial planning as a key factor in addressing the causes and the consequences of energy use and climate change, the impact of spatial planning decisions on energy consumption and emissions production is not always explicitly considered. At first sight, and mainly from an European perspective, it seems fair affirm that, in comparison with the building scale and the energy generation aspects, the inclusion of an energy dimension in the land-use planning process has been attracting much less attention by politicians and policy-makers.

In the last two decades, no substantial changes have occurred in the approach to the development of measures and actions, thus slowing down the inclusion of the energy policy into a more general theoretical framework of urban governance, and discouraging a comparison process. The general tendencies in interpreting urban energy questions is mainly oriented to mono-disciplinary and technical focuses - of acquiring more data and more local knowledge (Bulkeley et al., 2009) – and to use information from a limited number of scientific disciplines (mainly technology and economics). Consequently, energy planning has been maintained into a sectoral policy domain, centralizing the responsibilities and competencies for the development of such a plan to energy or environmental city departments, which usually have to deal with a whole range of environmental issues and in which the required multi-disciplinary expertise, political authority and financial resources could be limited.

In accordance with the worldwide experiences, and although some innovative cases have been developed, the Italian energy planning instruments remain anchored to a traditional and sectorial approach, not addressing the complex relationships between urban environment, energy supply and use and environmental consequences. The formulated policies have often been developed without an integrated urban planning framework. Local administrations maintain the emphasis on policies that are feasible in the short term, in which the required technical expertise are predominant, such as the policy area of new buildings with high energy efficiency standards, and in which it is comparatively simple to take decision and have a direct control, such as policies regarding municipal buildings and vehicle fleet. Correspondingly, long-term perspectives, such as land use and transport planning, are not well integrated into the existing planning tools.

3.3 The energy planning gap

This section aims to present and discuss the state of the art, and elaborate analytical categories to understand the main critical issues related to the implementation gap associated with energy planning.

Scholars increasingly recognize that the strength of adopted plans is not necessarily correlated with the implementation of their contents, and that research is needed to understand the degree to which policies are being implemented after plans are adopted. The progressive weakening of planning responses to environmental concerns clearly emerges from the main disciplinary traditions.

Despite regional and local governments across the world have elaborated a wide variety of actions and plans to address sustainable development, climate change or energy concerns, the translation of environmental awareness into development and implementation of actions often is far from straightforward (Bulkeley & Betsill, 2005). Owens & Cowell (2002, pp. 24–25) argue that:

“[...] despite the firm place of sustainable development on the national agenda, and its diffusion into plans and policies at all levels, there was still, by the end of the 1990s, a sense of implementation deficit. Real changes on the ground – to

the nature and form of development, or to the intensity of conflict over land use – were not readily discernible, or at least could not unambiguously be identified as sustainable in practice.”

Studies developed since early 1970s concerning planning theory, political science, environmental and public economics, have dealt fragmentarily and separately with the reasons behind the implementation gap in planning process, not considering the ideas accumulated in the study of other policy fields.

Consistently with the objective of this part, the ‘traditional’ interpretations of energy planning is discussed together with less conventional perspectives, in order to suggest a novel framework to explore the results of energy planning instruments at disposal. Energy policy in relation to planning is considered less as a new environmental policy and more a new urban policy.

The issue is being addressed through the positions proposed by the literature on environmental governance and planning, especially some contributions that have been proposed to explain the implementation gap in the light of analysis of climate protection planning cases, and the literature of public policy analysis and public economics. A new phase of the urban debate has been marked by the contributions of public policy analysis to the evolution of planning theory, and by those of the public economy discipline. In this regard, the policy approach (Balducci, 1991; Bolocan G., Borelli, Moroni, & Pasqui, 1996) has challenged the comprehensive planning model, prompting questions on the efficiency of the entire planning process. As far as contributions by economists are concerned, they focus on the relationships between public interventions and the market-state relationship, considering in particular the role of public authority in case of externalities that occur when the market fails to attain Pareto efficiency.

This section is structured as follows. First of all (3.3.1), the plurality of positions on the barriers to the implementation planning phase is set out by reviewing the literature that scans through the debates in traditional separate disciplines: environmental planning and governance, public policy analysis and public economics. All have points of contact with the planning debate and the attention is especially focused on these positions emerged over the past two decades, that provide analytical modes and tools. Subsequently, three distinct but overlapping analytical categories are described, discussing the more recurrent results of the literature review (3.3.2).

3.3.1 Reviewing the literature: the implementation gap

The implementation gap in the review of environmental literature

Since the early 1970s, different fields have concerned studies on the efficiency of urban environmental solutions, planning and policies. At the interface between the economy, society, and the environment, researches on environmental governance and environmental planning have concluded that the reasons for the weak implementation of strategies and plans have to be mainly researched inside the public administration and in the decision-making process.

Trying to examine the local policy initiatives to face climate change in Sweden and the UK, the analysis of institutional and political competencies of local authorities in the area of energy and transport, permits Collier (1997) to conclude that three main factors influence the level of engagement and action among municipalities. The paper shows that the potential of measures strongly depends on the response capacity within institutions, policy-makers and politicians, guaranteed by considerable experience in environmental issues locally, the nature and extent of local competencies in climate-related policy sectors, and the availability of financial resources. Similarly, Bulkeley and Betsill (2003), in a case study analysis of local climate protection in Australia, the UK and the US find that, the presence of political leadership, as well the political will to address emerging conflicts, are other key factors affecting local realities. Like Collier (1997) and Bulkeley & Betsill (2003), other authors (Allman, Fleming, & Wallace, 2004; S. Baker & Eckerberg, 2008; Davies, 2005; Rachel Lombardi, Porter, Barber, & Rogers, 2010; Wilson, 2006) confirm that the lack of professional, technical or political support, that means governance capacity and competencies, knowledge and experience among local officers and councillors, and the lack of powers or resources are barriers to transform rhetorical commitments into real chances.

More fundamentally, others suggest that the gap refers to, on the one hand, a misunderstanding about the problem to address and, on the other hand, to a temporal shift between intention and action during which the initial conditions could be changed. Whereas Lindseth (2004) mentions “*a misframing of the problem as one that can be ‘solved’ at local level*”, referring both to the different politico-administrative levels and competencies taking part in climate change planning and policies and to the local characterization of causes and effects of climate change, Wilson and Piper (2010) admit that the ineffective actions rely largely on the “*different perspectives on the nature of the problem or its solutions*” on the basis of a general failure to clearly identify the causal relationship between action and problem.

Taking a multilevel governance perspective (Betsill & Bulkeley, 2003, 2004, 2006, 2007; Bulkeley & Betsill, 2005; Bulkeley & Kern, 2006) and considering key obstacles at each stage of the policy process, Corfee-Morlot et al. (2009)

add some interesting points to those previously debated. Although the problems related to the human resources, competencies and responsibilities of public administration are always relevant, the authors admit that the low prioritization of environmental motivations in the agenda setting phase, as well as the development of feasible (and viable) policies, in the short term without an integrated urban planning framework, affect the environmental impact of public strategies, in term of greenhouse gas emission abatement. Insufficient attention has been given to the implementation phase with a general absence of appropriate national policy and regulatory framework in addition to the complete absence of monitoring system to evaluate the outcomes.

The implementation gap in the review of planning and economics literature

To explore more explicitly and critically what are the limitations to the real implementation of energy strategies in order to suggest a novel theoretical framework, the context of the discussion needs to be broadened. Considering energy (and environment) less a sectorial camp of action and more an urban and planning policy (Dente, 1996), the interpretation of environmental planning can involve less conventional perspectives, to open it to the contamination and comparison with other fields of research and practice.

Recognizing the important link between policy studies and planning discipline, over the past two decades, urban scholars and policy analysts, also in Italy, have recognised as determinant component of planning policies the implementation phase questioning on efficiency of planning action in the policy process.

On the basis of well-known implementation studies (Barrett & Fudge, 1981; Majone & Wildavsky, 1978; Pressman & Wildavsky, 1973), Balducci (1991) uses the categories of policy analysis to comprehend urban problem management and its efficacy. He claims that the effective capacity of measures to realise efficient consequences cannot definitely rely on a specific phase but concerns the whole planning paradigm. Accordingly with Majone & Wildavsky (1978) the author states that there is no demarcation line between the formulation and the implementation phases, because the policy contents, the agenda setting and the choice of tools actually affect the results. Over the years, the influence of public policy analysis has forced the traditional approach to planning (mostly on the conformative approach) to consider plans, projects and programs as urban complex of social and political processes (Ponzini, 2008). Mazza (2004), and Dente and Fareri (2009) retain the emphasis on process, which requires attention to the actors mobilized, resources available, the mode of interaction between actors. It is a game theory that determines the course of a policy and its results. Palermo and Ponzini (2010), on the other hand, consider the limitations of this standpoint that focuses mainly on the formal features of a planning programme, underestimating the technical-operative dimension of the policy tools. Thus, Ponzini (2008) states how the missed implementation is to attribute also to the institutional organisation and mode of governance, to the technical and political expertise of public administration and to the means of involvement of the civil society.

Shifting the attention from programme to action, in coherence with implementation research perspective, Palermo and Ponzini suggest to reason about planning tools as an analytical category to understand the relative effectiveness of government's action. Different choices of tools can orient both the policy formulation by influencing the point of view of actors and stakeholders and the phase of agenda setting.

Contextually, in accordance with the international planning debate, many scholars in Italy argues that regulation alone is no more adequate in guiding collective decisions about urban land use (Mazza, 2004), taking into account the general inefficacy of public intervention.

Likewise, urban economics has shown that the inefficiency of the forms of government could be attributed—at least in part—to the authoritative nature of the tools for implementing and managing plans and, in general, to an incorrect intervention of the public authority in the market (Micelli, 2002), that is justified, in the welfare economics, by a market failure or the intention to prevent from occurring. Urban policy tools can be considered a way of regulating the negative externalities that characterised the urban system: “*the uncompensated costs borne, or the freely captured benefits enjoyed, by someone else than the one who caused them*” (Buitelaar, 2003). Important examples from urban areas include traffic congestion, noise and smell, pollution, agglomeration advantages, and ethnic segregation and/or concentration (Verhoef & Nijkamp, 2002).

Generally, the public economy has suggested strategies that follow two different economic approaches, the welfare economics, a branch of neoclassical economy, and in particular the studies of Pigou (1920), and the new institutional economy, based on the well-known Coase Theorem (Coase, 1960). Many have interpreted the two visions as opposed, although the reality is so complex that it cannot fully reflect such a dichotomy. However, as examples, the arguments will be separately reported.

The ‘Pigouvians’ argue that steps should be taken by governments to reduce externalities for a more efficient allocation using the price mechanism and authoritative techniques. With the help of subsidies and taxes they would encourage

positive externalities or prevent negative externalities (Webster, 1998). Generally, the responses of local planning authorities to negative spill over effects induce a decision-centred view, top-down, public-led methods and procedures in which command-and-control regulations, such as zoning, conformance-based building code, or financial instruments are used in order to control the market.

The ‘Coasian planners’, on the other hand, claim that “[...] *there is great interest in creating innovative planning tools—in particular through real estate taxation and the creation of new markets—that do not replace the market (as command-and-control tools do), but are limited to intervening to correct its failures*” (Lanotte & Rossi, 1995; Stellin and Stanghellini, 1997, in Micelli, 2002). This hypothesis suggests that, in other words, the local planning administration does not necessarily prescribe the forms of use of property rights but merely regulate and determine the amount of fees to be exchanged. In this way it encourages private actors to be responsible in promoting the interests of the city through the market. The goal of land use planning within these economic approaches seems to be to internalise externalities as efficiently as possible (Micelli, 2002) assuming efficiency and effectiveness to be coincided. In practice, it is also necessary that institutions be effective in order to achieve goals, as efficiently as possible.

3.3.2 The analytical categories: the limits to the implementation phase

Applying a broad view on the weak implementation of solutions, urban planning and policies which are deployed with respect to sustainability, the systematic review of the literature describes phenomena using four distinct but overlapping analytical categories. On the one hand the question can certainly be placed under the lens to observe the disciplines of government and environmental planning (environmental science, governance and planning) in particular by adopting the method of case studies. The other is a necessary incursion in the literature of public policy analysis and economic affairs (public economics), disciplines that have had at least in the last twenty years, points of contact with the planning. To sum up, the following table (Table 3.1) shows a summary of the reasons for progressive weakening of energy planning practice, associated with distinct indicators.

Table 3.1: Summary of analytical categories

ANALYTICAL CATEGORIES: LIMITS	
POLICY TOOLS	Adequacy of policy instruments
POLICY IMPLEMENTATION TOOLS	Adequacy of policy implementation instruments
POLICY PROCESS	Development of city visions
	Formulation and approval of policies with clear-time horizon and prioritisation
	Evaluation framework
	Participatory planning process
TECHNICAL AND POLITICAL CAPACITY AND COMPETENCE	Political leadership with clear long-term vision and decision-making authority
	Multi-disciplinary technical expertise

Source: author’s elaboration

Limits related to the policy tools

Policy tools vary considerably from country to country. Despite this and in accordance with the novel perspective to Italian urban planning (Palermo & Ponzini, 2010; Ponzini, 2008), the urban planning toolbox at disposal of municipalities seems to produce the same results. Salamon (2002) asserts that “*the convoluted structure of many public programmes was the source of many of the problems causing public programmes*”, highlighting the limited number of basic tools whereas there is a multitude of different programmes. The policy tool approach (Howlett & Ramesh, 1995; Howlett, 1991, 2004; B. G. Peters, 2000; Salamon, 2002) predicts that the improper selection of tools or, in many cases, the absence of local refinement of policy tools, may also be a critical factor for the success of public actions. Accordingly, the choice of integrated tools sets should be done in relation to types of problem and context considering that policy instruments should be interpreted as social institutions capable of modifying rules and behaviours and that the social and political interactions subsequent to the adoption of a given tool must be considered (Palermo, 2008). Current researches and experiences show that different tools are not alternative options but should be properly combined with regard to the problem, the context and the local models of urban governance of climate change (Bulkeley & Kern, 2006). Actually, Bulkeley and Kern found that, in the UK and Germany, municipalities have been concentrated predominantly on self-governing – energy management of municipal properties - and enabling modes, such as financial incentives,

subsidies and public-private partnerships. The authors further state that the opportunities related to planning and land use regulation are not “*systematically exploited*” using few policy tools and pre-existing regulatory framework.

In Italy, the local planning responses to climate change causes and effects have been mainly focused on mitigation aspects introducing energy planning at the beginning of the 1990s through a new regulative framework defining the Municipal Energy Plan (MEP) and then, recently, adopting in a voluntary way the Sustainable Energy Action Plan (SEAP), the initiative of the European Covenant of Mayors. Both experiences highlight the difficulty for local administrations to interpret such policy tools as sectorial planning, ‘ad hoc’ planning or spatial planning instruments, more oriented to visibility and feasibility in the choice of mechanisms of action than other evaluating indicators.

Limits related to the policy implementation tools

The implementation phase is influenced by the role that local authorities can play in different institutional actors, the different levels and the resulting modes for local action and the use of implementation instruments (Bulkeley and Kern, 2006, Corfee-Morlot et al, 2009). Looking at the urban economics literature, the attention to the effectiveness of implementation strategies opposes, two different theoretical approaches: the welfare economics, a branch of neoclassical economics, in particular the studies of Pigou (1920), and the neo-institutional economics, on the basis of the well-known Coase’s theorem (Coase, 1960). In pigouvian terms (Pigou, 1920) land use planning and zoning are good examples of authoritative control (command-and-control regulation) by which the administration intends to address market failures represented by the negative externalities generated by physical interaction and spatial typical of urban areas. Pigou explains: “*zoning is introduced because the land market fails to internalize externalities*” (quoted in Buitelaar 2002). In addition to the practice of zoning, which is used in the general plan and the operational plan, taxes or subsidies, according to the type of use and location, can be introduced in order to directly influence the market, maximize wellness and prevent the negative externalities using the price mechanism (fiscal regulation).

Although the contribution of welfare economics has had a significant impact on land use planning, in recent years the limits of this approach have become apparent, and in particular the hypothesis according to which the intervention of the public in the event of market inefficiency occurs without cost and effectively, are much debated. Micelli (2002) argues that the inefficiency of the forms of government could be attributed, at least in part, to the authoritarian nature of the instruments of implementation and management plans, and in general, to an incorrect public intervention in the market. Among others, in fact, Webster (1998) argues that there are not only market failures, but also public and institutional failures, linked to an imperfect administrative process of resources allocation (Wolf, 1979).

Limits related to the policy process

The problem of the implementation is far deeper than generally reported by environmental studies: it is not only related to localized issues but it is inherent to the construction of public policies, the policy-making stage. A series of national and international studies attribute the implementation gap to the entire process (policy process).

On the basis of studies related to the policy implementation (implementation research), some Italian authors, dealing with urban planning (among other, Balducci, 1991), pose at the centre of the discussion the structure of the planning process (planning) as well as the different dimensions of the issue of effectiveness, using the analytical tools of public policy analysis.

The results of any public policy are not contingent at the stage of formulation than for implementation as political content, such as setting priorities (agenda setting) and the choice of instruments affect overall results. On the other hand, the influence of these studies of public policy analysis has forced the traditional approach to planning (type mostly legal) to consider the plans, projects and complex urban programs in terms of social and political processes (Mazza, 2004), which require attention to the actors mobilized, to available resources, to the ways actors interact.

Limits related to the technical and political capacity and competency of local authorities

Those involved in environmental policy and planning tend to consider success and failure of a plan as a problem of institutional capacity of the public administrations. In essence, they argue that merits and faults of a plan must be sought in the public that has adopted this plan and that has been proven or not able to put it into practice.

Collier (1997) observes that the potential for implementation of the measures depends heavily on proactive government, which can be guaranteed by the experience gained in environmental issues at the local level, the nature and extent of the jurisdiction relating to the protection from climate change, and the availability of financial resources. Bulkeley and Betsill (2003), make it clear that the powers of local governments, their capacity and availability of financial resources to objectives outside ordinary planning, as well as the presence of a strong political leadership, are other key factors that influence the results. Similarly, other authors (Allman et al., 2004; S. Baker & Eckerberg, 2008; Davies, 2005; Rachel Lombardi et al., 2010; Wilson, 2006) opposed to the implementation gap the lack of professional support, technical or political, which means governance capacity and skills, knowledge and experience of officials and councillors, as well as lack of power or human resources.

It should also be noted that elected officials do not necessarily have technical expertise concerning energy and urban settlements and they have even less knowledge to tackle the root causes of climate change or of the real implications of the concept of sustainable development. From a technical point of view, the cross-disciplinary nature of the problems of energy, makes it difficult to have, at all levels, the necessary skills. As a matter of fact, powers may be limited or centralized, not being able to involve all levels and services required to promote solutions in an integrated way. This is reflected in the definition of policies in the short (very short) term what is, politically feasible - and easy to use in election campaigns - and financially sound. The trend concerns policies that reflect the organization of the town, involving technological innovation and product and therefore strongly market-oriented. This results in a deficit with respect to process innovations, that is to say that grasp the relations between environmental issues and spatial dimension, while having, on the other hand, the lack of integration of urban issues in pre-existing regulatory frameworks (Bulkeley et al., 2009).

3.4 Evaluation questions: interdisciplinary and plurality

Scholars increasingly recognize that the strength of adopted plans does not necessarily correlate with the implementation of their contents, and that research is needed to understand the degree to which policies are being implemented after plans are adopted. As the analytical categories in the previous paragraph highlighted, the limits to the implementation are mainly related to four themes that are mostly recurring in the literature. The policy tools at disposal, the policy implementation tools, the policy process and the technical and political capacity and competency of local authorities clearly emerge as the main reasons for the weakness of local energy planning instruments from the main disciplinary traditions.

Planning scholars and practitioners have long debated the importance of tracking and measuring the implementation of adopted policies. Despite the extensive literature review and criticism regarding the translation of commitments on energy efficiency and production, what appears to be missing is a reflection on the results of municipal energy plan by applying an evaluation methodology based on an interdisciplinary approach able to overcome the traditional sectorial interpretations.

This section aims at discussing the state of the art and the main critical issues related to the evaluation of spatial plans and presenting the interdisciplinary evaluation methodology conceived for municipal energy plan. Consistently with the objective of this part, the paragraph is structured in two main sections: 1) an analysis of the general principles for planning evaluation, in particular those synthesized by Oliveira and Pinho (2010), referred to the evaluation theory and practice, and showing their relationships with the methodology (3.4.1); and 2) the description of the methodology based on an interdisciplinary approach, namely the different specific criteria, the main data sources and assessment techniques, and the construction of sub-criteria (3.4.2).

3.4.1 Principles

Khakee (2000) argues that, both from a theoretical and a practical point of view, planning and evaluation should be inseparable concepts. Whereas in the practice, the adoption of an economics perspective has supported the dominant use of quantitative methods, such as cost-benefit and multi-criteria analysis (Deakin, Mitchell, Nijkamp, & Vreeker, 2008; D. Miller & Patassini, 2005), in the research, qualitative approaches have proposed different type of conceptions of spatial planning and its implementations (Faludi, 1985, 2000).

Accordingly, Patassini (2006) claims that, especially after the translation of European Directives on Environmental Impact Assessment and Strategic Environmental Assessment in the national and regional legislations, the evaluation of planning practice has taken reductive characters in Italy with an environmentally dominated approach. The author asserts

that the spatial plan has been generally considered an object rather than a process, and a form of categorization has considerably simplified the connections and correlations between objectives, options and criteria. As a result, requests of justice, especially distributional justice, institutional learning, conformance and performance have been not completely ensured.

The necessity to understand if plan works - “good” or “bad”, following Alexander and Faludi (1989) – seems, therefore, an obvious observation (as seen, with some exceptions). Hence, despite the heterogeneity and complexity of energy concerns in urban areas, the continuous interest for the evaluation dimension of planning has to also consider planning practice as the municipal energy plan providing a frame of reference both for operational and strategic decisions.

Oliveira and Pinho in their article “Evaluation in Urban Planning: Advances and Prospects” (2010) provide a proposal, on the basis of a comprehensive literature review, for a set of general principles to evaluate the implementation of urban plans. Among others, mainly three of these will be further discussed:

- (1) The design of an assessment methodology must be clearly linked with planning evaluation theory;
- (2) The evaluation methodology should suit the object under appraisal;
- (3) The planning practice should be evaluated as a whole (plan-process-results).

The design of an assessment methodology must be clearly linked with planning evaluation theory

In accordance with the theme developed in this dissertation and in particular in this part 2, it is necessary to reflect on the different conceptions of success in plan implementation. Conformance-based and performance-based evaluation approaches are two alternative schools referring to planning theory and public policy analysis (the implementation research, in particular) literature. As asserted by Alexander (2009), “*in theory, a comprehensive assessment of a plan’s value might combine both approaches with some (ex-post) evaluation of the plan’s rationality and success (Alexander&Faludi, 1989)*”. In practice, the two strands of thought have different concrete effects on evaluation processes.

Conformity measures the degree to which decisions, outcomes, or impacts adhere to the objectives, instructions, or intent expressed in a policy or plan (Alexander & Faludi, 1989). Alexander (2009) asserts that the conformance-based evaluation judges the success or failure of planning mainly using two criteria. One is the conformance degree between the real outcomes and the planning policy prescriptions. The second is the effectiveness and efficiency of implementation tools (regulations, programs, detailed plans or projects, budget allocations, etc.) in relation to the promotion of defined objectives. Any differences between the goals and objectives of the adopted plan would, under this line of thinking, be considered a failure. Due to the uncertainties involved in the planning process, and the social and political complexities of plan implementation, as the analytical units of previous paragraph highlighted, a direct cause-and-effect relationship is an unrealistic expectation for most plans, among others also in part for the municipal energy plan. Talen (1996) asserts that the dismissal of linear association between the adopted plan and its outcomes on the basis of uncertainty “*can be seen as evaluation avoidance*” (p. 254).

Accordingly with the complexity of decision-making process, investigated also in the public policy analysis literature, Alexander and Faludi reject this means-ends approach to measuring plan effectiveness. Alexander (2006) defines the plan as a decision framework and its performance can be expressed as a plan’s or policy’s usefulness and effectiveness in this role. Mastrop and Faludi (1997) reinforce this stance when discussing the merits of evaluating strategic plans. These authors assert that the established policy or plan should never be followed blindly, but rather needs to be constantly re-enacted and readjusted. Instead, the key to plan performance is the way in which a strategic plan holds its own during the deliberations following plan adoption.

Faludi (2000) later considers that there are some differences between project plans and strategic plans. While the former is associated to a technical process of producing material things (a “blueprint”), the latter is a process of mutual learning involving interaction between actors. This also means that evaluation is not simply a process of “*measuring material outcomes*” (Faludi, 2000) but the appraisal of the role of plan in helping decision makers to learn how to face present and future problems. Once adopted this perspective, the author claims that the performance of plans happens in the case in which these support the decision makers in making sense of their situations, and so they need to be evaluated in this light. Within this context, the question now lies on what is municipal energy plan, in other terms, what the concept lies behind it. Regarding its conformance and performance characters, according to the conceptualisation developed by Faludi (2000) and adapted also by Patassini (2006), the Italian municipal energy plan is strongly influenced by the national and regional planning contexts that consider it as a sectoral plan, mainly oriented to regulate some sectors and propose actions and interventions in others. The local practice defines a range of situations in which the objects, the time-horizon, the construction of a future view, as well as the effects, greatly vary, defining uncertain predominant characters. Despite this,

the distinction generally adopted here between energy efficiency and energy production permits to distinguish two points. Firstly, the policies with object energy efficiency usually focus on the building sector, and in the Italian case especially on new building, using a regulative approach (the Building Code) with a strong conformance dimension. The object is material, the form is similar to a blueprint and the effects are determined in advance. On the other hand, concerning the transport sector, the municipal energy plan generally refers to the local urban mobility plan that is mainly considered a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life, to plan and manage of mobility access to and through the urban area and to ensure the accessibility using public transport system. Secondly, the policies finalised to increase the energy production on-site or networked from renewable resources, are generally strategic in character. Beyond the national and regional legislation on the provisions of singular buildings, the determination of future view is central to the problem. The object is the decision, the future is open and the interaction between actors is continuous.

The evaluation methodology should suit the object under appraisal

Following evaluation theory (Oliveira & Pinho, 2009, 2010), the conceptual framework for analysing and developing questions has to suit the object under appraisal. In the literature on planning and evaluation, there are a number of solid contributions to the relationships between planning models and their specific evaluation methods (Alexander & Faludi, 1989; Khakee, 2000; Voogd, 1997). Despite its reduced expression in the literature, the analysis of evaluation practice in real contexts provides some indications that confirm the importance of these relationships. Accordingly, an object can only be fairly assessed if the methodology is adequate for that purpose and if the planning practice is considered in its territorial context, legal system and planning culture. Oliveira and Pinho (2009) suggest that the number of specificities introduces significant changes in the generic character of a current evaluation model or methodology. In accordance with Faludi (2000), the answer as to the type of evaluation needed depends on our assumptions about planning, its function, or purpose. Hence, the question to be solved is about the predominant character of the municipal energy plan.

The design of proposed evaluation methodology involved a preliminary study of the municipal energy plan in the Italian planning and legislative system, both considering the planning and management of energy concerns in urban areas and the specific regulations on energy efficiency and energy production. Although some innovative experiences have been developed and despite the continuous progress in research and practice, the Italian planning instruments dealing with energy concerns in urban areas have remained anchored to a traditional and sectorial approach that simplifies and generally regulates some aspects, in particular the building sector. The object of the plan is the determination of auspicious effects in terms of CO₂ and energy demand reduction that can be measurable in quantitative terms by monitoring processes with policy-relevant indicators.

The planning practice should be evaluated as a whole

Alexander and Faludi (1989) argue over the general acceptance of the link between planning and action, and between plans, implementation and results, defining a planning practice that has to be evaluated as a whole.

Two main reasons support this statement in the particular case of local energy plan: (a) the analytical categories described in the previous paragraphs as result of the wide-ranging literature, particularly the considerations on the relations between limitations and process; (b) the need to integrate the evaluation in all dimensions of the planning process is strengthened by the evolution line of planning theory in the twentieth century that has renewed the interest on urban form, on the influence of planning in the urban development process and in particular on energy demand and production.

Integrating the traditional interpretations of energy planning practice with less conventional perspectives, it is a recurrent concern in the interdisciplinary debate in consideration of the progressive weakening of planning responses not only to the policy tools at disposal but also to some critical issues arising in the plan process. The literature in relation has concluded that the reasons for “bad” plans have to be mainly sought inside the public administration and in the planning process. On the one hand, the difficulties to develop specific plan proposals and define plan objects influence the formulation and approval of short-term, politically feasible and financially sound policies. On the other hand, the phase of implementation is affected by the role that actors and local public authorities involved in the process would play and the consequent different modes for local action and use of implementation tools.

With reference to the debate on urban form in planning theory, Oliveira and Pinho (2009) report the contribution of the concept of sustainable development to the renovated attention to spatial requirements. As earlier supported by the Green Paper on the Urban Environment (1991) and Aalborg Charter (1994), the concept of energy in the urban environment is

inextricably tied both to the sustainability of urban environment and the adaptation and mitigation to climate change. Thus, contemporarily, stimulated by the energy crisis of the 1970s and the consequent number of International and European initiatives specifically addressing energy questions, the management of energy supply, distribution and use began to be the subject of considerable interest also for planning scholars. The pioneering researches suggested that the spatial dimension of energy is an ancient question and the scientific literature later on has researched the physical factors as previously debated in Part 2. These considerations on the influences of the urban form on energy demand and feasibility of alternative systems of energy supply and distribution show the importance of a morphological dimension also of local energy planning.

3.4.2 The methodology

The methodology to assess the performance of local planning responses to energy concerns aims to contribute in ex-post evaluations to action-orienting reconstructive critiques of energy planning practice. Nevertheless, it can be applied in on-going evaluation to contribute to orient the development of the plan. The evaluation methodology is strongly oriented to understand the strategic and operative dimension of public action, particularly evident in each of evaluation criteria. This is due to the peculiar characteristics of Italian planning system and institutional allocation of competencies in the key policy areas and the consequent concept of local planning intervention. The design of evaluation methodology involved a preliminary study of local energy planning instruments in the Italian context and further exploration of main contributions on spatial dimension of energy use and supply by literature reviewing. Furthermore, the formulation of evaluation criteria and sub-criteria have to necessarily consider, as the contemporary evaluation planning debate has highlighted (Oliveira & Pinho, 2010), the integration between the questions of plan quality, plan process and the achievement of physical results. Concerning the plan quality, the relevance of plan proposals to guide and manage the urban development should be considered in relation to the legal and theoretical framework and its internal and external coherence. Then, the appraisal of plan process need to include specific criteria based on the relationships between the different stages and dimensions of plan process, such as the availability of human and financial resources, the relations between different actors and stakeholders involved, as well as those between sectors of the public administration. The involvement and the role that politics would play in plan making, such as in agenda setting and the elaboration of plan strategies have to emerge from the choice of evaluation criteria. Lastly, the discussion on evaluation principle has concluded on the importance of measuring the achievement of physical results on the ground and the influence of planning in the urban development in the context of energy planning. The reduction of GHG emissions and the control of energy demand in building and transport sectors, as well as the containment and densification of urban areas are pivotal aspects about the real impact of plan and its capacity of guidance.

The evaluation criteria

As the previous considerations highlighted, research into energy planning is clearly related to a number of traditionally separate disciplines located in social sciences and natural sciences: spatial planning, economics, politics, law, environmental sciences and building physics. Consequently an analysis of energy efficiency tasks - from rhetoric to practice - necessitates an interdisciplinary approach (Adger et al., 2003).

Accordingly, after having recognized in a multi-disciplinary debate the main reasons for implementation deficit of planning responses and organized them in analytical categories, three key questions appear as mainly involved in examining the success of public actions. Efficiency, effectiveness and integration are issues that all the disciplines have addressed, generally with a particular attention to one dimension in respect to the other (Table 2).

As can be seen, in the great majority of cases, all the three criteria are central to interpret the nature, the causes and the effects of planning choices. Although it is possible to recognize and examine each of these criteria especially in one or more dimensions where they place greater emphasis, it is necessary to pay attention to the plurality of perspectives. As a result, the use of these concepts has not implied that they have been taken into consideration in a unique way, but rather they have been approached with many differences from several standpoints. In particular, the limits' readings have been approached from three different perspectives: a public policy analysis perspective, a planning theory perspective and a public economic perspective (Table 3.2). Whereas the first and second ones have influenced each others, questioning on the conception of plan results by a wide formulation of what spatial plan is, public economics has intended to reflect on the mechanisms of market affecting the efficient allocation of resources (land and property). The interpretation given here of efficiency, effectiveness and integration is explained in the following parts.

Table 3.2: Evaluation criteria and disciplines

	ECONOMIC SCIENCE	PLANNING THEORY	PUBLIC POLICY ANALYSIS
<i>EFFICIENCY</i>	■ ■	■ ■	■ ■
<i>EFFECTIVENESS</i>	■ ■		
<i>INTEGRATION</i>		■ ■	■ ■

Source: author's elaboration

Table 3.3 shows the most recurring topics in dealing with questions, which have been assumed as pivotal in the discussion on barriers to local implementation.

Table 3.3: Analytical categories and evaluation criteria

	LIMITS	EVALUATION CRITERIA		
		Efficiency	Effectiveness	Integration
<i>POLICY TOOLS</i>	Adequacy of policy instruments	■ ■	■	■
	Development of city visions		■ ■	■ ■
	Formulation and approval of policies with clear-time horizon and prioritisation		■ ■	■ ■
<i>POLICY PROCESS</i>	Adequacy of implementation tools	■ ■	■	
	Evaluation framework			
	Participatory planning process	■	■	■
<i>TECHNICAL AND POLITICAL CAPACITY AND COMPETENCE</i>	Political leadership with clear long-term vision and decision-making authority		■	■ ■
	Multi-disciplinary technical expertise	■		■ ■

Source: author's elaboration

Criterion 1: Efficiency

Efficiency receives more attention in economics of public decisions in relation to the implementation devices and in planning theory and public policy analysis where the outcomes of planning practices have been the subject of a large branch of literature in Italy since the 1970s.

Economy scholars have focused on the relationships between the market economy and government and the tools by which dealing with the problem of externalities. Adger et al., (2003) stress that efficiency is often narrowly focused on welfare maximization, related to environmental economics. Hence, in welfare economics, the idea of efficiency is generally associated with the allocation of resources – land for instance – that allows producing goods and services. For these reasons the allocative efficiency is usually analysed by referring to Pareto optimum: the allocation of resources is such that all the improvements for the parties involved have been exhausted. In many situations, however, market failures, such as negative externalities, public goods and monopolies, appear and the optimum cannot be achieved. It will be argued then, that land use planning should be ruled to correct these market failures and to obtain a more efficient and productive system (Webster, 1998). Having considered the planning failure and the limitations of welfare economics' standpoint, neo-institutional economists have introduced the concept of process efficiency and this is the approach adopted here. In process efficiency, transaction costs, i.e. the costs incurred for the reduction of uncertainty and for the coordination of operations, are considered, implicitly or explicitly, as the determinant of efficiency (Buitelaar, 2003). This institutionalist perspective relates to the Coase Theorem: when property rights are well defined and the cost of transacting is zero, resource allocation is efficient and independent for the pattern of ownership (Coase, 1960).

As a result, the appraisal of economic efficiency focuses on the process, on the consistency between policies and tools and between strategies and implementation strategies.

On the other hand, the public policy analysis and the implementation research have considered policy instruments as critical junctions of the political processes affecting also the standpoint of planning theory. In this perspective, the policy approach (Bolocan G. et al., 1996) has challenged the comprehensive planning model, prompting questions on the efficiency of the entire planning process. Efficiency is considered in the internal (between plan strategies, actions and implementation) and external (with spatial plan/land use plan) coherence of energy plan instruments and in the plan process, in terms of participation and monitoring.

Moreover, efficiency is a term widely used to define the ratio of energy services in regard to energy input. Energy efficiency improvements refer to a reduction in the energy used for a given service (heating, lighting, etc.) or level of activity.

Criterion 2: Effectiveness

Effectiveness in general terms involves the achievement of planning goals.

In environmental sciences it refers to the capacity of a plan, programme, policy or decision, in more general term, to achieve its expressed objectives. “*Effectiveness can either be gauged through reducing impacts and exposure to them or in terms of reducing risk and avoiding danger and promoting security (Jones, Lannon, & Williams, 2001). The effectiveness of adaptation can sometimes be directly measured—for example, the number of houses removed from high hazard locations can be counted—but more often the effectiveness of an adaptation measure is more elusive: effectiveness depends on the sequence and interaction of adaptations over time*” (Adger et al., 2005). This establishes a strong relation with “performance” concept, generally used in mandatory energy labelling but also in the plan performance approach (Alexander & Faludi, 1989; Faludi, 2000). Whereas the “energy performance” concept is easily understood and associated with the analysis of environmental outcomes of sectoral policy, the evaluation of spatial planning is not simply a matter of measuring material results. Especially in this study, the process of learning, innovating and experimenting the tools and modes of governance the urban energy issues look beyond the material objects. In this view, the conception of success in energy plan implementation reveals complexity both about the multiple dimensions to recognize and evaluate (Alexander & Faludi, 1989) and, on the other hand, on the intrinsic uncertainty of the theoretical framework of energy-city (Alberti, 1999).

Concerning the concept of performance in relation to energy standards, energy mandatory labelling is an example of performance based regulation (one of the three regulatory regimes described by Peter May in "Regulatory Regimes and Accountability"). These are regulations that are based on the achievement of desired results. Performance-based regulation has goal-oriented outcome specifications for rules and standards, and regulatory goals are embedded in the results orientation. This is, therefore, used to regulate aspects of air and water quality, building and fire safety, energy efficiency, forest practices, or pipeline safety.

Although the goals of land use planning within the neo-classical (welfare) and the neo-institutional approach seems to internalize negative externalities as efficiently as possible, in practice, the goals of land-use planning are plural and often go beyond to internalize spill over effects (Buitelaar, 2002, 2003). Thus, it is necessary have institutions effective in order to achieve goals as efficiently as possible.

Criterion 3: Integration

Local Agenda 21 can be intended as the first experience of integration in seeking to capture the multi-level governance dimension involved in the pursuit of sustainable development (S. Baker & Eckerberg, 2008), as well as the European Strategies for Environmental Policy Integration (EPI), dating back to at least the early 1990s (Single European Act, 1986) and further strengthened by the 1992 Maastricht Treaty. In the different experiences and types of synergy between environmental concerns and urban development, political scholars mainly describe three types of integration. Firstly integration is considered a link between social and ecological systems, in particular concerning sustainability concept (Adger & Jordan, 2009), then integration between different actors, stakeholders and institutions, finally horizontal and vertical policy integration, largely debated in the perspective of multi-level governance of climate change (Bulkeley, 2009; Evans et al., 2003).

Policy integration does not refer to a new concept within spatial planning discourses but a part of planning modernization agendas where fostering the improvement of policy integration, both horizontally, across policy domains, and vertically, between policy actors and scales of governance (Counsell, et al., 2006; Nadin, 2007). The integrated approach is particularly relevant to the current administration agendas, facing energy efficiency concerns also into more general challenges, climate change and sustainable development, cross-cutting issues that transcend the boundaries of established fields (Dominic Stead & Meijers, 2009). Although literature related to “policy integration” can be found in organizational science, political science and policy analysis, more attention has been posed on studies about comprehensive approach in spatial planning.

The evaluation methodology

Table 3.4 shows a synthesis of evaluation methodology. As can be seen, each specific criterion is investigated using different techniques and focusing on complementary objects.

The municipal energy plan, therefore, is considered in its planning and administration systems and having effects and implications on the urban development of city. Two levels of assessment techniques would also reflect the interdisciplinary and comprehensive approach to the definition of methodology and specific criteria. They would permit to completely understand the implications of this planning practice. Firstly, the first level of evaluation considers the reading of the municipal energy plan, other urban and territorial plans, and official documents (available on-line), such as the Building Code. Then, using a semi-structured interview, four case studies are further explored.

The table also provides fourteen specific sub-criteria that complete the evaluation methodology. Some of these evaluate how the plan was made and used (performance) and others evaluate its impacts (conformance). As revealed in the following table (3.5), the sub-criteria clarify the significance of criteria.

Concerning efficiency, the following sub-criteria are focused on: (1) Formal and procedural compatibilities of energy planning instrument with spatial plan/land use plan, (2) Relationships between the objectives and the plan implementation strategies, (3) Implementation tools selection and substitution/evolution, (4) Monitoring process/data collection, (5) Participatory process.

Firstly, formal and procedural compatibilities of energy planning instruments with spatial plan/land use plan should consider for each instrument the interrelations with others, the combination (the instrumental mixes), the degree of coherence between each others, the synergies and contrasts, and the variety of effects. In other words, the complementary and conflicts within instruments is the subject of this sub-criterion. Accordingly with Howlett (2005; 2004), the question is: what are the interactions between instruments?

Table 3.4: Synthesis of evaluation methodology

SPECIFIC CRITERIA	EVALUATION OBJECT	SUB-CRITERIA	EVALUATION TECHNIQUES
EFFICIENCY	Plan Planning System	(1) External coherence	Reading of the plan / of the other official documents (Building Code/.....)/Interviews
		(2) Internal coherence	
		(3) Implementation tools selection	
		(4) Monitoring process	
		(5) Participatory process	
EFFECTIVENESS	Plan City	(6) Problem definition	Reading of the plan/of the other official monitoring documents/Interviews
		(7) Identification of the causal relationships between the nature of the problem and the objectives of the plan	
		(8) Environmental plan impact	
		(9) Plan guidance	
INTEGRATION	Plan Planning System Administration System	(10) Horizontal integration	Reading of the plan / of the other plan for that territory / of the other official documents (Building Code/.....)/Interviews
		(11) Vertical integration	
		(12) Cooperation among departments	
		(13) Political long-term vision	

Source: author's elaboration

Then, the sub-criteria: *Relationships between the objectives and the plan implementation strategies* and *Implementation tools selection and substitution/evolution*, investigate on the formation of policy and policy tools. While the need to match the plan objectives and implementation strategies and instruments exist in all policy areas, it is now particularly apparent in environmental and in urban energy policies. The changing nature of environmental problems occurred in the last three decades, from quantitative and easily recognized issues to globalize and multi-disciplinary ones, affects the conception of what the problem is about and what objectives can be achieved. Most objectives can, in a technical sense, be accomplished by a number of different strategies and instruments; in other words, certain instruments can seem equivalent. Peters and Hoornbeek (2005) state that the instrument choice has to take into account aspects of the social, political and economic context, assuming the full range of instruments at disposal. Accordingly, instruments' choice is circumscribed by organizational culture, is shaped by the preferences of state decision-makers and the nature of the constraints within which they operate. The differences in administrative context influence (Eliadis et al., 2005; Howlett, 2004; B. G. Peters, 2000) the capacity to utilize a self-governance approach, or governing by provisions, or by authorities or, last, through enabling. Sub-criteria 2 and 3 consider not only the particular context in which the energy plan operates but also the theoretical framework and research findings that should be the basis of design plan proposals and implementation strategies.

Fourthly, monitoring process and data collection are essential to have a feedback. The adoption of effective monitoring scheme with appropriate indicators to regularly check the progresses achieved is evaluated.

Fifthly, planning practice more considers the activation of a participatory process. The meaningful and active involvement in plan making and implementation of different community-level stakeholders, including local governments, communities, civil society and businesses, is a necessary exercise if the plan intends to be credible and socially shared. Furthermore, non-public actors have increased their role in the plan making and implementation phases, in particular, considering the shift in the modes of urban governance, they can influence the agenda setting in different forms (among others the local Agenda 21 processes) and give real plan implementation.

Regarding effectiveness, the following sub-criteria are used: (6) definition of the problems to be addressed, (7) identification of the causal relationships between the nature of the problem and the actions, (8) plan impact on CO₂ emissions, energy consumption and generation, (9) plan impact and guidance in urban development.

All these sub-criteria focus on the unquestionable relations between energy consumption, greenhouse gas emissions and urban areas. Given that “*by some estimates, cities account for 78% of carbon emissions from human activities*” (Stern Review, 2006, p.457), commentators and urban policy-makers have highlighted the potential role that cities might play in addressing the sustainable energy goals. The existing housing stock and the transport sectors, which are the reason for 65% of the total energy use in the EU, are the largest source of emissions and have the greatest potential to increase energy efficiency and production.

Within this context, the definition of the problem to be addressed is pivotal. What the problem is about, clearly identify the reasons for energy demand and GHG emissions level and develop a set of dimensions to which the problem could be ascribed should be the first step in plan making phase.

Table 3.5: Criteria, sub-criteria and indicators

CRITERIA	SUB-CRITERIA	INDICATORS
<i>Efficiency</i>	(1) External coherence	- Relationships in terms of objectives 1.Relationships in terms of effects of implemented actions [matrice obiettivi pec/obiettivi prg (altri strum)]
	(2) Internal coherence	- Relationships between the objectives and the action plan [matrice obiettivi/azioni] - Relationships between the actions and the plan implementation strategies [matrice azioni/strategie]
	(3) Implementation tools selection	- Implementation strategies - Actors - The nature of implementation tools
	(4) Monitoring process	- Development of effective monitoring scheme with appropriate indicators - Regularly check
	(5) Participatory process	- Quantity of different community-level stakeholders - Promotion of public participation by the local administration
<i>Effectiveness</i>	(6) Problem definition	- Identification of the reasons for energy demand and GHG emissions level - Development of hierarchic list of objectives
	(7) Identification of the causal relationships between the nature of the problem and the objectives of the plan	- Relationships between the multiple causal factors of energy demand and GHG emissions and the objectives of plan
	(8) Environmental plan impact	- Plan impact on CO ₂ emissions - Plan impact on energy consumption - Plan impact on energy generation
	(9) Plan guidance on urban development	- Capacity to suggest and guide the more appropriate physical development of urban areas in proposing coherent and feasible policy in land-use plan
<i>Integration</i>	(10) Horizontal integration	- Inclusion of energy issues into public’s agenda -Development of temporary project coordination units -Design joint policy
	(11) Vertical integration	- Integration across different tiers of government, different levels of decision-making
	(12) Cooperation among departments	- Design coordinated policies
	(13) Political long-term vision	- Relationships between political mandate and policy term

Source: author’s elaboration

Then, the appropriate identification of the causal relationships between the nature of the problem and the actions should clearly link the multiple causal factors of energy demand and GHG emissions and the actions of plan. On the one hand,

the planning practice should be improved by inputs from the growing body of knowledge about the interactions between physical, social and economic context with energy consumption and its environmental impact. On the other hand, this linkage can contribute to put into practice the theory, which is the most relevant objective within this activity.

Obviously, the plan impact on CO₂ emissions, energy consumption and generation have to be monitored and evaluated as well as the plan impact and guidance in urban development. The physical dimension of local energy plan and its capacity to suggest and guide the more appropriate physical development of urban areas proposing coherent and feasible policy is necessary to the densification, compactisation and land-use maximization.

In relation to integration, the following sub-criteria are considered: (10) inclusion of energy questions into all stages of policy-making in other policy sectors (horizontal integration), (11) integration of energy policy over different level of policy-making (vertical integration), (12) cooperation between different departments, (13) political long-term vision.

Given the crosscutting nature of energy concerns, it is desirable that not sectoral objectives and intersectoral interactions are central to policy integration. Horizontal integration across policy domains considers the capacity to design joint policy for the sector involved. It requires integration within the local agenda or among departments within the same local agency (inclusion of energy questions into all stages of policy-making in other policy sectors). In addition, this needs connections between the contents of the plan and the real allocations of local budget.

On the other hand, vertical integration concerns integration across different tiers of government, different levels of decision-making (integration of energy policies over different level of policy-making). The sub-criteria from 10th to 13th obviously have to focus on an adequate cooperation between different administrative departments.

Political and technical issues are mixed, by definition, and integrated. Wanting to provide a qualitative measure of the share between council and management, it can be assumed that this is represented in a perspective of core-periphery municipal organization. The work wants to analyse the distance between the centre of decision-making process and where really the responsibility and the risk of an operation of public policy are assumed.

Lastly, urban policy regarding energy issues, similarly to those about sustainable development and adaptation and mitigation, take long time to showing meaningful effects. Consequently, political long-term vision at the local level overcoming the political mandate is necessary.

3.5 Recapitulation

Chapter 3 presented the crucial theoretical and practical elements to be considered in case of analysis and evaluation of energy-sensitive local planning instruments, such as the municipal energy plan. This chapter conceptualised the implementation gap in energy planning as product of more than one factor. The review of the literature stressed the role played by all the aspects usually in the planning process: players, actors, planning instruments and implementation tools for the success of the plan. From this multi-disciplinary point of view, Chapter 3 elaborated four analytical categories of limits to understand the main critical issues related to the implementation gap associated with energy planning: limits related to policy implementation tools, limits related to policy tools, limits related to policy process and limits related to technical and political capacity and competency of local authorities. The analytical categories were the inputs for the interdisciplinary evaluation methodology conceived for municipal energy plan elaborated in Chapter 3: efficiency, effectiveness and integration are issues that all the disciplines questioned on with particular attention to one dimension rather than others. Then, the methodology based on this approach is described. The literature of planning and evaluation supported the elaboration of a set of different specific criteria (efficiency, effectiveness and integration), the main data sources and assessment techniques, and the construction of sub-criteria.

CHAPTER 4: Case Studies: questions on context and methodology

4.1 Introduction

The chapter 4 presents the case studies, questions on context and research methods and techniques. Section 4.2 describes the Italian local planning toolbox in reference to the issues of energy efficiency and production and defines the policy context in which the municipal energy plan (MEP) actually works. The instrument of MEP is delineated in its background, its main phases and its larger outputs, in particular considering the mainstream methodologies. Then, Section 4.3 contains the research methods and techniques concerning the approach to the selection of case studies, the investigatory model in terms of semi-structured interview, how to administer the interviews with civil servants of case studies selected and how to collect, analyse and present data. Finally, Section 4.4 provides an introduction to the selected case studies, the cities of Bologna, Modena, Venice and Trento, by illustrating the main characteristics of the cities and their municipal energy plans. In particular, the institutional and administrative profiles of case studies is highlighted and their implications for energy policy and planning.

4.2 The Italian local planning toolbox and the municipal energy plan

Adopting the typology of planning tools developed by Tiesdell and Allmendinger (2005) and based on their relationship to particular market characteristics, it is possible to characterize the Italian local planning toolbox dealing with energy efficiency and production themes and define the policy context in which the municipal energy plan actually works.

Governing by top-down approach involves policy tools that shape the decision context and define the parameters of this environment. Tiesdall and Allmendinger identify as the principal directive market-shaping tool the plan ('development' plan, 'regulatory' plan and 'indicative' plan) that, as mentioned, has potentially significant implications for energy policy in urban areas being intrinsically related with the energy consumption and demand of building and transport sectors. Land-use plan and transport plan set out the basis for proposed investment in public infrastructure, in the management of vehicular fluxes and for land-use regulation to assure conformance development. The municipal energy plan is considered a local sector plan in the Italian planning system and in accordance with the law. On the other hand, planning guidance, building and transport regulations seek to regulate the market actions, affecting the decisions by restricting the set of choice available (market regulation tools). Generally, cities have approached the revision of building code and the inclusion of legal-required performance rules related to the energy standard and performance of building, new and to be refurbished, and voluntary measures oriented to support the increasing of environmental conscious building sector. Likewise, the energy efficiency topic has been included in state law and regulations.

Table 4.1: The Italian local energy planning tool chest

INSTRUMENTS FOR PLANNING AND MANAGING ENERGY EFFICIENCY AND ENERGY GENERATION	INSTRUMENTS FOR MANAGING URBAN DEVELOPMENT
COMMAND-AND-CONTROL REGULATIONS	COMMAND-AND-CONTROL REGULATIONS
<i>Municipal Energy Plan</i>	Strategic Plan
Municipal Energy Efficiency Plan (for municipal buildings)	Land-use Plan
Municipal Illumination Plan	Local Sectoral Plans
Building Code	Building Code
PRO-MARKET TOOLS	PRO-MARKET TOOLS
Incentives and fiscal policies	Direct state action
Investment subsidies (infrequent)	Eminent domain
Tax deductions (on property tax and urban development charges)	Incentives and fiscal policies
Non economic incentives	Investment subsidies
Reward-based mechanism (local tailor-made measures)	Tax deductions (on property tax and urban development charges)
Public-Private Partnership Initiatives (in particular developed for energy generation)	Non economic incentives
Community Policies and Initiatives (in particular developed for demonstration projects – building or neighbourhood scale)	Equalization
	Compensation
	Reward-based mechanism
	Public-Private Partnership Initiatives
	Community Policies and Initiatives

Source: adapted and integrated from (Bengston, 2004, p.275; Bulkeley & Kern, 2006; Tiesdell & Allmendinger, 2005, p.65)

Furthermore, local authorities can encourage private sector to act for public purpose through market-stimulation tools (Tiesdell & Allmendinger, 2005). Healey et al. (1995, p. 18) argue that “*urban management cannot be understood these days in terms of ‘top down’ or ‘command and control’ models of governance*” and that the involvement of private sector in participate actively in the realisation of certain planning goals is strongly related to that trend characterized by a government that becomes a less active regulator (Cars, Healey, Madanipour, & De Magalhaes, 2002), and instead becomes a facilitator of new developments that are preferably realized by the market (Spaans et al., 2010; van der Veen et al., 2010). In addition to fiscal measures and subsidies, German and UK case studies analysed by Bulkeley and Kern (2006) show the use of, the so-called traditional devices such as promotional activities (education campaigns), public-private partnerships and, guidance for architects and developers on energy efficiency and renewables. Although all these tools are developed and coordinated at different institutional level, they are completely considered as implementation strategies of municipal energy plan.

The municipal energy plan

The National Law No. 10/1991 “*Norme per l’attuazione del Piano Energetico Nazionale in materia di uso razionale dell’energia, di risparmio energetico e di sviluppo delle fonti rinnovabili di energia*” (Regulations for the Implementation of the National Energy Plan in the field of rational energy use, saving energy and developing renewable sources of energy) introduces the ‘energy plans’ identifying two different levels of detail, the provincial and the urban levels. The law at Article 5, paragraph 5, provides only that municipalities with more than 50000 inhabitants should adopt a specific plan of municipal development and use of renewable energy sources within the ordinary urban planning instruments (*Piano Regolatore Generale*), with the consequent supremacy of the urban plan over the energy one. The law therefore aims to involve the municipalities with over 50,000 inhabitants, including 114 provincial seats, about 21 million inhabitants and 36% of all Italian citizens (Coralli, D’Angelo, & Lai, 2003).

If energy plans for regional and provincial law defines, albeit briefly, the minimum content requirements for the preparation of plans, at the municipal level it is not exhaustive on the structure, much less the essential contents of the Municipal Energy Plan (MEP). The motivation underlying such failure stems from the nature of the law, which refers to matters of greater detail, to decrees, this has not yet issued. Although the law does not suggest mode of formation and content of this plan, since that time some *modus operandi* have been consolidated. Two studies, finalised to develop guidelines and handbooks (ENEA and Ambiente Italia), were initially proposed as a reference guide to draft an energy plan to the municipal level, then, in fact, as consultants to the local government by participating in most of the plans made. These handbook provide a common language and methodology that includes a stage purely cognitive, it follows one of implementation and management.

With the main objectives of the rationalization of energy consumption and diversification and replacement of traditional energy sources with renewable ones, the municipal energy plan is generally based on some knowledge to quantify the flows of energy supply and demand (the so-called Municipal Energy Balance). It requires the calculation of consumption indicators (e.g. per capita, in total and by source), sectoral indicators (consumption per unit space, by number of employees in relation to value added products, etc.) performance indicators, used as an energy technology, systems and economic-financial qualification. On this basis, the plan develops scenarios and develops an action plan has to implemente by specific tools (Table 4.2). Two consolidated methodologies slightly differ, while some innovative approaches, such as those of Bologna and Modena, contribute to the Italian debate thanks to a constant search for integration, both horizontally and vertically, with the urban planning in all three phases of the plan.

Using the interpretative model proposed by Bulkeley and Kern (2006), the action plan can be described by referring to four different forms of urban governance, as a significant development of the dynamics of an urban policy for climate protection. These modes are distinguished in terms of decision-making and include both soft forms of government and traditional forms of state intervention (Bulkeley & Kern, 2006, p. 2242). The first form of urban governance is the self-governing. Self-government can be defined as the ability to govern its activities, for example by improving the energy efficiency of real estate and technological systems of the municipality. The implementation of these measures can be relatively simple, as are areas where the municipality can make its own decisions in complete autonomy and can directly control their own consumption. Various studies (Betsill & Bulkeley, 2003; Bulkeley & Kern, 2006; Kern & Alber, 2008) have noted, as in many countries, the majority of climate protection measures should focus on this form of governance. In this framework, the policy of energy supply and distribution of local government can have a considerable impact on the local economy, because the city require a wide range of goods and services. Governing by provisions implies the opportunity to formulate and implement policies and financial infrastructure through the provision of particular types of services and resources using the municipal local utility for energy, transport, water and waste. Through enabling refers to

the role of local government to coordinate, facilitate and encourage actions with public goals through partnerships with public agencies and private voluntary actions by citizens and entrepreneurs, supporting them through awareness campaigns and promotional activities. Finally, governing by regulation involves the use of traditional forms of government, such as command-and-control and the use of sanctions. These different modes of public action can be detected as many tools with which the municipality can take action, according to the regulatory provisions governing the division of powers between the various entities.

Table 4.2: The municipal energy plan in Italy

ENEAMETHODOLOGY	AMBIENTEITALIAMETHODOLOGY	INNOVATIVEAPPROACHES
ANALYTICAL PHASE		
- Town Energy Balance - Elaboration of trend scenarios - Analysis of the potentiality of renewable local energy resources - Identification of indicators and data collection	- Town Energy Balance - Elaboration of trend scenarios - Analysis of the potentiality of renewable local energy resources - Identification of indicators and data collection - <i>Analysis of environmental externalities</i>	- Town Energy Balance - Elaboration of trend scenarios - Analysis of the potentiality of renewable local energy resources - Identification of indicators and data collection - <i>Spatial characterisation of energy consumption</i> - <i>Identification of energy basins</i>
ACTION PLAN		
<i>Self-governing</i>		
Energy efficiency actions on municipal properties		
<i>By provision</i>		
- Energy network	- Energy network - <i>Integrated planning of energy resources</i>	- Energy network
<i>Through enabling</i>		
- Promotion of renewable technologies		- Promotion of renewable technologies - <i>Support to energy shared compensation</i>
<i>By regulation</i>		
- Energy efficiency standard of buildings		- Energy efficiency standard of buildings - <i>Mandatory and voluntary measures on building orientation, reduction of heat urban island and surface to volume ratio</i>
IMPLEMENTATION INSTRUMENTS		
- Financial incentives - Mandatory energy labelling - Building code with performance measures on energy efficiency of building envelope and technological systems	- Financial incentives - Mandatory energy labelling - Building code with performance measures on energy efficiency of building envelope and technological systems	- Financial incentives - Mandatory energy labelling - Building code with performance measures on energy efficiency of building envelope and technological systems - <i>Reduction of infrastructure costs</i> - <i>Density Bonus</i>

Source: author's elaboration

4.3 Research methods and techniques

4.3.1 Selecting case studies

The case selection has two main objectives that are, desires, firstly, a representative sample and, then, useful variation on the dimensions of theoretical interest.

In case studies of this sort, the chosen case is asked to stand for (represent) a population of cases that is often much larger than the case itself. Evidently, the problem of representativeness cannot be ignored if the ambition of the case study is to reflect on a broader population of cases. A second case selection strategy has as its primary objective the achievement of maximum variance along relevant dimensions. It requires the selection of a set of cases—at minimum, two—, which are intended to represent the full range of values characterizing the application to be studied.

Within this background, some preliminary knowledge of cases and application allows selection phase to be much stronger in the research design. The cases has been selected considering four criteria, in order to maximize what can be learned (Tellis, 1997):

- (1) Cities with own municipal energy plan (MEP): although the municipal energy plan has been required by law since 1991, in the monitoring carried out by ENEA, in 2010 only 44 of provincial capitals had approved a municipal energy plan, with the involvement of only 35% of the potential population;
- (2) Cities that are provincial capitals: the Italian provincial capitals are 115;
- (3) Cities with municipal energy plan that can be ascribed to one or more standardised methodologies, ENEA, Ambiente Italia or innovative approaches;
- (4) Cities that combine policy, plans and programmes (mandatory and voluntary) dealing with the planning and management of urban sustainability, climate change and energy efficiency and production. At this regard, Local Agenda 21 Process with the *Bilancio Ambientale* and the *Rapporto sullo Stato dell'Ambiente* and the Covenant of Mayors are the main actions. 361 local authorities in Italy have joined Local Agenda 21 Process. Local Agenda 21 is a policy tool for implementing local sustainable development and at the same time it is also a learning process for both the community and local government. It was first described in Agenda 21, the global blueprint for sustainability that was agreed at the United Nations Conference on Environment and Development in 1992 (the Rio Earth Summit). Chapter 28 of Agenda 21 identifies local authorities as the sphere of governance closest to the people, and calls upon all local authorities to consult with their communities and develop and implement a local plan for sustainability - a 'Local Agenda 21'. By 2001 more than 6,400 local governments in 113 countries worldwide were developing and implementing LA21s. Local Agenda 21 promotes a participatory, long-term, strategic planning process that helps municipalities identify local sustainability priorities and implement long-term action plans. Local Agenda 21 processes aim at involving all stakeholders in the community in decision-making in sustainability planning and management at the local level. These processes offer great opportunities for participatory learning as groups debate their future direction based on working in partnership with government, industry and other community groups. Guides abound, aiming to support the community to integrate environmental, economic and social development in a long-term strategic action plan that integrates existing policies and programs.

Many of local authorities involved in the Local Agenda 21 Process have developed instruments to constantly monitor the environmental health, such as the *Bilancio Ambientale* and the *Rapporto sullo Stato dell'Ambiente*.

The *Bilancio Ambientale*, is intended as an instrument of measurement, evaluation and reporting of environmental policy to support decision making, is an instrument through which the local authority defines and analyses the choices made in the environmental area and defines the actions to be taken towards the sustainability of development and quality of urban life, also informing the local community of commitments, all in a logic of transparency and democracy. Through this local administration not only reports on their environmental policies, activities undertaken and on the economic and financial aspects but, by means of data and statistics, measures the environmental impacts of its activities, review the effectiveness in achieving the objectives of the program and evaluates the quality, in terms of efficiency, with which the environmental expenditure is paid.

The *Rapporto sullo Stato dell'Ambiente* is a document designed as a working tool in the process of Local Agenda 21. It combines environmental, social and economic information by the union of the three dimensions of sustainable development. The RSA provides, therefore, a picture of the status of the various components and the main environmental problems in the local area, allowing you to quickly identify the critical environmental areas, or on which there is no need to investigate further. The Report is an essential information tool designed and constructed to allow all individuals, social and economic operators, administrators and policy makers to understand the state of land and begin to outline trends and outcomes of socio-economic-environmental phenomena.

Recently, the European Union has introduced the Sustainable Energy Action Plan, as the operative instrument of the Covenant of Mayors, with the aim of make formal the engagement of the European Cities in the 20% reduction of CO2 emissions. Over 2003 Italian cities have joined the Covenant of Mayors to date. As part of their commitment, they have pledged to adopt a Sustainable Energy Action Plan (SEAP) outlining a set of key actions intended to bring a more sustainable future to their citizens, but only the 26% have submitted own Plan and only 65 Plans have been accepted.

Table 4.3: Case studies actions

CITY	LOCAL AGENDA 21 PROCESS	BILANCIO AMBIENTALE	RAPPORTO SULLO STATO DELL'AMBIENTE	SUSTAINABLE ENERGY ACTION PLAN	REGIONAL PLANNING SYSTEM
<i>Bologna</i>	■	■	-	Covenant signatory – plan formally approved	Piano strutturale (PSC)/piano operativo (POC)

<i>Modena</i>	■	■	■	Covenant signatory – plan submitted	Piano strutturale (PSC)/piano operativo (POC)
<i>Trento</i>	■	■	■	-	Piano Regolatore Generale
<i>Venice</i>	■	■	■	Covenant signatory – plan in elaboration	Piano di assetto del territorio (PAT) – Piano degli Interventi (PI)

Source: author's elaboration (data: Enea, municipal websites)

Within this context, Bologna and Modena were selected a-priori because of some specific and innovative characteristics, whereas Trento and Venice were chosen for the peculiar geographical, legislative, financial context and for the similar approaches with national protocols.

4.3.2 The semi-structured interview model

The basic objective of qualitative research is to go deep to unravel the complexity of the phenomenon investigated. If the goal is to access the perspective of the subject studied, it necessarily follows the individuality of the report of interview: this tool must be flexible, must adapt to different personalities of the interviewees must be able to change from subject to subject, you must give freedom of expression, through the use of their own mental categories and their language. The choice among the three types of interview depends on the research objectives and the characteristics of the phenomenon studied (Corbetta, 2003, pp. 405–435).

The work needs an interview able to go into something in depth in order to:

- (1) to get a more detailed knowledge about it;
- (2) to get a sense of how the apparently straightforward is actually more complicated.

Hence, semi structured interviews is used to corroborate the evidences resulting from the literature review. It is designed to have a number of interviewer questions prepared in advance by the researcher/interviewer's concerns and initial theoretical framework but such prepared questions are designed to be sufficiently open that the subsequent questions of the interviewer cannot be planned in advance.

The semi-structured interview is aimed at involving key persons without creating a too much time consuming dialogue. A participatory approach emphasizes a reciprocal learning process in a relationship, instead of a one-way transfer of know-how ideas. Carrying out interviews in a participatory approach is as much a learning process for the interviewer as a process for collecting data.

Selecting interviewees

The interview will be performed with the administrators responsible for the municipality's environmental management (secretary, director, manager), who will be identified in the course of the research on the urban instruments developed in the Italian context.

The interviewees are chosen among:

- advantaged witnesses (people who have an institutional or technical role inside the public administration involved in the analysis)
- significant witnesses (people who have particular political or technical competencies or position).

Administering the interviews

Interviews are administered in various ways: some are personal or individual interviews and others (Bologna and Venice case studies) entirely via mail in response to written questions also in a multiple choice format, according to the model developed.

Two interviews have been individual, with Trento and Modena city managers, in which I directly conduct the interview after having presented the research. Also in this case, the interview has followed the model.

The interview model

In order to develop the model to conduct the semi-structured interview analysis, the work follows some steps. The literature review have permitted to identify three different but overlapping analytical categories that present and discuss the most recurring considerations about the barriers to the implementation planning phase. According to the evaluation questions, (efficiency, effectiveness and integration) the analysis of municipal energy plan documents has highlighted some rooms in which a more detailed knowledge is necessary. Consequently, the semi-structured interview model has been organised in respect both the limits described in the analytical categories (policy tools, policy process and technical and political capacity and competence) and the previous findings of first level of analysis.

The model is structured as follows (see Appendix A). Some questions are open; others are in multiple-choice format with free space for comments.

INTRODUCTION Part 1: MEP General Description

1. What were/are the expectations/aims of the municipal energy plan?
2. How has the program evolved and why? What are some of the foreseeable future developments of this municipal energy plan?
3. How do you evaluate the success/failure of the municipal energy plan?
(Monitoring process based on set of indicators; other; nothing)

Comment:

4. On the basis of your evaluations, is it meeting/did it meet the expectations of the founders and why?

5. What limits/broadens the reach of this municipal energy plan?

(Financial resources; Mandate; Human resources; Public supports; Tools; Other)

Comment:

ANALYTICAL UNIT 1, THE POLICY TOOLS

Part 2: The formal features of Municipal Energy Plan instrument

6. The municipal energy plan manages the use, conservation and transformation of urban space or provides a strategic vision of how to tackle the energy problem in municipal context?
7. Do you consider that the formal features of the municipal energy plan (approval process, adoption, procedural rigidity...) are capable of governing aspects intrinsically related to the energy problem such as uncertainty, variability or the influence on climate?
8. What is the time horizon of municipal energy plan? On the basis of this, are the actions prioritized?
9. What are the relationships between municipal energy plan and city plan? In other words, is the urban planning framework integrated with energy policies?

ANALYTICAL UNIT 2: THE POLICY PROCESS

Part 3: The development of the MEP, related policies and tools

10. What is the nature of the energy issues and the solutions considered in the plan?
11. What is the causal relationship between definition of problems and actions?
12. What is the role the municipality would like to play in order to improve the implementation process of energy policies and energy plan?

(Facilitator; consumer; provider; regulator; other; mix)

Comment:

13. What has affected the choice of the implementation instruments?

14. There was/is innovation in instrument design? Have you used new tools, refined existing tools or usual?

ANALYTICAL UNIT 3: TECHNICAL AND POLITICAL CAPACITY AND COMPETENCE

Part 4: The role of Local Authority. Political and Administrative expertise

15. Who is responsible for the operation of the municipal energy plan?

(City Department of Energy; City Department of Environment; City Department of City Planning; Other)

Comment:

16. What is the nature of the relationship between municipal energy plan participants at different levels of government?

(Collaborative; Financial; Advisory; Hierarchical; Other)

Comment:

17. What are the technical skills and expertise of city managers and officers?

18. Are training policy professionals organized by local administrations or supported?

(yes, no)

Comment:

19. Do usually external bodies support the development of plans, programmes and policies?

(Universities; Research Institutes; Engineering/Consulting; Other)

Comment:

Data analysis and presentation

The empirical material produced by an interview is the content of the interview itself, or the motives, the opinions provided by the interviewee.

The analysis of this material, unlike what happens with other research techniques, is a continuous process. The interviews have been analysed, in fact, systematically, immediately after being conducted, in order to identify any other issues to be investigated and subjected to further questions from other subjects. Once conducted all the interviews they have been reviewed as a single group: in the case of emerging areas are incomplete, the researcher can return to the field to give more interviews. Analysis and interviews, therefore, have been modified during the study: to proceed with the analysis of the theoretical background has been enriched and sometimes it has been correct.

The presentation of the results is through the stories of episodes or description of cases, using often the same words of the interviewees. The aim is not to alter the material collected by transmitting to the reader the immediacy of the situations presented. Mainly, a theme is developed in accordance with the findings of the two levels of analysis, using data and evidences from both the analysis. The result is a mix of analysis, illustrations, examples, and empirical support represented by sentences quoted of the interviews.

4.4 The case studies: institutional context and city profiles

The cities of Bologna, Modena, Trento and Venice lay are in Northern Italy. Whereas Bologna and Modena is located in the Padania Plain and Venice in the Venetian Lagoon to the border of the Po Valley, Trento lays in the Adige Valley in the Alpine area. Modena and Trento are medium-sized cities in the Italian ranking (around 100.000 inhabitants), while Bologna and Venice are larger (table 4.4 and Appendix A). The institutional status is the same for the municipalities, while regions and provinces have different powers and financial resources, thus defining differentiated relationships among the institutions.

In Italy institutional competencies differ profoundly from authority to authority. In particular, while Emilia-Romagna and Veneto Regions have important powers, Trentino-Alto Adige Sudtirolo has residual competencies and the Autonomous Provinces of Bolzano and Trento have crucial competencies and financial resources. The special autonomies of the Provinces of Trento and Bolzano are the results of a long institutional process (never ended), started after the Second World War with the first statutory order. At the beginning of the 1970s, their status was reinforced after a period of significant frictions between the German-speaking minority and the central State, hollowing out the Region, which is currently no more than an empty box (Zanon, 2013). As a result, differently from Bologna, Modena and Venice, Trento is a city that has to continually confront with the Province, which retains large competencies and financial resources.

Concerning spatial planning competencies, the Italian planning system depends on national and regional laws. Municipalities maintain a key role in urban development policies by the assignment of land-use rights based on zoning mechanism with the land use municipal plan. Some Regions, such as Emilia-Romagna and Veneto, have introduced a new approach based on the distinction between the structural and the operational level of urban plans, and on the Planning and Building Regulations. The structural plan is generally aimed at outlining the main organization lines and indicating long-term changes; the operational plan is finalised to identify actions and transformations to be carried out in the short-term. As a result, a proactive/strategic nature and a regulative one arise for the plan (Veronesi, Tulumello, Rubino, & Delponte, 2012). The former, without a real prescriptive framework, create new hypotheses for transformation. The latter ensures existing and new rights, defined through prescriptive and accurate procedure (Mazza, 1995a). In the case of Trento, on the other hand, the relationships between the city and the Province are unbalanced and affect also the planning decisions that have to be approved by the Province (Zanon, 2013). Hence, although a recent reform of planning system (law n°1 of 2008), the main planning instrument at local level is still the municipal plan (*Piano Regolatore Generale*, PRG).

Table 4.4: City Profiles

	BOLOGNA	MODENA	TRENTO	VENICE
<i>POPULATION</i>	380181	184663	116298	270098
<i>MUNICIPAL AREA [km²]</i>	140,845	183,663	157,9	414,57
<i>POPULATION DENSITY [pop/km²]</i>	2699,3	1010,5	729,85	652,869
<i>NATURAL GAS CONSUMPTION [mc/inhab]</i>	571,7	640,7	630,4	619,5
<i>ELECTRICITY CONSUMPTION [kWh/inhab]</i>	1304,5	1189,3	944,1	1170,4
<i>VOLUME OF DISTRICT HEATING SYSTEM [mc/inhab]</i>	19,84	5,46	00,00	00,00
<i>SOLAR PANELS [msq/1000inhab]</i>	0,6	3,0	4,6	0,7
<i>PHOTOVOLTAIC PANELS ON MUNICIPAL BUILDINGS [kWh/1000inhab]</i>	5,2	0,1	0,6	0,5

Source: municipal statistical departments, ENEA, Legambiente, Ecosistema Urbano (data 2010)

As a result, the regional planning systems greatly encourage Bologna, Modena and Venice differently to Trento to consider the spatial dimension of energy concerns in the development of both structural and energy municipal plans. Regarding energy sector, differences between institutional competencies, especially between Regions and Autonomous Province, largely influence the local modes of governance and public actions. The National State generally exercises the concurrent legislative competencies over energy area with the exceptions of the Trento and Bolzano territories where, a decentralisation of institutional competencies is taking place.

On the one hand, Regions and Autonomous Provinces similarly have the major institutional room in energy management and planning in order to foster the sustainable development of local energy system “*guaranteeing a balance between energy supply, rational energy use and carrying capacity of a territory and environment*” (author’s translation) (L.R. Emilia-Romagna 23th of December 2004, n°26) and the control and reduction of greenhouse gas emissions. Considering energy concerns in urban areas more as a discipline related to environmental protection, energy management and planning can be considered a regional competency and, accordingly, some regional authorities – i.e. Emilia-Romagna region - have promulgated laws with guidelines for supporting and strengthening municipalities in the development of local planning (Florenzano & Manica, 2009).

On the other hand, a pivotal case is that of energy production. The traditional companies providing energy (electricity, gas) and water, which, founded at the turn of 20th century by the municipalities, now have become public utilities serving the provincial territory and are directly owned or controlled by the Autonomous Provinces (with different between Trento and Bolzano-Bozen). Moreover, the strong legal status and financial resources of the Province of Trento have supported and guaranteed a major initiative in energy sector both at territorial level and municipal level, thanks also to a key role played by the University and research centres. Consequently the city of Trento has found itself in more favourable financial and institutional situations than Bologna, Modena and Venice, especially in consideration of recent trends towards federalism.

4.4.1 The case studies and the municipal energy plan

Bologna

The municipality of Bologna has gained considerable policy experience in energy area within a number of pioneering projects and initiatives since 1985 (Bologna Energy Study – BEST, Urban CO₂ Reduction Project with the support of ICLEI). Bologna confirmed its commitment to sustainability by signing the Aalborg Charter in June 1996 and implementing the local Agenda 21. In addition, in 1996 Bologna was one of thirteen recipients of a Certificate of

Distinction under the "European Sustainable City Award" scheme. In this context, in 1999 the first Municipal Energy Plan was developed. Recognising its weak efficiency and considering the spatial dimension of energy concerns in urban area, in 2007 a second one was performed in parallel with the review process of the Strategic Plan supported by strong participation of civil society.

In accordance with the traditional formulation of MEP instrument and with a strong correlation with the municipal Geographic Information System, the 'new' plan has founded on accurate analysis of urban energy balance and spatial dimension of energy consumption in order to define energy demand and GHG emissions scenario for the urban development provisions. In particular, urban energy basins, homogeneous areas for urban and energy features, have been identified in concordance with the structural urban plan.

Then, guidelines differentiated from energy basin to energy basin and actions to compensate and reduce energy use on existing building stock, have been defined in order to achieve the "energy saving" scenario both on new development areas and existing ones.

Concerning the action plan, the major energy efficiency measures implemented by municipality include actions in relation to energy conservation, fuel sourcing or demonstration projects for renewable energy. Adopting a self-governing approach one key arena for action has been in reducing energy consumption in municipal buildings, municipal vehicle fleet and public street lighting. In addition, Bologna has included the energy issues into the municipal building code primarily in accordance with the structural planning process.

Local authority has been also directly involved in promotional activities such as educational campaigns, pilot projects (with strong public-private partnerships), proposal and involvement in national and European projects.

Considering as a guide the municipal energy plan drafted in 2007, the administration of Bologna joined the Covenant of Mayors on 22nd of December 2008, and, thanks to the contributions collected during the Consultation Forum, the final proposal was prepared for SEAP (Sustainable Energy Action Plan). The document was approved by the City Council.

Modena

Modena, already active until the early 1980s on environmental issues also with the process of Local Agenda 21, in 1996 the Province of Modena joined the Aalborg Charter and the 1997 Plan of Lisbon. To meet these commitments and to activate a process of participation and sharing of the local environment, the Province of Modena approved on June 5, 1997, in the occasion of World Environment Day, the constitution - with the Municipality of Modena - of the Forum of the Environment - Sustainable Development.

In this context, it was arrived in 2002 to adopt an initial MEP elaborated in accordance with the Provincial Energy Plan. It already contained a strong correlation with the municipal Geographic Information System, basis also for the land-use plan, which allows a first spatial analysis of energy consumption with a strong interest in terms of urban planning.

This comparative study of energy data has been extremely useful in 2007 MEP Revision, in parallel with the revision of both structural plan and building code, that forcefully introduces the cogency of specific performance requirements for buildings and requires the Energy Certification Labelling for new buildings. Modena has introduced a tool for coordination of policies and instruments focused on environmental protection in force in order to provide guidelines for proper energy planning of city development, through integration with existing planning instruments. In addition, the municipality, similar to Bologna, has identified homogeneous areas suitable for renewable energy grid, technologies and energy efficiency measures. On the base of energy basins, specific areas for action in the field of energy saving, reduction of collective consumption and emissions of greenhouse gases, the MEP-2007 introduces a system of parametric elements to assess in advance the transformation of the area together with possible scenarios to choose policies energy in the residential, manufacturing, service industry.

Similarly to Bologna, Modena has included actions in relation to energy conservation, fuel sourcing or demonstration projects for renewable energy. Adopting a self-governing approach one key arena for action has been in reducing energy consumption in municipal buildings, municipal vehicle fleet and public street lighting. In addition, the municipality has included the energy issues into the municipal building code primarily in accordance with the structural planning process.

Local authority has been also directly involved in promotional activities such as educational campaigns, pilot projects (with strong public-private partnerships), proposal and involvement in national and European projects. The MEP-2007 provides an updating process every two-three years.

The City Council of Modena signed the Covenant of Mayors in January 2010 and, with Council's resolution of 18 July 2011, it submitted own Sustainable Energy Action Plan (SEAP) .

Trento

With a process that began in 1995 and concluded in 1999, the municipality of Trento and in particular the City Department of Environment approached the problems of municipal energy plan. In 1998 the city administration has assigned the Research Institute Ambiente Italia the development of municipal [environmental] energy plan. Prepared in the following year, the plan is an analysis of the evolution (1995-1998) of the energy flows in the municipal area, changes in greenhouse gas emissions in order to define an action plan with measures in energy supply and energy use. Beyond the validity of the proposed public action, the problem was an incomplete procedural path. Approval and adoption phases were lack. Although the City Council approved the “*Progetto esecutivo per il completamento del Piano energetico comunale*” (Working Plan for the completion of the Municipal Energy Plan), the final draft has never been approved and adopted.

In 2006, it was decided the revival of energy management and planning and, as a consequent, in the two followed years the city of Trento, always supported by Ambiente Italia Research Institute, started a participatory process finalised to identified shared key areas in which focalise the action. The plan, called Participatory Energy Plan Trento x Kyoto (“*Piano energetico partecipato Trento x Kyoto*”) was approved in 2008. It was mainly based on a self-governing approach under the guide of Environmental City Department with energy efficiency policies on municipal buildings, public street lighting and municipal vehicle fleet. Campaigns for energy efficiency and education campaigns have supported the development of environmental awareness of inhabitants.

Although the mandatory implementation of building energy standards under the municipal building code, the City Department of Buildings promoted a supplementary planning guidance on sustainable design for new building with voluntary assessment scheme, which assess a wide range of environmental issues (sustainable sites, the efficient utilization of materials, selection of environmentally preferable materials, and minimization of waste during construction, the improvement of indoor air quality by reducing possible air pollution) including energy efficiency, particularly in the building envelope and heating and cooling design. It approved in 2006, four years before that the Piano Casa, and now in phase of review. The scope, methods and criteria for building sustainability assessment are largely different from the ‘traditional’ building label (Protocollo ITACA and KlimaHause Nature), more similar to LEED method (LEED for Home Program). This guidance adopts the philosophy that buildings must achieve performance standards over and above the relevant legislative requirements to gain any credits, and the number of credits permits to obtain additional land development rights and economic incentives. The incentive criteria have been developed in parallel with the review of building indexes of land-use plan, in 2008, and the bonus provides up to 10% more than building index allowed in the same area by land-use plan and regulations.

Contemporarily with this municipal voluntary assessment scheme, the Province of Trento in 2011 recognised a based-reward mechanism into its legislative system as a result of the introduction with the National Housing Plan (2009) of additional land development rights. The extraordinary and temporary (two-years) measure focuses on new and refurbished buildings and on demolition and reconstruction practices that reach an energy efficiency standard (Energy Class A, A+ and B+) higher than the mandatory one (Energy Class C). The assignment and the amount of density bonuses depend on the Building Energy Class and existing or designed building’s volume. The final incentive (the maximum is 17,5% of existing building’s volume) is the sum of partial ones obtained in the brackets, according to the building volume.

Venice

In 1996, the Venice City Council has adopted the strategy of Agenda 21 with relevant results from the scientific point of view (studies and research of FEEM Fondazione Eni Enrico Mattei), more modest in terms of participatory approaches and involvement of citizens and stakeholders.

After the determination of AGIRE, Venetian Agency for Energy, and with its support, the municipal energy plan of the city of Venice was firstly approved in 2003 and then revised in 2009 through a participatory process.

It has been structured largely in accordance with the two main Italian protocols for energy planning and management, following the three-part organization: town energy and emission balance, energy scenario and action plan. In the Venetian case, the city balance has been focused on different sectors, with particular attention to transport, tourist accommodation and renewable energy, giving priority to the local potentialities in terms of energy sources. The output has been a City Energy Atlas on which AGIRE has developed the energy consumption projection (scenario) and the municipal strategies to achieve the GHG reduction and energy efficiency goals.

Energy saving and production measures have been mainly directed to municipal buildings with provisions finalized to the installation of solar and PV panels and optimization of cooling systems while about municipal vehicle fleet the Venetian Energy Agency are working to pursue its modernization both in terms of new means of transport and innovative fuels. With respect to renewable energy, local authority has promoted an action focused on district heating systems and/or combined heat and power by exploiting Porto Marghera industrial site and the glass industry in Murano Island.

Adopting an approach by authority, a supplementary planning guidance on energy efficiency design for new building with voluntary measures and related incentives has been included in the building code. Venice, in compliance with the EU directives, national and regional laws, has also provided a mandatory energy performance certification for all new buildings. In addition, in the new land-use plan for Campalto area some bio-climatic criteria have been elaborated in order to consider performance indicators in the detailed plans.

Local government has been directly involved in educational campaigns, such as the “*Cambieresti?*”, “*Energia 300x70*” and “Echo Action” projects, which aim to promote the energy savings to private households organised in groups similarly to the Agenda 21 Locale process, as well as to stakeholders from, for example, the building industry.

In 2011 the municipality of Venice joined the Covenant of Mayors with the intention to develop the Sustainable Energy Action Plan that is more rigorous from the point of view of the quantification of the results by revising and modernizing the municipal energy plan.

CHAPTER 5: Results and Discussion

5.1 Introduction

The great variety of approaches being developed for the municipal energy plan instrument in Italy means that it is difficult to compare the activities of one city (or set of cities considering the main above-mentioned methodologies) with another, or to reach general conclusions about the efficacy of municipal action (Kern & Alber, 2008). Accordingly, main themes could be traced and discussed in general terms after the analysis and evaluation of case studies in according with the criteria and sub-criteria elaborated in Chapter 3. Chapter 5 presents the results of analysis and critically discuss them, suggesting new issues for a research agenda. The theoretical framework described in Chapter 3 is applied to the municipal energy plans of the cities of Bologna, Modena, Venice and Trento to evaluate the efficiency, effectiveness and integration of the proposed planning approaches. The input of the analysis carried out in this chapter is represented by the data collected during the interviews, as well as by the available information in the municipal documents. The expected output consists in a set of impact scores presented in tables, expressing the performance of each city in terms of criteria and sub-criteria. These will be used then to qualitatively evaluate the case studies and to compare and discuss them. A number of themes emerge from the elaboration of results and these are further discussed.

5.2 Evaluation results of case studies

5.2.1 The evaluation of efficiency

(1) External coherence

The assessment of the external coherence of municipal energy plan focuses on the relationships between the objectives of MEP and those of land use plan, the higher level plan, and the building code, one of the main instrument involved with energy themes in urban areas (although it focuses on individual buildings). Theoretically, the goals and the objectives of MEP, land-use plan and building code should be in close articulation, in order to address the need of greater energy efficiency and production from renewable resources in urban areas.

Table 5.1: Relationships between MEP objectives, Land use plan objectives and Building Code objectives

	MEP OBJECTIVES	LAND USE PLAN OBJECTIVES	BUILDING CODE OBJECTIVES
<i>Bologna</i>	A.Reduction of energy demand of existing building stock B.Containment of energy pressure due to the transformation of urban areas	The structural urban plan identifies key objectives in order to address the reduction of energy demand of building stock and the containment of energy pressure due to the transformation of urban areas. The article 36 “Ecological and environmental quality” provides: Paragraph 12: Energy saving for existing buildings Paragraph 13: Improvement of existing district heating Paragraph 14: Development of energy production from renewable sources Paragraph 15: Energy analysis of urban areas subjected to transformation	The Building Code has the urban and environmental quality as key objective. Great attention on principles able to orient the transformation of public space
<i>Modena</i>	A.Reduction of energy demand B.Reduction of CO ₂ emissions	General mention to the limits and conditions for the sustainability of interventions and transformations and identifying infrastructure of major importance	Energy performance of new and refurbished buildings
<i>Trento</i>	A.Reduction of energy demand of	No relationships	Improvement of energy and sustainable

	existing building stock		standards of new buildings
Venice	<p>A.Reduction of energy demand of existing building stock</p> <p>B.Reduction of energy demand of industrial sector</p> <p>C.Reduction of energy demand of transport sector</p>	<p>Intention to introduce ecologic principles for building stock and the transformation of open spaces</p>	On-going process

Source: author's elaboration

As table 5.1 shows, whereas the municipal energy plan and the structural plan of Bologna agree on the necessity to reduce the energy demand and the GHG emissions improving the energy performance of existing buildings and limiting the energy pressure of new development introducing standards for new buildings, the city of Modena, despite its experience along a similar path, does not succeed in going beyond rhetoric intentions. The same cannot be said for the objectives of Building Code of Modena that is aimed at encouraging the betterment of energy performance of new and existing buildings.

The land-use plan of the city of Trento does not pursue greater energy efficiency and production from renewable resources and has not any relationships with the energy planning experiences proposed and carried out by the same local authority. The promotion of a supplementary regulation for sustainable design, which implies a voluntary assessment scheme, focuses exclusively on new buildings in contradiction with the objective of the plan called "*Trento x Kyoto*".

Concerning Venice, the timing of this exercise has negatively influenced the evaluation of the external coherence of its municipal energy plan. The evaluation has been undertaken contemporarily with the phase of public inquiry of the new structural plan (*Piano di Assetto Territoriale – PAT*) that defines ecologic principles for building stock and for the transformation of open spaces. About building code, in accordance with one of the action identified by the MEP's Action Plan, will be revised following energy saving and efficiency criteria.

(2) Internal coherence

The second evaluation sub-criterion is the coherence between the different parts of the MEP, objectives – from the analytical phase -, action plan and the planning implementation phase. Assuming that the initial set of objectives is one of the central elements of a plan, the linkages of these with the other parts has been carefully analysed. Firstly, the objectives of MEPs were linked with the correspondent actions, according to the plan documents, and then, the relationships between objectives, actions and implementation strategies have been analysed.

Bologna elaborates two different sets of actions. One focuses on the existing buildings in order to obtain greater energy saving and production from renewables, the other is elaborated for the new urban development areas (Energy Guide Lines), but these do not consist in a real Action Plan. These have been - in part - accomplished by the revision of Building Code and the inclusion of energy dimension into the structural plan.

The analysis of linkages between objectives and actions in the municipal energy plan of Modena shows a shift between objectives and actions, in particular concerning actions aimed at reducing energy demand. They mainly concern interventions of self-governing on municipal buildings (energy retrofit), municipal vehicle fleet and the elaboration of a plan for the public illumination. In terms of actions oriented to the containment of energy demand of existing building stock, the Action Plan proposes the revision of building code with the inclusion of mandatory and voluntary measures for new and refurbished buildings in compliance with EU Directive and regional law. The objective of reduction of CO₂ emissions is centred on the development and encouragement of energy production on-site from renewable energy and district system. There is a general mention to the reduction of private transport.

Trento associates interventions on municipal buildings, in particular the installation of active solar technologies for the energy production and the improvement of insulation capacity of envelope and roof systems, and public illumination, with education ("*Trento X Kyoto*") and energy audit campaigns. Furthermore, although Trento has developed and promoted a supplementary planning guidance on energy efficiency design for new buildings, this has not been elaborated within the municipal energy plan.

Being a UNESCO world heritage site with an historical centre that has been losing population in favour of mainland in which the suburbs have been attracting new residents and with an industrial sector in crisis, are peculiarities of Venice that strongly influenced the identification of objectives and the elaboration of appropriate actions for the MEP's Action Plan. Despite the usual actions on buildings and public properties, the Action Plan of the municipal energy plan of the city of Venice introduce punctual measures on the reduction of energy demand of industrial sector encouraging the

development of district heating in Marghera Harbour and energy-sensitive criteria for the building and the regeneration of industrial sites.

Table 5.2: Matrix Objectives/Actions

MEP OBJECTIVES		MEP ACTIONS
<i>Bologna</i>	A.Reduction of energy demand of existing building stock	2. Greater energy efficiency and production of existing buildings 3. Improvement of existing heating systems 4. Municipal buildings 5. Public illumination 6. Private transport
	B. Containment of energy pressure due to the transformation of urban areas	- Development of heating systems 7. Building envelope 8. Cooling and heating system 9. Building illumination 10. Local energy production from renewable resources
<i>Modena</i>	A.Reduction of energy demand	11. Revision of Building Code 12. Use of incentives to encourage energy-sensitive buildings 13. Plan for the public illumination 14. Interventions on municipal buildings
	B. Reduction of CO ₂ emissions	15. Development of heating systems 16. Development of micro-generation 17. Encouragement to the diffusion of active solar technologies 18. Reduction of pollution from transport 19. Encouragement to the use of bicycle and car sharing
<i>Trento</i>	A.Reduction of energy demand of existing building stock	- A 'Building Identity Card' - Education campaigns - Municipal properties
<i>Venice</i>	A. Reduction of energy demand of existing building stock	- Municipal buildings - Revision of Building Code - Specification for sustainable interventions - Introduction of bio-climatic criteria for the revision of land-use plan for the Campalto Area - Introduction of the prescription of green roofs in the Building Code - Use of active solar technologies of municipal buildings
	B.Reduction of energy demand of industrial sector	- Introduction of energy questions within admissibility criteria for industrial sites - Development of heating system in the Mestre and Marghera areas
	C.Reduction of energy demand of transport sector	- Change of public transport fleet - Car sharing

Source: author's elaboration

The linkage between the objectives, actions and the modes of plan implementation is less clear. All the cases analysed show similar modes to realise the Action Plan, not in complete accordance and relationships with the objectives and the actions elaborated.

Bologna and Modena, as well as Trento and Venice mainly adopt strategies that support the refurbishment or retrofitting of municipal buildings in relation to energy conservation, fuel sourcing or demonstration projects for renewable energy. Particularly popular in the city of Bologna and Modena is the support of external operators (Esco - Energy Service Companies) in energy-saving projects in which a part of the amount saved is allocated to the Energy Commissioner or user in building in question, using environmental financial instruments such as Energy Savings Certificate (ESC) or Energy Efficiency Credit (EEC).

In addition to the self-governing mode through enabling approach is that mainly adopted in seeking to address the reduction of energy demand of existing building stock. Education campaigns to support public policies and promote environmental awareness, aimed at encouraging action by private actors, are activities that involve all four local authorities. Likewise, public-private partnerships and the provision of financial incentives, in particular municipal tax deduction (on the first home tax or urban development charges), are frequently used and introduced in building codes and/or additional assessment schemes, such as the case of the city of Trento. In addition to education campaigns, demonstration projects, public-private partnerships and financial incentives, Bologna and Trento have elaborated a

reward-based mechanism into their building code, which permits the assignment of extra land development rights in case of achievement of particular energy or sustainable performance in new (Trento) and refurbished (Bologna) buildings. Concerning new buildings and the capacity to orient future development, all four cities indifferently adopt command-and-control regulation that intend to influence the building materials and technologies in view of greater energy efficiency and production from renewable sources.

(3) Implementation tools selection

The assessment of planning implementation phase focused on three main elements: firstly the modes of governance resulting in the implementation strategy chosen to realise that action (or group of actions), secondly the main institutional actors involved and then the nature of the implementation tools used.

Table 5.3: Planning implementation phase

SUBJECT OF ACTION	IMPLEMENTATION STRATEGY	ACTORS	NATURE OF IMPLEMENTATION TOOLS
<i>New or refurbished buildings</i>	By authority	Municipality	Command-and-control regulation
<i>Existing private buildings</i>	Through enabling	Municipality	Education campaigns Fiscal incentives (tax deduction) Reward-based mechanism (Only Bologna and Trento)
		Region State	Fiscal and economic incentives Fiscal and economic incentives
<i>Public Properties</i>	Self-governing	Municipality	Contracting with external operators PPP initiatives
	Through enabling	Municipality	Demonstration projects Community funds
<i>Energy Networks</i>	By provisions	Municipality	PPP initiatives
<i>Private transport</i>	Through enabling	Municipality	Education campaigns

Source: author's elaboration

(4) Monitoring process

The fourth sub-criterion intends considering the development of a monitoring procedure along the implementation-planning path in order to evaluate the energy efficiency trends after the adoption of the municipal energy plan. The activation of a systematic effective monitoring programme, using set of indicators previously identified in the analytical phase, provide considerations on the actions and implementation strategies elaborated and support constant improvement.

Table 5.4: Monitoring Process

	MONITORING PROCESS	COMMENTS
<i>Bologna</i>	YES	It is used the Bilancio Ambientale, developed every year
<i>Modena</i>	NO	In the MEP a plan revision every 2/3 year is suggested but, actually,
<i>Trento</i>	NO	-
<i>Venice</i>	YES	The MEP activates a monitoring process action per action

Source: author's elaboration

Bologna and Venice have implemented monitoring process, using the Bilancio Ambientale and action per action, respectively. On the other hand, Modena, despite the MEP provided systematic revision of the whole plan every 2/3 years, have succeeded in monitoring the relevance of its actions and strategies only when the Baseline Emission Inventory for Sustainable Action Plan (Covenant of Mayor) was developed. Finally, Trento, for different reasons, has never maintained a complete evaluation of its municipal energy plan.

(5) Participatory process

The process of public participation during the preparation of municipal energy plan can follow a consultation process addressed to both citizens and institutions, although it is not framed by law n°10/1991.

Public participation in the MEP of the city of Bologna had occurred during five meetings in the period between March 2007 and May of the same year, was open to citizens' participation – on a voluntary basis with an on-line subscription -

and stimulated by local authority through the activities of dedicated showroom with a newsletter system, web pages on the municipal sites and international projects, such as Microkyoto and Echo-action.

Differently, the public participation occurred in the elaboration of the municipal energy plans of Modena, Trento and Venice is mainly oriented to selected representatives of civil society. Key actors of public transport, public and private building sector, national energy agencies, process A21L, as well as members of public authorities were the main actors of thematic boards. Obviously, the promotion of the public participation by these local authorities focused systematically on encouraging the inclusion of the most pivotal private actors and the creation of informal groups of similar institutions.

In this context, it should be highlighted the quality of the participation process in the elaboration of municipal energy plan of Venice that had produced the Action Plan, thanks also to the reasonable stimulus to public participation by the local authority.

Table 5.5: Elements of a participatory process

	TYOPOLOGY OF PARTICIPATORY PROCESS	NUMBER OF MEETINGS	TYOPOLOGY OF STAKEHOLDERS	PROMOTION OF PARTICIPATORY PROCESS
<i>Bologna</i>	Forum	5 (2007)	400 people (150 public agencies, associations and private companies)	Showroom International projects
<i>Modena</i>	Boards for participatory decision-making	3 (2007) + 1 year of Forum Energy Point	Professional associations Stakeholders A21L Public officers	Forum Energy Point Agenda 21L
<i>Trento</i>	Boards for participatory decision-making	4 (2007)	60 actors	no data
<i>Venice</i>	Boards for participatory decision-making	no data	Main private and public actors about public transport, public and private building sector, national energy agencies, tourism accommodation sector	no data

Source: author's elaboration

5.2.2 The evaluation of effectiveness

(6) Problem definition

The evaluation of the process concerning the definition of the problem focuses on the modes and modality of analysis of municipal energy plans, the subject of analysis in relationships with the main findings of recent academic researchers and local experimentations and, finally, on the capacity of public administration to organize the problems in a hierarchical classification.

Bologna and Modena undertook a pioneering analysis phase, at least in Italy, focusing on sectors and energy sources, and on urban areas. This is because it is believed that energy is a spatial variable in relation to the obsolescence of the buildings, their period of construction, the maintenance status and performance of plants, and the density of population and buildings. This methodology allowed identifying, in addition to trends in demand and supply of energy, homogeneous urban areas for energy pressure.

Bologna focuses exclusively on future urban areas of city subjected to transformation (11 urban sectors, nearly 15% of the entire municipal area), and identifies 'energy basins' (for which also prepares guidelines and a matrix of different priority-requirements), including contiguous areas, especially those of uniform energy conditions, environmental and urban planning.

Modena's entire municipal area is partitioned into six areas (residential areas, industrial areas, areas of low energy pressure, etc.) in accordance with homogeneous geographical location, land and building use and intensity of energy use.

In summary, both Bologna and Modena undertake an analysis of energy demand by using spatial representations of the distribution of energy indicators, supported by GIS. In this perspective, both Bologna and Modena build a database of urban energy consumption (divided by zones, utilities and in historical series), with critical issues in the collection of data held by private utility companies, aimed at highlighting, making a series of cartographic representations, the spatial distribution and the trend of energy indicators. The intensity of exploitation of energy resources, calculated by area of land-use plan and depending on power consumption and thermal efficiency and the potential for energy savings is

analysed. Both local administrations identify and classify their territory in homogeneous areas that allows a proper definition of the problem revealed by the analysis of trends for energy sources and sectors.

If the municipal energy plan of Bologna, in conclusion to the analytical phase has been able to recognise the main hierarchy of problems, namely the existing building stock in the historical centre and the new urban areas of BEU, the same appear less clear for Modena.

The urban reality of Venice was analysed by comparing, appropriately, the demographic and socio-economic aspects (Venice is a city that loses citizens but with growing number of tourists), especially the presence of industrial districts in Marghera and Murano, with the trend in energy sources and sectors. This describes the city as both a consumer and as a producer. The energy flows were closely linked to the industrial reality and then to the related processes of extraction, transport, processing and distribution of goods. Similarly, demographic trends, the strong tourist presence and characteristics of the buildings affect the final energy consumption in residential and commercial sector. Within this context, the government of Venice identifies a hierarchy among the problems identified during the analysis and focuses primarily on the productive sector and the residential / tertiary sectors.

The singularity of the case of Trento places emphasis on the procedural standardization occurred in all phases of planning process for the use of national methodologies, such as Enea and Ambiente Italia protocols. In addition, the lack of the approval and the adoption of the municipal energy plan elaborated in 1998 (revised in 2008) and the development of “*Trento X Kyoto*” participatory plan in 2007 has created considerably fragmentation in the articulation of a complete analytical process, focusing exclusively on energy trends due to sources and sectors.

(7) Identification of the causal relationships between the nature of the problem and the objectives of the plan

The analysis shows that the case studies predominantly formulated generic and similar objectives about the reduction of energy demand and the support of energy production. There are not particularly robust linkages between the outputs of analytical phase and objectives, which are aligned with those actions really viable by local administrations. Therefore, focusing the attention on the technical challenges of addressing energy efficiency locally – of acquiring more data and more local knowledge – have distracted from the deeper challenges of building local capacity to develop local objectives and implement local policy.

This is greatly evident in Modena that after having classified its municipal territory in homogeneous areas in accordance with the energy pressure and consolidated its energy database with an enormous effort, it does not pursue objectives oriented to area-level interventions and related spatial planning policies but generically describes a number of possible measures to achieve greater energy efficiency and production from renewable resources. On the other hand, the municipal energy plan of Bologna, according to the categorization of urban areas subject to transformation in different energy basins (BEU), has as objective the containment of their energy demand that did not find appropriate room and strategies in order to be implemented.

Unlike Bologna and Modena, the Venice’s MEP presents an accurate data analysis of energy demand and supply combined with statistical data and urban dynamics per sector, with a focus on industry, transport and existing housing stock. The objectives of the plan approximately follow the outputs of analysis.

(8) Environmental plan impact

While the environmental relevance of these plans is difficult to ascertain because are processes that take long period (and the plans have been adopted few years ago), the long-standing influence of other local urban policies suggests that these have not a significant role in shaping the nature of energy demand and supply.

The table 5.6 shows the timeline and the different steps in the use of municipal energy plan instrument in the case studies. Bologna and Trento started at the end of the 1990s the elaboration of the first MEP, whereas both Modena and Venice began four years later. On the one hand, Bologna, Modena and Trento contemporarily felt the need to develop new plans, which are those analysed and evaluated in this work, in order to overcome the failures of previous ones and address the increasing of energy demand and carbon emissions. On the other hand, the public administration of Venice has decided to maintain the structure of the MEP2003 and, systematically, revise both analytical phase and the Action Plan to monitor its activation and implementation. The energy trends in the Revision2008 confirm the general tendencies of increasing in energy demand by residential and tertiary sectors.

Table 5.6: Timeline of energy planning practices in case studies

	FIRST MEP	REVISION	NEW MEP
<i>Bologna</i>	1999	-	2007
<i>Modena</i>	2002	-	2007
<i>Trento</i>	1998	2008 (analytical phase)	2007 (Trento x Kyoto)
<i>Venice</i>	2003	2005 and 2008 (analytical phase and action plan)	-

Source: author's elaboration

A selection of municipal indicators constantly monitored by ENEA (Table 5.7) agrees with the general increasing in the consumption of natural gas and electrical energy. In addition, this clearly shows the effects of the emphasis on a self-governing approach into the municipal energy policies, able to increase the energy efficiency of municipal operations, through retrofitting buildings or through improving the energy efficiency of appliances used by the municipality, especially with respect to the opportunity to instal active solar technologies such as solar panels on municipal roofs. For a number of reasons related to the national context, the use of photovoltaic panels on municipal buildings has not had the expected results.

Table 5.7: Selection of municipal indicators

	NATURAL GAS CONSUMPTION [mc/inhab] 2000-2010	ELECTRICITY CONSUMPTION [kWh/inhab] 2000-2010	SOLAR PANELS ON MUNICIPAL BUILDINGS [msq/1000inhab]	PV PANELS ON MUNICIPAL BUILDINGS [msq/1000inhab]	VOLUME OF DISTRICT HEATING SYSTEMS [mc/inhab]
<i>Bologna</i>	642,1 – 571,7	1262,3 – 1304,5	0,1 – 0,6 (2007-2010)	0,1 – 5,2 (2007 – 2010)	19,84
<i>Modena</i>	609,7 – 640,7	1077,6 – 1189,3	2,6 – 3 (2007-2010)	0,1 – 0,1 (2007 – 2010)	5,46
<i>Trento</i>	616,2 – 630,4	1111,9 – 944,1	0,3 – 4,8 (2006 – 2010)	0,1 – 0,6 (2007 – 2010)	-
<i>Venice</i>	614,9 – 619,5	1087,7 – 1170,4	0,3 – 0,7 (2004 – 2010)	0,1 – 0,5 (2007 – 2010)	-

Source: Enea, 2010

(9) Plan guidance on urban development

The environmental effectiveness of the municipal energy plan can be analysed from two different perspectives: (a) its capacity to orient the urban development encouraging those spatial requirements that are proved to influence energy demand and support the production from renewable resources and (b) its capacity to promote energy-sensitive buildings. The assessment of plan effectiveness through the influence on the physical urban characteristics can be divided into two parts. In the first part the municipal energy plan is compared with the priority areas defined in the main land-use plan. In the second part, a detailed analysis of the land-use plan is carried out to understand how these intentions are defined to be operationalized. This is strongly linked with the capacity to influence the physical characteristics of buildings, the point (b), using financially and institutionally viable local strategies.

Within this background, the planning authorities of the city of Bologna, contemporarily with the revision of structural urban plan and the elaboration of the new municipal energy plan, revised its building code and included a set of measures with the objectives to assign rules for the construction of energy efficient buildings and support with financial and non-financial (a reward-based mechanism) instruments for the refurbishment. Furthermore, the structural urban plan of Bologna introduces the article 36 “Ecological and environmental quality” that provides:

Paragraph 12: Energy saving for existing buildings;

Paragraph 13: Improvement of existing district heating;

Paragraph 14: Development of energy production from renewable sources;

Paragraph 15: Energy analysis of urban areas subjected to transformation.

Except for the attention to the development of urban areas subject to transformation, which are the same classified in the municipal energy plan as ‘energy basins’, the structural urban plan of Bologna prescribes the other actions through the measures introduced in the new building code, centred on buildings as units of analysis and interventions.

Whereas the cities of Modena and Trento revised their building codes in view of higher energy performance of buildings, Venice introduced energy dimension in the construction criteria for the elaboration of detailed plans that insist on the Campalto area thanks to a revision of land-use plan, and admissibility criteria for industrial sites.

5.2.3 The evaluation of integration

(10) Horizontal integration

The analysis of horizontal integration corresponds to three different dimensions: (a) the inclusion of energy themes into the public agenda, (b) the development of temporary project coordination units during the elaboration of municipal energy plan and, finally, (c) the capacity to design joint policy.

The evaluation of the relationships between the nominal aspects of public actions and financial resources assigned to the public objectives gives the measure of the real extension of the inclusion of energy questions into the public administration.

The modes of public authorities to include an objective into own programme can be categorized into four classes:

1. Politics is limited to non-statutory documents
2. Politics is limited to the definition of objectives/programme in own internal administrative planning (*Relazione Programmatica Provisionale/...*)
3. Politics is limited to the definition of objectives/programme in own internal administrative planning (*Relazione Programmatica Provisionale/...*) and identify the subjects responsible for that objective
4. Politics assign financial resources to these objectives/programme

Accordingly, Modena and Bologna address the third category whereas Trento and Venice the second one. In the administrative documents of Bologna and Modena there is the clear identification of the political (generally the locally elected councillor with responsibility for environmental matters) and technical (generally the Head of City Department) people in charge, the public officers and other departments involved.

Concerning the development of temporary project coordination units, no case studies have considered them and this has influenced the achievement of joint policy.

(11) Vertical integration

The vertical integration, with a certain approximation, can be represented in view of centre-periphery municipal organization. In other words, the evaluation of vertical integration moves from the description of the shifting of the responsibility (and risk) of a public policy operation from the centre to the periphery of political power. The risk can be taken at the highest levels, assigned to managers, to officials, or assigned in its entirety on an external agency. In this sense, the real extent of integration between politics and technique can be considered. The issue of vertical integration is then placed in a function of the risk-taking: from the periphery to the centre of the administration.

Similarly to the analysis and evaluation of the horizontal integration, the case studies highlight three different orientations within the municipalities. The first case, which could be well represented by the local administration of Modena, consists in a strong policy direction that guides the technical sphere through a full risk-taking by locally elected councillors, they are assigned, nominally, the achievement of objectives and programmes. Within the administration of Modena, the elaboration of the municipal energy plan and its implementation is entrusted to the Environment and Civil Protection Department and in particular to the Unit of Energy and Environment, as a direct emanation of councillor office's jurisdiction.

The second case is represented by a plea agreement between the politics and technique, where political risk is fully shared (and sometimes shifted) with the relevant technical field involved. With a completely different approach, both Bologna and Trento can be included in this category.

The government of Bologna strongly integrates the political component with that technical, resulting in a harmony of objectives and programs that are fertile ground for their effective implementation and continuous implementation. On the other hand, Trent suffers from the risk sharing, for a very specific institutional context, and this does not seem very balanced.

The case of the government of Venice, with the creation of a Venice Energy Agency as result of SAVE European project, AGIRE, shows that there may be a strong technical direction in the absence of a full assumption of risk by the political sphere outsourcing the implementation and revision of municipal energy plan to a non-profit organization owned (in part) by the city of Venice. Although the Office of Energy Sources and Thermal Systems (Environmental Management Policies and Youth, Department of Protection of air and energy sources) maintains the coordination of the plan, AGIRE has the full mandate to monitor and implement energy and environmental strategy of the City of Venice.

(12) Cooperation among departments

The evaluation of the cooperation among municipal departments takes into consideration the participation of different administrative units during the elaboration of the municipal energy plan. The documents of the participatory process, in terms of Forum or Boards, and the interviews provide sources of evidence for the analysis.

The case of Bologna shows continuous relationships between the Department responsible for environmental matters and that responsible for urban and territorial planning, thanks to the contemporaneous revision process of the main local planning instruments (structural, operative plans and building code). Actually, from the documents emerges that a meeting between departments took place only at the end of the elaboration of instruments. In addition, the interviewee points out that the involvement of different municipal units is considered the real limitation to the efficient and effective implementation of MEP.

Generally, therefore, although some types of interaction takes place during the planning process, policies have been defined within the confines of the powers and responsibilities of different government units. The case - perhaps the only example - of coordinated and shared policy between different departments is the review of the building code, while other forms of collaboration are evident in demonstration projects or projects financed by national / international funds.

The municipality of Modena mentions only 2 meetings between different departments during the elaboration of the municipal energy plan whereas both Trento and Venice involved in the participatory processes a number of actors (at different extent) from the different sectors of local administration.

(13) Political long-term vision

The assessment of the capacity of the political sphere to produce long-term policies that affect energy issues, environment and, more generally, sustainability, may be difficult respect to the instrument of municipal energy plan. This could be justified in the first place for the mandatory nature of the same instrument, provided by Law 10 of 1991, and its declared sectoral approach with respect to the land use, and second, because the four plans are already well developed but with deadlines not properly defined, as well as revised in the case of Venice.

The work then, in order to analyse the tendency of politics to overcome their elective limits, investigates how it has been approached another instrument, the Sustainable Energy Action Plan. It is a voluntary action, promoted by the European Union in the Covenant of Mayors initiative, which provides after the signature of a declaration of interest its elaboration, within 1 year.

The analysis questions how the signature of the Covenant of Mayors (if any), the approval by city council and subsequent submission of SEAP are distributed on the time axis. Or more simply, the work observes what is the shift between the deadline declared in the scenario building or goal setting and the real moment of submission.

Table 5.8 shows signature, approval and submission of four governments and stresses, by the way, what should be the lead time set by the EU to meet the deadlines.

Table 5.8: Signature of the Covenant of Mayors and SEAP submission

	COVENANT OF MAYORS SIGNATURE	RESOLUTION OF CITY COUNCIL SEAP SUBMISSION
<i>Bologna</i>	22 December 2008	(22 December 2009) 28 May 2012
<i>Modena</i>	14 January 2010	(14 January 2011) 18 July 2011
<i>Trento</i>	-	-
<i>Venice</i>	22 July 2011	(22 July 2012)

	COVENANT OF MAYORS SIGNATURE	RESOLUTION OF CITY COUNCIL SEAP SUBMISSION
<i>Bologna</i>	22 December 2008	(22 December 2009) 28 May 2012
<i>Modena</i>	14 January 2010	(14 January 2011) 18 July 2011
<i>Trento</i>	-	-
<i>Venice</i>	22 July 2011	(22 July 2012)

Source: author's elaboration

As the table well shows, to the signature of the Covenant of Mayors does not precisely correspond, after one year, the City Council resolution that approves the Sustainable Action Plan and permit its submission. Similar to a number of other cases in Italy (and in Spain), being a signatory has mainly a political meaning but it does not coincide with a real political vision and entitlement.

In the administration planning of the municipality of Bologna, at the end of 2010 (*Relazione Previsionale e Programmatica 2011-2013*), it is declared June 2011 as deadline for the elaboration of the SEAP, which, fundamentally, revises the existing municipal energy plan. Whereas Bologna, not achieving this objective, submitted its plan 3 years after the EU deadline, the municipality of Modena did it with only 6 months of delay, in July 2011.

Trento has the political intention to sign the Covenant of Mayors, as the internal administrative planning for 2011-2013 demonstrates (“*Programma 160: valutare ed approfondire le modalità e condizioni per aderire al Patto dei sindaci*”), but the public administration is still in a phase of negotiation between the political and technical spheres, in particular the Environmental Department feels the necessity of a strong methodological support from the Autonomous Province of Trento in the definition of appropriate approach to the SEAP, in order, in this perspective, to give coherence inside the same territory.

5.2.4 Summary of the critical analysis

The overall conclusion of this evaluation exercise is presented in the following tables that reassume the results discussed in the previous paragraph. The score attained represents the impacts of the case under analysis on each sub-criterion, which are qualitatively measured in three different levels (□□, ■□, ■■).

Seeking to make clearer the gap between the adoption and the implementation of plan and according to the conclusions of the evaluation work, this summary provides the basis for identifying a number of singular and important themes. Hence, the evaluation highlights a number of issues where plan implementation can be improved. Great differences and similarities emerge between four case studies, especially five: (1) the innovative character of the analytical phase of the MEPs of Bologna and Modena, which includes a spatial dimension of energy demand and supply; (2) the existence of a ‘good’ analytical phase and of a ‘weak and standardized’ Action Plan in Bologna, Modena and Venice; (3) the weakness of the plan implementation strategies and tools in all four cases, which is limited to a self-governing approach or to impose by authorities regulations on buildings; (4) the different attempts to include and integrate energy questions into a more general framework of urban governance in Bologna, Modena and Venice, and (5) the fragmented and confused approach of the municipality of Trento in addressing objectives as greater energy efficiency and production from renewable resources.

Bologna

Table 5.9: Evaluation results of the city of Bologna

CRITERIA	SUB-CRITERIA	BOLOGNA RESULTS	COMMENTS
<i>Efficiency</i>	(1) External coherence	■■	
	(2) Internal coherence	■□	No Action Plan
	(3) Implementation tools selection	■□	Introduction of a reward-based mechanism for new and refurbished buildings
	(4) Monitoring process	■□	
	(5) Participatory process	■■	Forum with citizens
<i>Effectiveness</i>	(6) Problem Definition	■■	
	(7) Identification of the causal relationships	■□	
	(8) Environmental plan impact	□□	
<i>Integration</i>	(9) Plan guidance	■■	
	(10) Horizontal integration	■■	
	(11) Vertical Integration	■□	With the consulting of “La Esco del Sole”
	(12) Departments Cooperation	■□	
	(13) Political long-term vision	■□	

Source: author’s elaboration

Modena

Table 5.10: Evaluation results of the city of Modena

CRITERIA	SUB-CRITERIA	MODENA RESULTS	COMMENTS
<i>Efficiency</i>	(1) External coherence	■□	
	(2) Internal coherence	■□	
	(3) Implementation tools selection	□□	
	(4) Monitoring process	□□	
	(5) Participatory process	■□	

<i>Effectiveness</i>	(6) Problem Definition	■ ■	Strength and weak point of Modena's mep
	(7) Identification of the causal relationships	■ □	
	(8) Environmental plan impact	□ □	
	(9) Plan guidance	■ □	
<i>Integration</i>	(10) Horizontal integration	■ ■	
	(11) Vertical Integration	■ □	
	(12) Departments Cooperation	■ □	
	(13) Political long-term vision	■ ■	

Source: author's elaboration

Trento

Table 5.11: Evaluation results of the city of Trento

CRITERIA	SUB-CRITERIA	TRENTO RESULTS	COMMENTS
<i>Efficiency</i>	(1) External coherence	□ □	No relationships between analytical phase and action plan Introduction of a reward-based mechanism for new buildings
	(2) Internal coherence	□ □	
	(3) Implementation tools selection	■ □	
	(4) Monitoring process	□ □	
	(5) Participatory process	■ □	
<i>Effectiveness</i>	(6) Problem Definition	□ □	In the plan called "Trento X Kyoto" the analytical phase is completely lacking.
	(7) Identification of the causal relationships	□ □	In the plan called "Trento X Kyoto" the analytical phase is completely lacking.
	(8) Environmental plan impact	□ □	
	(9) Plan guidance	□ □	
<i>Integration</i>	(10) Horizontal integration	■ □	
	(11) Vertical Integration	■ □	
	(12) Departments Cooperation	■ □	
	(13) Political long-term vision	□ □	Weak relationships with the provincial institutional level

Source: author's elaboration

Venice

Table 5.12: Evaluation results of the city of Venice

CRITERIA	SUB-CRITERIA	VENICE RESULTS	COMMENTS
<i>Efficiency</i>	(1) External coherence	■ □	Some attempts with revision of land-use plan and industrial sites
	(2) Internal coherence	■ ■	
	(3) Implementation tools selection	□ □	
	(4) Monitoring process	■ □	
	(5) Participatory process	■ ■	
<i>Effectiveness</i>	(6) Problem Definition	■ □	
	(7) Identification of the causal relationships	■ □	
	(8) Environmental plan impact	□ □	
	(9) Plan guidance	■ □	
<i>Integration</i>	(10) Horizontal integration	■ □	
	(11) Vertical Integration	■ □	With the support of Agenzia Veneziana per l'Energia (Agire)
	(12) Departments Cooperation	■ ■	
	(13) Political long-term vision	■ □	

Source: author's elaboration

5.3 A comparison of the results obtained in the case studies

Learning by doing

At the local scale, planning practices should be based on processes, learning by doing and from whose experience should be an increase in political, technical and organizational capacity. During these learning situations, planning, policy processes and best practices are hybridized and transformed, and this process allows public administrations to build a local memory that can strongly influence their capacity to deal with complex issues and uncertainty. In other words, the accumulated experiences in interactive processes involving local contexts, in terms of actors and institutional levels, influence the choices of the government, helping to build a institutional capacity. City rating systems such as Green City Initiatives and Smart Cities show examples of relevant local governments with a long tradition in the fields of environmental policy and sustainability. Scores of cities in Scandinavia, in general very close to the top positions, show how to achieve public objectives requires efficient and effective urban strategies, following a long process of learning can overcome the limitations and barriers to local governments' implementation of actions (Betsill & Bulkeley, 2006; Bulkeley, 2009; Wilson & Piper, 2010). The city of Stockholm has a long and unbroken tradition of ambitious environmental efforts since the mid 1990s. In recent decades, the city has undertaken various initiatives led development to reduce the climate impact. Similarly, Copenhagen has addressed environmental issues and sustainability since at least 1970s. In recent decades, to broaden the visibility of the solutions that are used, tested and proven in the Copenhagen, the municipality works to promote the city as an international showcase for smart green solutions. In the Italian context, interesting case is the city of Bolzano-Bozen. The municipality uses the well-known experience of the Autonomous Province of Bolzano, in which an energy certification procedure (*KlimaHaus-CasaClima*), was launched in 2002 and managed by a provincial agency, and has had great success, qualifying the property market and becoming also a standard across the province. The certification process has raised awareness on the issue of energy and has established an integrated system to generate positive effects in terms of dissemination of know-how, qualification of the construction industry and building materials, and - more generally - has supported the construction of a considerable 'institutional capacity'. In the analysis performed, Bologna and Modena have gained considerable experience in energy and sustainability through a number of innovative projects and initiatives since 1980. They were the promoters of the process of Local Agenda 21 in Italy and signed the Aalborg Charter and other international and national networks, such as ICLEI. Moreover, the Emilia-Romagna and its municipalities are recognized nationally as a leader in the field of spatial planning and participatory processes. The result is a continuous process to improve the tools available, such as municipal energy plan, and to adapt to the local context.

Public leadership

The local capacity of effectively dealing with environmental issues, specially with regard to climate change adaptation and mitigation strategies, refers to a problem of public leadership. In the case of municipal energy plan the key role of public leadership is particularly evident in two ways. First, the political leadership, by inserting the energy as a problem in municipal agendas (the phase of the policy process generally called agenda setting) has allowed cities like Bologna and Modena to catalyse national and international opportunities in terms of projects, campaigns and awards and to pursue innovative actions and to build policies with long-term visions. As a result, the variety of local experiences along the peninsula, Bologna and Modena are positioned at the forefront in tackling energy problems using innovative urban policies as the process of Local Agenda 21, the municipal energy plan and the opportunity of the Covenant of Mayors (Sustainable Energy Action Plan - SEAP). On the other hand, Trento seems to have suffered the unquestionable political, institutional and financial leader position of the Autonomous Province of Trento in the areas of energy policy and urban development. The example set by the municipal energy plan in this regard is interesting. Although the City Council has committed to structure its energy policy (and has in part done, as we have seen), it knowingly waived his technical role, requiring a legislative and methodological support from the Provincial Energy Agency both in the case of municipal energy plan and the voluntary sustainable energy action plan. The theoretical and methodological framework is still considered by officers and directors, doubtful and uncertain.

In the case in which the political leadership is strongly supported by technical leadership, this results in the enhancement municipal competencies. Generally, however, in contrast to the exceptional innovation of the plans of Bologna and Modena, Ambiente Italia and Enea have proposed two methods for the development of the Municipal Energy Plan and at the same time, they were the main catalysts and promoters. Due to the novelty of the instrument, the lack of legal

provisions and case studies to be considered as best practices, most local planning authorities involved have decided to be supported by these external bodies, not taking the opportunity to lead and manage the process. The adoption of the first municipal energy plan in Modena (2002) was intensively promoted and supported by the city environmental manager - with the support of the young structure of the Agency for Energy and Sustainable Development. The document was not produced within the public administration and, therefore, had little impact on training and qualification of technical staff in the environmental sector and contributed weakly to the pursuit of energy efficiency and generation of energy from renewable sources. On the other hand, the PEC-2007 (still in force) had a completely different story. Stems from the desire of the manager of the Department of Environment and Energy that, using internal resources and support to young professionals and external supervision of the Politecnico of Milano, has promoted the formation of a much more able to engage both the structural level is the operating planning process.

Moreover, from a technical point of view, the cross-cutting issues and multi-scale energy, corresponding to a wide range of relevant questions to be addressed, would make it difficult to accredit in a unique and specific institutional site that has all the skills needed by all levels. As a matter of fact, however, that jurisdiction is limited in some central and municipal offices, with extreme difficulty in involving all levels of government and all the different structures of the same administration, theoretically required to promote integrated solutions. Consequently, the drafting of the energy plan and the planning of energy types was kept in a unique policy domain, which generally centralizes the powers and responsibilities in the environment or energy sectors. They usually have to do with a whole range of environmental issues and where the demands of the multi-disciplinary, the political leadership and financial resources may be limited. In many cases, such as Venice and Modena, were established Municipal Energy Agencies, in addition to the creation of working groups in the environmental sector, in Bologna, the *Unità Intermedia Qualità Ambientale*, in Modena, the *Unità Specialistica Energia e Ambiente*, and in Venice the *Servizio Fonti di Energia e Impianti Termici*.

Policy integration

The attempts of integration of energy efficiency and renewable generation within the administrative areas of intervention, also not directly involved in the development of municipal energy plan, are particularly evident in cases of Bologna and Modena. These were processed in parallel to the revisions of structural urban plan with the aim of integrating their analysis, the objectives and strategies by adopting a new approach. The spatial analysis of energy consumption and the subsequent division of the municipal area into homogeneous urban areas (BEU), in accordance with standards and specific criteria, has allowed orienting urban transformations with different guidelines. The MEP-2007 of the city of Bologna has initiated a systematic integration of energy efficiency goals oriented to the existing building stock in the local planning and regulatory instruments (from the structural plan to the building code), making a major step forward compared to the previous plans. Similarly, in 2007 the city of Modena started a process to revise its planning instruments conforming to the latest European directives, national and regional standards on building energy efficiency. This has favoured the introduction of energy certification for new construction and economic incentives to promote and encourage voluntary measures to new buildings or substantial refurbishments. Despite the municipal energy plan and the structural plan are different instruments, one (MEP) for urban policy and methodological approach, the other (PSC-POC) for planning and local governance, Modena has sought a relationship between the conformance measures of building code (RUE) and the actions of the energy plan. Even Venice, although "poorly", has experienced the interaction between energy and urban planning in its own variant of the land-use plan for the area Campalto, in which the municipality planned to incorporate bioclimatic criteria for the detailed plans, in terms of building energy standards and volumetric and functional incentives. Moreover, most Italian cities have undertaken the revision of building codes in order to include energy-performance requirements for new construction and substantial renovations, with the aim of regulating the energy aspect of building transformations. Mandatory measures aimed at reducing energy consumption and certification of performance in accordance with European Directive - EPBD Recast EPBD and - and national and regional standards, while voluntary measures refer mainly to good design practices, in terms of technical and construction criteria, typological and engineering, with the objective to encourage product innovation and process innovation in the construction industry. As previously mentioned, the municipal organizational units of Bologna, Modena and Venice involved in the drafting of municipal energy plan have directly coordinated (or are coordinating) the revision process of building code, considering the crucial integration between the requirements of the urban plan and the municipal energy plan. Trento, however, has developed a set of regulations for sustainable building without any collaboration with the City Department for the Environment. The *Sportello Imprese e Cittadini* promoted in 2007, and has now started the process of revision, the *Regolamento per la diffusione dell'edilizia sostenibile* as a technical annex to the building code, based on an assessment system for the sustainability of buildings. In particular, one of its officers personally took care of a process of

decomposition and operative translation of an instance of the public administration about sustainability goals in the construction industry. Subject of the Regulation are new buildings, that according to the score obtained in the outlined actions, are entitled to the allocation of financial incentives, volume incentives and advertising incentives.

From a technical point of view, the crosscutting nature of energy, corresponding to a wide range of important matters to deal with, make it difficult to define one precise institutional place with all the necessary skills. As a matter of fact, however, that jurisdiction is limited and centralized in some municipal offices, and that is extremely difficult to involve all levels of government and all the different structures of the same administration that theoretically are required to promote integrated solutions. Consequently, the preparation of the energy plan is kept in a sectoral policy domain, which centralizes responsibility and expertise for the development of this plan in the areas of environment and energy. Such funds usually have to do with a number of environmental issues that may limit the multi-disciplinarian competencies, political leadership and financial resources.

In many cases, such as Venice and Modena, have been set up local Energy Agencies, in addition to establishing within the environmental sector working groups. Bologna has been activated Intermediate Unit for Environmental Quality and Modena, the Specialized Unit for Energy and Environment, while in Venice was established the Renewable Energy and Thermal Systems Service.

Cooperation and coordination between different departments is emerging, as a *conditio sine qua non* for achieving the integration of policies, although a good relationship between the different sectors of the municipal administration cannot be considered sufficient. While Bologna notes the great difficulty of making cross-sectoral projects, Modena has suffered the supremacy of the historical planning department despite the expertise on energy and climate change of environmental department is nationally recognized.

The standardization and weak linkages between the main phases of the MEP

The case studies find a shift from the phase of analysis and the subsequent development of strategies and actions. The evaluation of the relations between the proposals of the plan and the results obtained from the reconstruction of the historical evolution of supply and demand of energy has not always successful. Many municipalities have emphasized the importance of being able to measure progress and demonstrate results - a complex endeavour - through long and costly process of collecting and analysing data. The focus on technological challenges such as acquiring more data and more local knowledge have not, on the one hand, strongly influenced the development of measures tailored to local needs, and, on the other hand, *"may distract from the deeper challenges of building local capacity to develop and implement policy to which we now turn"* (Bulkeley et al., 2009, p. 13). The strategies contained in the action plans are all too familiar. Increasing energy efficiency, switching from fossil fuels to renewable sources, reducing energy demand (in buildings and transport) are generally actions indistinct from context to context, as in the case of Trento and the other 3 municipal energy plans, particularly those prepared by following national protocols. In the case of Bologna and Modena, the energy balance of the city is integrated with the analysis of spatial pattern of energy consumption and greenhouse gas emissions in order to understand the energy demands of the different basins in relation to their physical, organizational, social and economic features. Despite the differences between Bologna and Modena in the identification of the BEU - Modena for the classification of the energy basins occurred on the basis of homogeneous areas of PRG in 1999, while Bologna are areas on which to intervene because they show particular critical or problematic, as the new development or presence of district heating networks - a similar approach was proposed for the drafting of guidelines, differentiated according to urban energy basins. However, the translation of objectives into action, has given rise to some reflections to the municipal leaders interviewed. Bologna argues that the lack of a detailed study on the implementation and implications of the proposed action *"has left some parts of the plan in a dimension of 'incompleteness' while others have found fulfilment in their authoritative size"*, in particular the introduction of the energy dimension into the building code and structural urban plan. From another point of view, the head of the Energy Sector of the municipality of Modena says that thanks to their long experience, *"the issues to be addressed and the relevant actions have been properly identified and proposed, but not implemented in a hierarchical relation accordingly with their relevance to, because of the discrepancy between the actions of the energy plan and the urban and detailed plan"*. Similar to Modena and Bologna, Venice also highlights concerns about the consistency between analysis, strategy and action plan. The Venetian manager maintains a positive opinion of the plan ability to describe - despite the use of a top-down approach - energy demand and supply in the city. On the other hand, the officer concludes that this *"is quite incomplete when compared with the actual capacity of governing the conservation and the transformation of urban space. The proposed actions [then] do not affect significantly the trend of energy consumption"*.

Fundamentally, the analysis of case studies highlights the major difficulties in defining the problems and the identification of causal relationships between the nature of the problem and the actions to be addressed. Also in those cases where the analysis phase has proposed innovative methodologies, able to recognize the influence of local conditions as the energy supply, urban policies do not attempt to govern interdependencies, the simultaneity of the processes that energy efficiency in its proposed multi-dimension and in its multi-scale characteristic, and are not even designed in accordance with the attributes and local priorities (see Howlett). Although the standardization of processes and methodologies for comparing and monitoring, where possible, the result, local governments have kept the focus on equities too general, not locally defined, with a fragmented hierarchy. The case studies make clear that municipalities tend to prefer policies that are feasible in the short term, where the necessary technology and technical component is predominant, as the area of new buildings with high energy efficiency standards - completely forgetting that the existing housing, representing 40% of total energy consumption in the European Union, is the main source of emissions and has the greatest potential to increase energy efficiency - and where it can be relatively simple to take decisions and have direct control, as policies on municipal buildings and park vehicles. Adopting the conceptual model of Bulkeley and Kern (2006), analysed energy plans, as had Trento, in particular, tend to intervene through policies of self-governing, assuming the municipality as the alert user to improve the energy quality of its buildings, use of renewable sources in demonstration plants, the rationalization of its technological systems and street lighting. Similarly in Bologna and Modena, the municipality may act in integrating regulatory instruments, such as building regulations, building innovative models that meet the goals of reducing energy consumption and developing renewable energy sources. Acting by the regulating authority may only partially affect the construction industry, because its operation is in fact limited to new buildings and those subject to considerable changes in building codes. The intervention on the existing building implies the need for a shift from the authoritative models to models of urban governance through enabling, according to the common support and encourages the pursuit of public objectives using financial incentives and volume, that volume is additional or volumetric deduction, as in the cases analysed.

Weakness of energy planning implementation phase: the actors and the nature of the tools

Various public actors and levels of government are involved in the respective areas of competence, creating a certain fragmentation in the way by which resources are managed and objectives implemented. It follows that the energy policy at the local level suffers from a particular balance of power that takes place between the different levels of government on the basis of a distribution of resources and expertise. The first point to be stressed is that various actors at different scales take part in energy planning and policies, creating considerable fragmentation in how resources are managed across the country (table 5.13). The results of case study analysis reveal the lack of public resources at the municipal level and the difficulties of promoting 'green' urban regeneration processes. Generally, the key actors are the state (retaining general regulation duties and fiscal and financial powers) and the regional governments (responsible for planning and land-use laws and the allocation of economic resources), which have defined the main implementation mechanisms in terms of financial instruments. These include economic incentives to promote the energy efficiency of new and old buildings and energy generation (especially photovoltaic and solar panel systems), as well as fiscal measures. Differences between institutional competencies, especially between Regions and Autonomous Province, largely influence the local modes of governance and public actions. The National State generally exercises the concurrent legislative competencies over energy area with the exceptions of the Trento and Bolzano territories where, a decentralisation of institutional competencies is taking place. On the one hand, Regions and Autonomous Provinces similarly have the major institutional room in energy management and planning in order to foster the sustainable development of local energy system and the control and reduction of greenhouse gas emissions. Considering energy concerns in urban areas more as a discipline related to environmental protection, energy management and planning can be considered a regional competency and, accordingly, some regional authorities – i.e. Emilia-Romagna region - have promulgated laws with guidelines for supporting and strengthening municipalities in the development of local planning (Florenzano & Manica, 2009). The Province of Trento distinguishes in the Italian context for the particular attention to energy and climate change issues with the development of Provincial Energy Plan, adopted in 2003 and now in review, and Provincial Strategies to address climate change, adopted in 2010. In the meantime, the Province has introduced high-energy standards for new and refurbished buildings and provides financial incentives to promote and encourage energy efficiency measures and the production from renewables. On the other hand, a pivotal case is that of energy production. The traditional companies providing energy (electricity, gas) and water, which, founded at the turn of 20th century by the municipality, now have become public utilities serving the provincial territory and are directly owned or controlled by the Autonomous Provinces (with different between Trento and Bolzano-Bozen). Moreover, the strong legal status and financial resources of the

Province of Trento have supported and guaranteed a major initiative in energy sector both at territorial level and municipal level, thanks also to a key role played by the University and research centres. Consequently the city of Trento has found itself in more favourable financial and institutional situations than Bologna, Modena and Venice, especially in consideration of recent trends towards federalism.

Table 5.13: The Italian implementation strategies for energy efficiency and generation

IMPLEMENTATION STRATEGIES		POLITICO-ADMINISTRATIVE LEVEL		
		MUNICIPAL	REGIONAL	NATIONAL
Building Regulation	Mandatory building energy performance certificate		■	■
	Building code	■		
Financial Incentives	Economic incentives	■	■	
				■
	Fiscal incentives	■		■
Public-Private Partnerships Initiatives	Energy generation systems and technologies	■		
	Public properties	■		
Community Policies and Initiatives	Demonstration projects	■	■	
	Education campaigns	■	■	

Source: author's elaboration

Despite the mentioned local differences, fiscal and economic measures are implementation strategies widely used to support new behaviours in all the four municipalities analysed. In support to the regional and provincial financial measures, all are focused on different kinds of tax reduction, especially on mechanisms relative to property taxes and urban development charges. The combination of implementation instruments developed at different level can be considered most effective for new constructions and energy generation – in particular photovoltaic and solar panel technologies – with large interest in the Province of Trento and its capital. In terms of effects, the risk of free-riders (those who would make the investment anyway without the grant) is considerably high and real (Ürge-Vorsatz, Koeppl, & Mirasgedis, 2007) with the sudden construction of large photovoltaic plants on industrial and agricultural areas (Legambiente & CRESME Ricerche, 2010), sometimes generating conflicts on the use of fertile areas or for the impact of technical equipment on the landscape. To regulate this, the Province of Trento and the municipality of Trento, contemporarily with the discussion on new Provincial Territorial Plan, have agreed on the necessity of developing guidelines and strict regulation on the use of solar active technologies. Completely different the impact of these measures on the mobilization of low-income householders, and the 'green' refurbishment of old buildings.

At the local level, the Italian planning system depends on national and regional laws. Some Regions, such as Emilia-Romagna and Veneto, have introduced a new approach based on the distinction between the structural and the operational level of urban plans, and on the Planning and Building Regulations. The structural plan is generally aimed at outlining the main organization lines and indicating long-term changes; the operational plan is finalised to identify actions and transformations to be carried out in the short-term. As a result, a proactive/strategic nature and a regulative one arise for the plan (Veronesi, Tulumello, Rubino, & Delponte, 2012). The former, without a real prescriptive framework, create new hypotheses for transformation. The latter ensures existing and new rights, defined through prescriptive and accurate procedure (Mazza, 1995b). In the case of Trento, on the other hand, the relationships between the city and the Province are unbalanced and affect also the planning decisions that have to be approved by the Province (Zanon, 2013). Hence, although a recent reform of planning system, the main planning instrument at local level is still the municipal plan ("*Piano Regolatore Generale*" PRG). As a result, the regional planning systems greatly encourage Bologna, Modena and Venice differently to Trento to consider the spatial dimension of energy concerns in the development of both structural and energy municipal plans. Hence, although municipalities are strong centres of local autonomy that retain jurisdiction over local planning, they can develop their urban and energy policies only with great difficulty. This is due in part to the lack of financial resources – which discourages the development of local measures in terms of capital subsidies and grants – and in part to the allocation of competencies between different institutional levels, and finally to the still limited interest in land-use-based mechanisms to govern energy as an urban issue.

The point about the nature of the tools is closely related with the previous considerations. It concerns the nature of the implementation tools available. In general, these rely on a key role of the public administration in replacing the market and correcting its failures – what are called negative externalities – through authoritative tools in form of regulation, as well as taxes and subsidies, in accordance with the Pigouvian approach (Webster, 1998).

As the above table 5.13 suggests, different politico-administrative levels make use of different implementation tools in relation to their institutional competencies on economic and financial matters and on urban development and land-use rights assignment. The local planning authorities generally use market shaping and market regulation tools – such as the municipal energy plan and the building code – when it is recognized that market failures would prevent economic instruments alone from achieving the objectives of the energy or environmental policy. As previously mentioned, these typologies of policy tools have not had the desired effects, especially when the plan objectives have regarded existing property rights. City authorities are in a unique position to engage local stakeholders and design locally tailored implementation strategies in accordance with specific local priorities and context and this capacity is evident in extraordinary projects carried out by Modena and Bologna about energy production and municipal buildings, such as the projects “*Photovoltaic in the city*” and “*The sun at school*”.

Non concerning the self-governing approach, the local administrations analysed maintain the emphasis on policies that are feasible in the short term, in which the required implementation tools are those at disposal, such as the policy area and tools for new buildings with high energy efficiency standards – completely forgetting that the existing housing stock, which accounts for 40% of the total energy use in the EU.

In particular, command-and-control regulations are generally effective for new buildings when they are followed by an on-going inspection programme (Ürge-Vorsatz et al., 2007), while authoritative approaches are – in part - ineffective for improving old inefficient buildings. According to Rydin (1992), the property can play a passive or active role in this environmental impact. Whereas the intention to construct the building or building complex or urban areas under energy efficiency criteria in design and materials can be an active ingredient in the case of mandatory implementation of building energy efficiency standards (imposed by EU Directives – EPBD and EPBD Recast) and with the support of financial incentives, the passive role is largely related to the cause of CO₂ emissions increasing and has to deal with the different legal nature of property rights over the building or land. In consideration of the discussion on the spatial requirements under energy concerns, it is clear that the nature of land and building property, different in the various legal traditions (the Roman model and the British model) and that influences the assignment of rights, their autonomy and separability (Renard, 2007, 2008), has an effect on the efficiency and the effectiveness of land management strategies developed and some evidences from case studies supported. Hence, although the objectives of Bologna and Modena were to address the existing urban areas and housing stock, the lack of detailed study on the implementation and implication of measures proposed “*has left some part of the plan in a dimension of incompleteness, in particular the measures to improve the energy efficiency of existing residential buildings*” (interview with Bologna energy city manager). Similarly to Bologna, the Venetian city manager concludes how the municipal energy plan of Venice has “*limited real capacity to govern the conservation and transformation of urban space. The actions and policy tools proposed do not significantly influence the consumption trend*” (interview with Venice energy city manager).

Nevertheless, the administrative capacity to deal with environmental and energy issues may improve the existing implementation instruments, as demonstrated by the scores achieved in the Italian ‘*Ecosistema Urbano 2011*’ report by the best ranking cities, such as Modena, Bologna and Bolzano.

5.4 Recapitulation

Chapter 5 presented selective results of case study analysis. These indicate that is possible to identify a set of criteria and sub-criteria able to analyse and evaluate the success of energy-sensitive local planning instruments. In a national context substantial differences can be observed with respect to the efficiency, effectiveness and integration, which constitute the questions within which the implementation planning phase is taken place. Therefore it is obvious that the planning process and the elaboration and application of the same instrument differs between cities. The goal was to determine the possible factors that explain the different municipal performances in this perspective. In addition, some communal themes emerge from the findings of evaluation process that allow the study to further understand the reasons for the energy implementation gap conceptualised in Chapter 3.

PART 3: ENERGY EFFICIENCY AND IMPLICATIONS FOR URBAN PLANNING INSTRUMENTS. LAND MANAGEMENT TOOLS INNOVATION IN THE RECENT ITALIAN EXPERIENCE

CHAPTER 6: New urban themes implication and innovation in land management tools. A framework for the discussion

6.1. Introduction: the limits of energy plan and the plan implementation phase

Chapter 6 is the first of Part 3. This is focused on the analysis and evaluation of tools that address the implementation phase in the planning process. The decision to analyse and evaluate the most novel instrument in the Italian context, the *incentivo volumetrico*, requires presenting a discussion about the main influences between energy and land use and between these and land use management methods and practices in a changing Europe. The objective of this chapter is to present an analytical model for the third part of the research on the influence of the tools on the success of energy-sensitive planning implementation, which is based on the thoughts underlying the mainstream shifting in planning theory and initial empirical investigations. This is done in order to contribute to the further conceptualisation of the impact of tools on energy-sensitive planning process. In particular, the analytical model is aimed at discussing the role of tools using property rights in land and it will be used in comparison between cases concerned in the research, the cities of Trento and Bolzano.

The chapter begins with the Section 6.2 about the relationships between energy, land management strategies and tools. The mechanisms of urban and agricultural land value formation in consequence of different approaches to energy supply, the higher appraisals related to the introduction of mandatory energy performance standards and certification systems for buildings, as well as the influence of property market on energy performance of urban area are discussed.

Then, Section 6.3 connects the Italian innovative experiences in energy implementation with the topic of property regimes and development rights devices, framing them within the wider topic of urban development policies. A review of the neoclassical and welfare economics approach to planning and development issues followed by the critiques of the mainstream approach and the traditional discussion of ‘market versus government’ in land use planning is presented followed by the influence of new institutional economics approach on the most recent experimentations. Section 6.4 elaborates the analytical model for the discussion, by learning from successful elements in national and international experiences. The analytical framework collects the successful elements that are recurrent in the several researches analysed and which also fit the Italian context.

6.2. Energy, land management strategies and tools

Urban agglomeration represents a complex energy system, in which are concentrated economic and social activities which produce emissions of greenhouse gases, in particular carbon dioxide, and consequently the place where human activities produce environmental problems related to the global scale and the local one. Moreover, energy implications of spatial organisation of the society are linked to economic and financial aspects as well as every sector of our life and affect the International and European political decisions.

Within this context, some planning themes can be traced in order to face the energy consumption of existing buildings and the consequent amount of emissions and the energy demand of mobility and to consider the mechanisms of relations between energy and land use.

It is unquestionable that energy and land use are related. As Owens (Owens, 1992b) points out, “*planning influence land-use patterns and therefore some aspects of energy demand in the longer term*”. Moreover, these urban challenges highlight similar concerns to other (re)development projects, including fragmented ownership structure, land degradation and inefficient land use, which add to peculiar ones, such as environmental and landscape damage in “frontier” areas (agricultural and industrial) for new energy sources, huge costs (payback period), uncertain demand and uncertain effects on the global phenomena. The analysis of land management strategies and tools in operationalizing these planning themes become key elements to properly translate rhetoric commitments into real changes.

6.2.1 What are the relationships between energy, land-use management and mobilisation tools?

Urban land management is a system of interrelated actors and activities as a result of which the most efficient allocation and utilization of urban space, particularly of land, is ensured. The overall objective is enabling the guidance and control of the orderly growth of towns and cities and their efficient functioning (the efficient provision of housing, urban services

and facilities, etc) and making land available for intended (re)development projects in an efficient way (Krabben & Buitelaar, 2011).

In order to do this, how owners are granted land rights, the nature of such rights, in particular in regard to the use of land, how they influence the process of price formation, the modalities of transaction of property and, as a result, the land and property value, have to be discussed in the case of considering the effects of energy themes and factors. These enable new policy to be designed for effective implementation and with realistic knowledge of the constraints in that policy.

Three general perspectives of the relationships between energy, land management strategies and tools can be summarised.

Firstly, the section analyses the mechanisms of urban and agricultural land value formation when novel land use are hypothesized as a consequence of needs for energy efficiency and on-site energy production from renewable resources and innovative energy distribution technologies.

Secondly, the introduction of mandatory energy performance standards and certification systems for buildings has permitted certain properties to have higher appraisals, contemporarily with stagnation in the property market. This part discusses the premium, in terms of higher rent or/and higher market value, for energy efficiency buildings. In particular, the literature focuses on cases with energy or environmental labels, such as LEED in U.S. and others in European Union.

Lastly, the influence of property market on energy performance of urban area is shown in the third reading. Property market plays a significant role in creating, altering and allocating the built environment. According to Rydin (1992), this role can be passive or active in relation to the legal nature of property rights and the consequent state regulation.

Themes and factors affecting urban and agricultural land value

This section is not intended to theoretically debate the mechanisms of formation of differential and absolute urban land rent. It makes reference in a rather pragmatic way to economic principles of spatial organisation – agglomeration, accessibility, spatial interaction, hierarchy, competitiveness - as strictly connected to some traditional models of urban economics theory.

Notwithstanding the fact that there still remain a variety of discussion to theorize urban phenomena, the urban land rent, according to economic theory, develops in the presence of two elements, a condition of scarcity of supply, which may result from natural or socio-economic causes, and an advantage for the demand, identified in a general fertility or in proximity elements.

Within these situations, differentiated typologies of land rent are traditionally distinguished in urban economics (Camagni, 1992; Micelli, 2004a), differential urban land rent and absolute urban land rent.

In structuring the economic division of urban space, differential rent is supposed to play a crucial role. It lies in the capacity of plots of land to produce surplus profits that arises at the micro-territorial differences in the quality of the different land: this is the kind of income analysed by Ricardo (Principles of Economic Theory and Taxation, 1817) and von Thünen (Isolierten Staat, 1826).

To analyse the relationship between land fertility and rent, the obligatory reference is the model of David Ricardo. Accordingly, it stands for the difference in fertility of soil compared with respect to marginal land (the decay of productive power), if all land were equally fertile there would be no pension.

Unlike Ricardo's model, von Thünen's model poses the formation of ground rent no longer as a function of different land fertility - and thus an inherent feature of real property - but the accessibility (the proximity) - that is an extrinsic characteristic. Furthermore, still referring to the Ricardian model, von Thünen's reflection not only considers the problem of income distribution, but also goes further by linking the rent and the location of production activities in the territory.

The key point of the model is the accessibility of different locations with respect to the centre so that the production costs of transport should support the access to markets.

According to Camagni and Micelli (Camagni, 1992, pag. 203, footnote 25; Micelli, 2004), the models of Ricardo and Von Thünen have to be actualised.

The first problem is related to the translation of the concept of fertility in an economic and built environment dominated by secondary and tertiary sectors. (Micelli, 2004b) suggests that the concept of fertility can be generalised in terms of market potential, as a possibility to obtain above-average revenues of companies that operate in a certain sector of economy, to the office and commercial. Certain territorial contexts permit higher levels of demand and thus ensure higher levels of income to those businesses located in those areas.

Similarly, the concept of accessibility is susceptible to a modernization in respect the features of current economy. If the attention is moved from the physical accessibility to markets to the ability to obtain "information" - a key input

production in many advanced tertiary activities - for less money, the von Thünen's model becomes very useful in understanding land allocation between different activities.

Marx suggests that land would not be rented to a tenant at less than some minimum rent which he calls absolute urban land rent. This develops at macro-territorial level and aggregates in the formation of undifferentiated rent on all lands. Such cases of rent do not arise under a different accessibility/fertility of a land with respect to another within the same category, but to a general aggregate scarcity of land - urban or rural - with reference to aggregate demand of the latter.

Both authors claim that, as a result of previous considerations, if the land rent is tied to location advantages in which information and level of demand play a decisive role, the rent interacts dynamically with the process of collective construction of the city and territory. This suggests that the land rent is not a static concept but a dynamic one: the urban actions can affect the levels of accessibility and fertility of the different areas and thus constantly reshape the revenue, making the first disadvantaged areas, penalizing other placing on the margins of the central places.

Adopting these concepts to the specific questions discussed here, some themes and factors that generally influence the mechanisms of price formation, situation (proximity) and fertility (also in terms of increase in revenues), can be also related to the spatial requirements previously identified under energy concerns.

Urban infill areas, urban fringe and brownfield sites (also in industrial contexts) are attracting the growing interest in intensive technological solutions for energy production from renewable resources, in particular photovoltaic power stations, also called solar parks. Similarly, also the agricultural areas, sometimes abandoned, are the objects of large-scale development of solar panel installation and wind farms in competition with traditional agricultural uses. In addition, the research on alternative fuels, such as bioethanol and biodiesel, has largely influenced the growing of bioenergy crops, (corn, sugarcane, soy, rapeseed, jatropha, mahua, mustard, flax, sunflower) instead of traditional ones, exacerbating socio-economic conflicts, especially in under developed or developing countries, the abandonment of fertile areas (in marginal areas in developed countries), the fluctuation of food price and the food scarcity.

Very little has been published in regard to value impacts of energy production from renewable resources. In contrast, passive solar design and the reduction of travel needs, affect the land value formation, and consequently land rent, on the one side in terms of proximity – accessibility and agglomeration principles - to urban centres, concentration of services and facilities and networks of road and cycle-lane. On the other side, the geographical position of land, which mainly affects the sunlight availability mechanism by the shadow due to the mountains and building obstruction, could be interpreted both in terms of situation value (difference between lands due to the localisation) and fertility value. Whereas the former can refer to the accessibility principle, in the case that this permits the use of technologies decreasing costs, the latter, in accordance with Camagni (1993, pag.203, footnote 25) and with the objectives, always more frequent, of energy electricity production at the utility level, can allude to the capacity to get surplus revenue thanks to higher 'fertility'.

Tables 6.1 and 6.2 provide the most common themes and factors in pursuit of energy production and efficiency that affect alternatively urban and agricultural land value and some additional considerations on the forms of land rent.

Table 6.1.: Themes and factors affecting urban land value

	THEMES	FACTORS AFFECTING LAND VALUE	LAND VALUE FORMATION MECHANISMS	FORMS OF LAND RENT
Energy production	On-site production from renewable resources	Availability of sunlight, wind and geothermal resources	Situation or Fertility value	Land Differential (extensive)
	Use of district heating/CHP	Proximity to current technologies; Appropriate urban density	Situation value	Differential (extensive)
Energy efficiency	Passive solar design	Availability of sunlight; Site; Layout	Situation value	Differential (extensive)
	Use of collective means of transport	Proximity to public transportation	Situation value	Differential (extensive)
	Use of non-motorised alternatives	Proximity to current cycle-lane networks; Proximity to services concentration	Situation value	Differential (extensive)

Source: author's elaboration

As can be seen, in the great majority of cases taken into consideration, a differential form of land rent is connected to location of plots and 'fertility' both for urban case and agricultural one. In choosing the right land management strategies and tools to mobilize urban land and reasonably protect the open agricultural area, themes and factors connected to the production of energy on-site and energy efficiency have different impact on value formation.

Although, as will be discussed in the next paragraph, the urban land value influences – in part - the formation of building value, being affected firstly from the land features, which are intrinsic, and then from building ones, the added value for the generation of electricity, mainly, will be of major impact in proportion than that for proximity to public transportation and cycle-lane network.

Table 6.2.: Themes and factors affecting agricultural land value

	THEMES	FACTORS AFFECTING LAND VALUE	LAND VALUE FORMATION MECHANISMS	FORMS OF LAND RENT
<i>Energy production</i>	Production on site from renewable resource	Availability of sunlight, wind and geothermal resources	Situation value or Land Fertility Value	Differential
	Production of agricultural crops for biofuel	Economic factors	Land fertility value	Differential

Source: author's elaboration

Themes and factors affecting building value

Focusing on property value, empirical studies have mainly focused on the impacts of energy efficiency measures on building value, on the supplementary amount of money that can be achieved in case of transaction for new or refurbished building. Generally new buildings in Europe (EU Directive EPBD and EPBD Recast) and in US (ASHRAE Standard) are constructed according to high-energy efficiency standards. In addition to the legislation, are actually applied different and not homogeneous systems for environmental building certifications, such as Energy Star Program and LEED Certification in US, HQE (Haute Qualité Environnementale) in France, DGNB Certification (German Green Building Council) in Germany and Minergie – Eco in Switzerland. In Italy three are the most significant labels: Protocollo ITACA, LEED Italia and CasaClima Nature. Whereas Protocollo ITACA, promoted by the Italian Regions and CasaClima Nature, an “expansion” of the CasaClima energy standard, have a public origin, LEED Italia is managed and promoted by Green Building Council Italia and it is the Italian adaptation of the U.S. LEED. In the U.S. and in EU, after the introduction of certifications, different results have been published.

In the U.S. context, empirical studies with different methods of analysis and focused on various real estate markets (N. Miller, Spivey, & Florance, 2008) have found sales and rental price premiums of varying magnitudes (a selling premium between 5,7% and 16% in the case of “green”, or Energy Stars or LEED certified commercial buildings). Eco-certified buildings exhibit the growth rates typical of innovative products with particular spatial foci adopting the new product more rapidly than the rest of the country. Most existing empirical studies identify a cost premium associated with LEED-rated new buildings and that the higher rated buildings tend to have a higher cost premium. However, the cost premium is found to be relatively low ranging from 2 per cent to 10 per cent depending on the level of rating. A range of benefits are attributed to green buildings or associated with features common in green buildings: reduced operating costs, improved productivity, improved image for occupiers and owners and reduced operating and regulatory risks. Micro-level studies have found that the present value of the reduced operating costs alone is sufficient to cover the construction cost premium (ECOFYS, 2003; Kats, 2003). In turn, surveys of willingness-to-pay have found that occupiers have stated that they are prepared to compensate owners for the additional costs of green buildings through higher rents (see McGraw Hill Construction, 2006 and GVA Grimley, 2007 for examples).

Recent studies conducted on the data set CoStar have identified rental and sales price premia, albeit with varying magnitude and statistical significance (Fuerst & Mcallister, 2009). A further alleged advantage of eco-certified buildings is that they have lower vacancy rates. The consensus emerging from the studies cited above is that investors in eco-certified buildings may be rewarded for the additional costs in three main ways: higher rents / prices, lower holding costs and / or lower risk and that these are mainly related to certification than energy improvements.

Fuerst (2009) analyses investment trends for Leadership in Energy and Environmental Design- and Energy Star-certified buildings in the United States and he concludes that rates and sales are higher in price for eco-certified properties due to lower holding costs, that cover the construction cost premium, and lower risk. Despite this, Fuerst highlights that new construction rarely constitutes more than 1% of the existing stock of buildings and “*a shift to existing buildings appears necessary in order for LEED and similar certification programs to have any significant impact on total greenhouse emissions*” (2009, p.289). Furthermore, the author doubts about the serious contribution of eco-labelling to tackling climate change since their narrow energy efficiency view and the green-washing phenomenon.

Reichardt et al. (2012) investigate whether a sustainable building certification can influence a rental premium for commercial office buildings in a large panel dataset of U.S. office buildings in the period 2000-2010. The results indicate

a significant rental premium for both Energy Star and LEED certified buildings (+2,5% for Energy Star and +2,9% for LEED). The research also shows a significant positive relationship between Energy Star labelling and building occupancy rates (+ 4,5% with Energy Star). On the other hand, authors argue that a simple comparison of average rents highlights that certified buildings command higher rents, but it does not indicate causation, as certified buildings tend to have superior building features. Hence, although it is often argued that certification is carried out in combination with a major renovation of the building, the results presented from the authors demonstrate that the effect predominantly comes from certification, not from renovation. The results further show that the strong economic downturn had an effect on the rent premium.

In the European Union, the Energy Performance of Buildings Directive (EPBD) came into force nine years after the Energy Star program started. Thus, there are not more results on the link between the impact of European policies and the sales/rental prices. Since January 2011, similarly to other European countries, in adoption to the European Directive EPBD Recast, all transactions in the Italian housing market need to be accompanied by an energy performance certificate.

Researches focus on the profitability of energy efficiency measures, calculating the costs of energy savings and the payback period of the investment (Audanaert, De Boeck, & Roelants, 2010; Uihlein & Eder, 2010), and on the willingness to pay more for energy efficiency of European citizens (Banfi, Farsi, Filippini, & Jakob, 2008). The findings are sparse and different from country to country but tend to confirm the intention to pay more (purchase price or rent price) for a buildings or dwelling with high-energy performance labels (A or B). The common idea is that energy efficiency measures can influence the reduction of utility expenses, benefits for owner, developer and tenants in addition to the reduction of impacts of urban system on the environment.

Fuerst et al. (2012) investigate the relationship between the energy performance ratings, as measured in Energy Performance Certificate, and the sale prices of residential properties in the England and Wales. Details of transactions involving approximately 500.000 dwellings that took place in the period from 1995 and 2011 were analysed. Authors find that, compared to dwelling EPC rated G, dwellings with better EPC ratings have sold at a significant price premium. In addition, dwellings with high EPC ratings (C or above) have achieved significantly higher price appreciation than lower-rated properties.

The above-mentioned results, both in U.S. and in EU context, provide some evidences on the market adoption and economic implications of energy performance certificates. Firstly, it seems that assessment systems, which include issues other than energy as quality of location, construction materials, water consumptions, emissions, waste, fundamental part of the process of certification, permit an increase of property value also in a moment of market stagnation. Secondly, buyers and tenants' willingness to pay a premium for buildings with better energy performance (certified) is highlighted, although the considerable variation of real building quality.

Concluding, the building value is proved to be affected also by the quality of building materials and construction technologies that permit high-energy efficiency performance and consequently owners to reduce significantly the consumption of non-renewable energy. Based on these observations, it appears that the market for eco-certified buildings is well positioned for further growth, particularly if a larger percentage of existing buildings is beginning to seek certification.

Influence of property market on energy performance of urban areas

Rydin (1992) claims that the operation of property market in creating and allocating the urban areas, alters the environment (as a result also of different energy demand and performance). Accordingly, she states that property can play a passive or active role in this environmental impact. Whereas the passive role is largely related to the cause of CO2 emissions increase, the intention to construct or refurbish the building under energy efficiency criteria in design and materials can be intended as a more active ingredient.

Although the widespread use of command-and-control and performance regulation on the building activities, such as the building code, the different legal nature of property rights over the building or land, in general defined at the national level by the Constitution of a country and, according to the legal system, by the common law, may prevent the optimal use of the physical site. In consideration of the discussion on the spatial requirements under energy concerns in 1.2.1 paragraph, it is clear that the nature of land and building property, different in the various legal traditions (the Roman model and the British model), influencing the assignment of rights, their autonomy and separability (Renard, 2007), have an effect on the efficiency and the effectiveness of land management strategies developed. Undoubtedly, the discussion has to make reference to the role of state in planning, public policy and its relationship with the property market. In the next paragraphs this will be debated.

6.3 Innovating tools and modes of land management

If energy policy, as said, must be considered a new urban policy which learns from other policy fields (Dente, 1996), it is important to connect the Italian innovative experiences in energy implementation with the topic of property regimes and development rights devices, framing them within the wider topic of urban development policies.

6.3.1 The International debate

At present, many national and local governments are discussing and implementing innovative devices based on a different approach to the relation state-market. In recent decades, it is argued that government authorities are no longer capable of giving direction to spatial planning in the same manner as was done before (Kearns & Paddison, 2000) and the usual top-down, public-led actions are no longer politically and economically viable. Consequently, policymaking and urban planning have witnessed a significant proliferation of policy tools shifting the mainstream institutional paradigm from government to governance (Seixas & Albet, 2010). As a result, in combination with the push for reform of the national and regional planning legislations, several mechanisms have been trialled “*with contracts among different institutional tiers or between public and private actors, with grants, special purpose vehicles, marketable building rights or potentials, mixed agencies*” (Ponzini, 2011). In particular, new consensual planning methods based on public-private partnerships and the strengthening of market role, in terms of re-delineating and reassigning land development rights are being progressively adopted in place of the traditional authoritative mechanisms (Spaans et al., 2011).

Shift from government to governance

The last three decades of the past century have been described as the epoch of the post-modern shift, the transition between a fordist and a post-fordist economy being entrenched to great social and cultural consequences and gigantic spatial transformations within the urban field (Filion, 1996). The growing specialization of urban spaces, the fragmentation of the urban tissues, the emergence of new and typical urban forms allows to consider the 1970s as the beginning of a period of general transformation of the urban forms, not yet concluded (Martinotti, 1993).

Such phenomena have been faced by the public sector with growing difficulties due to the fiscal stress connected with de-industrialization processes. Neo-liberal trends and the crisis of planning models made concepts like the decline of nation states, the fragmentation of the decision-making processes, the prevalence of the multinational private sector decisive to explore contemporary policies (Shaktin, 2002). In this context, the models of local actions have changed and “*urban management cannot be understood these days in terms of ‘top down’ or ‘command and control’ models of governance*” (Patsi Healey et al., 1995, p. 18).

Three general trends of the contemporary shift in planning can be resumed.

Firstly, decentralization processes and the changing nature of national state in an enlarged European Union have reshaped the relationships between national and local levels (Zanon, 2010), defining new models for public action and a number of new policies were developed (Seixas & Albet, 2010). Within the EU, a further level is on stake: a re-scaling of territorial governance (Brenner, 1999) related to the bilateral relationships between nation states and communitarian institutions. The coexistence of a plurality of scales, actors and political arenas defines a “multi-level game” (Gualini, 2003), in which the local level is that scale that maintain a fundamental role to shape both urban economic and the quality of urban life, managing land property rights and regulating land regimes. The shift to governance and the innovation of local policies are commonly considered as main tools for achieving the pair competitiveness/cohesion framing the communitarian agenda on urban development (Agenda, 2007; ESPON, 2010) (Governa, 2010) and challenging the cities into the interurban competition (Kearns & Paddison, 2000; Zanon, 2013).

The second theoretical point to be debated is the so-called institutional turn in social sciences, stressing the new forms of political interactions between the vertical pressures of private interests – entrenched with the growing role of multinational sectors – and the grass-roots democratization and decentralization requests. In a post-modern political arena, decisions cannot be taken “*in a linear fashion from intent to choice, but in a complex, socially structured interaction*” (Vigar, Healey, Hull, & Davoudi, 2000, p. 47). Thus, specific practices should be embedded in a wider context made of social relations (Patsi Healey, 1999), considering both the growing effects of large international institutions on day-to-day people live and the ability of people to influence them (Beauregard, 2005). Gualini (2002, p. 33) argues “*the challenge for governing and managing action becomes that of co-production, of the pursuit of joint*

results from the activity and initiative of multiple social actors". Consensus building practices and the general shift from normative to strategic planning are deeply interconnected with such readings.

Within their analysis of contemporary large urban developments in Europe, Gualini & Majoor (2007) have stressed some critical aspects: a limited amount of both strategic and comprehensive planning approaches; a lack of effective implementation of "new" planning ideas. The point seems to be the institutional fragmentation wherein most of such projects are realized which makes it harder to governments and local administrations to effectively pursue their interests. The authors foresee the emergence of a "*new urban policy*" (2007, p. 198) whose main focus shifts from welfare policies to market-oriented approaches.

A last reading stresses the increasing (but debated) consideration of the roles of state and market in planning as a response to the need of more effective and fair local actions, in reflection of the changed relationships between public and private parties (Kearns & Paddison, 2000) and to the limitations in financial resources of public authorities. The involvement of private sector in the realisation of certain planning goals is strongly related to that trend characterized by a government that becomes a less active regulator (Cars et al., 2002), and instead becomes a facilitator of new developments that are preferably realized by the market (Spaans et al., 2010; van der Veen et al., 2010). Novel instruments are introduced to manage the plan, in which the agreement takes the place of authoritative tools (Micelli, 2011b), in the perspective of consensual spatial planning (Urbani, 2000). In addition, despite growing windfall profits created by private development and urban metabolism, a limited growth of the public city and the consequent need to invent new mechanisms of action capable of capturing the added value, redistribute yields and use them to ensure both the public and private investments is evident.

On the one hand, some implementation devices, aware of urban economics principles, adopt an approach that seek to realise certain planning goals by redelineating and reassigning property rights, such as the transfer of development rights in U.S. and the equalisation, compensation and density bonus in Italy, only to mention few examples. On the other hand, with the intention to regulate and organise the administrative and private action and the fair distribution of added value, the financing of public actions is pursued by public-private agreements (Codecasa & Ponzini, 2011).

Governance strategies in regulating the property market and assigning land property rights

The conceptualisation of state-market relations and the significant implications and impacts for spatial planning and planning tools have been the subject of academic debates and studies mainly referring to property-related disciplines of urban economics, law and urban planning.

Property rights and land regimes are fundamental aspects of the property market, conditioning its efficacy by defining the regulatory role of public actors. While property rights are generally defined at the national level, and are not site-specific, rules as regards the land market are usually defined by spatial plans (Buitelaar, 2003). The principal issues concern in which ways owners are granted land rights and their nature, in particular in regard to the use of land.

Although spatial planning, referred to the intentional public/governmental actions in order to achieve certain planning goals (Buitelaar & Needham, 2007a, 2007b), is the key instrument by which manage land-use rights, the governance policy strategies also include the regulation of market and the assignment of land property rights directly through land and urban policies, and indirect influences on the behaviour of property institutions through taxation and fiscal mechanisms (Adams, Watkins, & White, 2005).

Any analysis of state-market relations in land and property is highly dependent on the particular theoretical approach to market operations. Mainstream economics mainly count neo-classical (welfare economics is a branch) and neo-institutional economics, which have greatly influenced different interpretations of modes of urban actions.

For neo-classical economics the market is a mechanism for coordinating the demand and supply decisions under the strong hypothesis that this is fully competitive and supply and demand will become equal at an equilibrium in which there is the optimal allocation of resources (the Pareto optimum). In Pigovian terms there are some market imperfections when the competitive equilibrium cannot be achieved and they can mainly attribute to externalities, monopolies and public goods. These market failures are the justifications for the government actions. In the welfare economics perspective, land-use planning is a means to regulate negative externalities that characterised cities. Two of the implicit assumptions of welfare approach are that the public intervention is costless (transaction costs are considered zero) and that the public body is always able to find and apply the best corrections.

Zoning represents a good examples of command-and-control regulation through which a community can deal with market failures represented by the externalities generated by the physical and spatial interaction typical of the urban contexts (Pigou explains that "*zoning is introduced because the land market fails to internalize externalities*", quoted in Buitelear, 2002, p.316). In addition to zoning technique, taxes or subsidies according to the type of use or the location

can be introduced in order to influence directly the market, maximize the welfare and prevent negative externalities, using the price mechanism.

The welfare economists, thus, have had a significant impact on spatial planning but in the last years the limits of this approach for planning have become evident.

Unlike welfare economics, neo-institutional approach is conceptually grounded on the intention to see how economic behaviour would be affected if transaction costs were not zero and what would be the role of property rights within economic reality. Under the general heading of neo-institutional economics three main strands of thinking are highlighted in accordance with the main focuses: transaction cost theory, property right theory and public choice/game theory.

Regarding the impact on spatial planning, using the well-know Coase's theorem as a support, the government intervention doesn't need to be the only way of securing collective action (Webster, 1998). Voluntary market agreements should be explored (1) enforcing existing property rights, (2) transferring property rights, and (3) redefining property rights (Ellickson, 1993, p. 1326) to reduce negative externalities, also in the case of transaction costs. Despite the extreme view of Coase as a free-market supporter, Lai (2005) stresses that, more correctly, the government should have a role in the (re-) assignment of property rights through zoning in order to reduce the transaction costs.

These hypotheses suggest that the local planning administration does not necessarily prescribe the forms of use of property rights but merely to regulate and determine the amount of fees to be exchanged. In this way it encourages private actors to be responsible in promoting the interests of the city through the market.

Despite the neat dichotomy of 'the government' versus 'the market' (Buitelaar, 2002) and 'Pigouvian' versus 'Coasian' planners, the reality is often too complex to fit within. Both Buitelaar (2003) and Micelli (2011) affirm that this conceptual model is not more viable. From different standpoints and with distinct arguments, "*both government and market*" or "*neither market nor government*" are the considerations highlighted by the authors. The "*redelineating and reassigning property rights*" (Buitelaar & Needham, 2007), as every market, need a government that creates and enforces rules, able to innovatively organize the administrative action.

In search of distributive justice

Distributive justice concerns the nature of a socially just allocation of goods in a society, and is conceptualized as fairness associated with outcomes decisions and distribution of resources. Spatial and land-use planning systems are strictly connected to how owners are granted land rights and the nature of such rights, in particular in regard to the use of land.

As noted by Donald Krueckeberg, "*Property is not just the object of possession or capital in isolation, but a set of relationships between the owner of a thing and everyone else's claim to the same thing. This understanding of property highlights considerations of distributive justice that are particularly important in light of the issues in the contemporary debate about property rights. Rights to personal use of property are fundamental to individual and social well-being – rights to profit from property, in contrast, have always been subject to reasonable constraints for the benefits of the entire community and society. Attempts to establish a contrary case by appealing to natural rights, market necessity, liberty, social utility, or just desert all fail to withstand scrutiny. ... These concepts of use rights and profit rights in property are at the heart of the planning question*" (Krueckeberg, 1996, quoted in Renard, 2007).

Adopting the argument of market failure, the introduction and the use of government interventions has been supported. Zoning mechanisms – following the Pigou's perspective -, are perfect examples of command-and-control techniques, because they regulate the development of lands and divides the land into zones of land use. Accordingly with the different planning systems, zoning may also establish development standards (Clinch & O'Neill, 2010), conferring and/or restricting development rights. This rule is not impartial because it varies by location: the rule is "*locationally specific*" (Needham, 2006, p. 20). The enormous financial inequality that this can create is obvious to all; it is due to land rents and windfall gains. It attracts much political criticism, and often generates much obstruction to land-use planning in practice (Needham, 2007). Camagni (in Micelli, 2011) states that equal distribution of land value has been intrinsically violated in decisions on the spatial form of urban space and the location of equipment and public networks. Likewise, Henry Jacquot asserts that "*spatial planning has as main object to assign different permitted uses to land, and as these can not be everywhere the same, necessarily has a discriminatory nature. These uses, when they have the effect of prohibiting or restricting the development right, can exert a profound influence on the value of land and generate great inequalities between landowners*" (Richter, 2005).

Whereas for private owners the persistence of adverse consequences of regulatory measures (Janssen-Jansen, Spaans, & Van der Veen, 2008) has been possible because planning decisions are primarily political decisions, and made as a result of political, not economic calculation, from the public standpoint the question lies in the widespread procedural, financial

and administrative difficulties for developing the different kind of services for public use – such as parks, road, public transport infrastructure, social housings. If the private areas have been the objects of urban development strategies due to their intrinsic economic opportunities, the public goals have been failed.

Within this context, two general readings of the contemporary debate in planning and urban economics can be resumed. First, private actors need the satisfactory distribution of the benefits that follow the public choice, in other terms, the equal distribution of developing rights to all landowners involved in the plan.

Although more debated worldwide, the questions on distributional equity have been of particular relevance in the Italian context. Pompei (1998) argues that the regulation efforts fail to bring about fair outcomes in development decisions when firstly (differential iniquity) these concern the assignment of different development rights in land with the same current and legal status and then when (absolute iniquity) the allocation of public services causing a reduction/limitation in property value. Accordingly, Camagni (1999a), asserts that theoretically two different approaches to the fair allocation of land value can be defined. Whereas the “absolute equity” implies the same rights to all ‘participants’ (in the more large sense) of urban development, the concept of “differential equity” tends to consider and accept the existed land values as a structural condition of urban society. A third approach, resulting from the urban debate, suggests an “equalised equity”, the attribution of the same building index, without distinction, to the urban areas. Consequently, this model hypothesizes the homogeneous assignment of all the land rent (sum of absolute land rent and differential land rent) resulting from the areas designed to urban transformation, independent of land features.

The second concerns the surplus land value that is generally independent of capital private investments in building improvements whereas it results from planning decisions. The public has the necessity of recovering the added value of land rent with the aim of financing its implementation and, in particular, the public facilities. There is a considerable literature on the theoretical bases of added value capturing for public interest (Camagni, 1999a, 1999b) and on planning experiences in searching of fair and efficient solutions.

If it is questionable the legitimation of such a strategy, similarly in many Western countries land value taxes have been the principal measure (Camagni, 1999a; Gihring, 2001) to capture surplus value and support the development of public contents of urban plans. As Camagni (2012) concludes, different types of taxes are used with a number of objectives, from infrastructure costs. The Italian urban development charges, the French tax locale d'équipement, the Spanish cargas de urbanización, are related to the permit of development, the English case, or to the environmental impacts of construction phase (the U.S. impact fees). Differently, the additional value can be obtained by obligatory realisation of social housings (in German and the UK) or by financial contributions to infrastructure costs not directly connected to the areas designed to transform (the English planning agreements and the Spanish case).

The local public authorities and the need to compensate and incentivate

From the landowner/developer's perspective, the right to use and develop land is generally one of the most important and valuable rights associated with the land. The zoning mechanism usually provides restrictive development rights in accordance with the use decided in case of ‘public interest’ (i.e. public utilities, highways and railways). Adopting transfer title, such as eminent domain in U.S., compulsory purchase in the UK and Ireland, and expropriation in Italy, the government can acquire property from its private owner without owner's consent. Just monetary compensation has to be paid in these cases. From the public's perspective, the possibility of the public authority to acquire – at an appropriate price – the soil needed for collective purposes is limited by the nature of property. The problem is that the value of land is defined both by the location in relation to the availability of public utilities, infrastructures and distance from urban centrality (situation value in accordance with the conceptual models of Ricardo and Von Thunen-Alonso), and by the use defined by the zoning area (absolute land rent) (Camagni, 1992). In addition, procedural, organizational difficulties and long-time and uncertain outcomes (in some cases, the property owner challenges the action because the proposed taking is not for "public use", or the condemner is not authorized to take the subject property, or has not followed the proper substantive or procedural steps as required by law, etc.) have to be considered in the case of public interference with private property rights (Micelli, 2011b). Consequently, the public administration has no chance of acquiring the land at an acceptable price.

In Italy, a number of rulings by the Supreme Court have recognized market prices to expropriated land and the constant cutbacks in public funding have had a considerable impact on the capacity of municipal planning authorities in the effectively pursuit of planning goals. The compensation paid out by public administration for the purchase of building land needed for public utilities and infrastructures has increased twice as much.

In addition to this first question, but strongly related to it, it is possible to distinguish a second one: Planning Authorities cannot afford to finance the developers to realise certain planning goals. This is mainly due to the lack of public funds of

local governments, which does not allow them to enable a higher quality of urban space, focused on paying for basic services like transportation and schools.

These trends result in new types of planning instruments mainly based on the use of land development rights and locally tailor-made (Spaans et al., 2011). In these cases, the practices assigning extra development rights are currently applied in order to restore “*conditions of efficient resource allocation*” (Micelli, 2002, p. 141) and to enable administrations to implement planning decisions without using financial resources. The use of pro-market devices in terms of incentives is suggested by several scholars (Blanc, 2008; Booth, 2008; Kaplowitz et al., 2008; Spaans, van Der Veen, & Janssen-Jansen, 2008; van der Veen et al., 2010) and usually uses in U.S. (Pruetz & Standridge, 2009) and in other countries. By creating an incentive, the government does not directly subsidise realisations but creates a property right, which landowners and developers can use or sell, respectively, when the planning goals are realised. Thus, it is related to an opportunity to develop something additional to usually planning activity. On the other hand, according to Van der Veen, M. et al. (2010) and the worldwide experimentations, the same instrument can also exist as a way to only compensate the landowner for his loss. The single-purpose of the use of land development rights is compensation (Micelli, 2011b; Renard, 2008).

6.3.2 The Italian experiences within the International debate

The Italian ‘urbanism tradition’ (CEC, 1997; Espon, 2007) is centred on urban design, grounded in an out-dated law, the 1150 approved in 1942, which defines the municipal plan (PRG, *Piano Regolatore Generale*), the pivotal tool in the national system, as a master plan based on land-use zoning extended to the municipal area. Its main aims were organizing the physical growth of the city and providing building regulations for land transformation.

Subsequent legal amendments and supplements have further articulated the zoning and the PRG has progressively become an instrument used to orient the urban growth in order to perform economic and social development (Mazza, 1997; Oliva, Galuzzi, & Vitillo, 2002). This model is based on a comprehensive knowledge of reality that allows the definition of problems and the construction of alternatives to choose the planning solutions, structuring the local plan into the notion of public interest (Mazza, 1997). On the other hand, this comprehensive and top-down approach combined with the traditional urban design (Tira & Zanon, 2011) has influenced the modalities to allocate and control the land and property rent by zoning, generally resulting in significant differences and constraints on land use and value.

Since the 1970s, as discussed in the previous paragraphs, the strong territorial expansion has stopped, the social demand changed, and the notion of collective interest broken down (Saccomani, 2003) putting in crisis the described plan and the Italian planning system. This new phase has been marked by the influence, on the one hand, of the contributions of public policy analysis and those of the public economics discipline. On the other hand, the introduction of old, new and self-made policy tools originally combined have had a pivotal role in the evolution of planning practice.

The policy approach has challenged the comprehensive planning model, prompting questions on the efficiency of public action and the entire planning process, considering no demarcation lines between different phases (Bolocan G. et al., 1996), no predefined roles of actors and stakeholders and no predetermined rules of play (Fareri, 1990, 2000). With reference to the public policy analysis literature, in particular the contribute of Dente to the Italian debate, Balducci (1991) begins to use the categories of policy analysis to comprehend urban problem management and its efficacy. He claims that the effective capacity of planning measures to realise efficient consequences cannot definitely place in a specific phase but concerns the whole planning paradigm. Through the years, the influence of public policy analysis has forced the traditional approach to consider plans, projects and complex urban programs as social and political process (Ponzini, 2008). Accordingly, Mazza (1996 and 1997 in 2004) and Dente and Fareri (2009) maintain the emphasis on the process, requiring the attention to the games that determine its course and its outcomes.

Contextually, in accordance with the international planning debate (Patsi Healey et al., 1995), many planning and economics scholars in Italy argues that regulation alone is not adequate in guiding collective decisions regarding urban land use (Mazza, 2004), taking into account the general inefficacy of public intervention. Healey states, “*urban management cannot be understood these days in terms of ‘top down’ or ‘command and control’ models of governance*” (Patsi Healey et al., 1995, p. 18).

As far as contributions by economists are concerned, they focus on the relationships between public interventions and the market economy, considering in particular the externalities that occur when the market fails to attain Pareto efficiency. On the economic side, land-use plans, standards and norms are tools by which the government and communities deal with the problem of externalities, and they are good examples of command-and-control regulations used by the public authority to intervene in the market. To be stressed is the poor efficiency of authoritative urban planning implementation

tools (Micelli, 2002) intended to correct the negative externalities that involve the city, generating an unequal treatment of land and property owners in the land use allocation phase, as extensively discussed in the previous paragraphs with the contributions of Camagni (1999a, 1999b) and Pompei (1998, 2008) and in planning law discipline (Boscolo, 2010; Richter, 2005; Vasta, 2008).

Furthermore, the incorrect action of public entity in the market in terms of distorted use of zoning mechanism and land constraints (Micelli, 2011b), has negatively also influenced the construction of “public city”, limiting the provisions of public utilities, services and transport infrastructures. On the other hand, the production of public facilities (Micelli, 2004b), the ‘public decisions’, results in a not expected increase of land value (or lost value) for owners or developers.

Closely related to the above-mentioned considerations on efficiency principle are the effects of a number of rulings by the Supreme Court (recognizing market prices to expropriated land) and cutbacks in public funding which mean that the public authority cannot afford to acquire, at an appropriate price, the land needed for collective purposes or to subsidize the achievement of certain planning goals. Micelli (Micelli, 2002, p. 141) argues that in the debate of urban economists and planners about the possibility of using innovative methods and tools in managing urban plans in order to increase their efficiency and effectiveness, “*a major step would lie in shifting from the use of authoritative tools towards those that employ market levers to implement public policies and, as economists say, to restore conditions of efficient resource allocation*”. Furthermore, the necessary cooperation with the private sector is the need to find new sources of funding, rather than from a priori belief that the private sector is more efficient than the public. As a result, the partnership is based on the enlargement of capital available, without which only few projects could be really implemented.

The novel approach to urban planning: the innovation in the land management tools

Since the early 1990s, these positions have contributed to two decades of experiments for legislations and operations (Governa & Saccomani, 2004; Palermo, 2008), with a particular focus on the renewal of planning tools in relation to the different parts of the city and territory, and the modification of implementation techniques passing from the use of authoritative tools to new methods, based on public-private partnership, on a consensual basis. As a result, a novel approach to urban planning has been arisen contributing to the innovation in the land management tools, with the introduction in the toolbox of local planning administrations of new rules and instruments based on land development rights (table 6.6).

In the 1990s, an incremental approach to the municipal plan was developed aiming to a design by parts of the city (‘planning by project’), according to the needs and priorities of the moment (Gelli, 2001, p. 190). New tools for urban planning were introduced in the Italian framework to operate in a more flexible and pragmatic way on the basis of public-private agreements in derogation of the existing PRGs (Mello, 2007; Ombuen, Ricci, & Segnalini, 2000), shifting the way of urban intervention from “*traditional*” to “*integrated*” (Governa & Salone, 2005). The family of complex urban programmes (*Programmi Complessi*), and tools focusing on economic-productive aspects, negotiated planning (*Programmazione Negoziata*), were all finalised to define a contractual model for the interaction between public and private actors. These new tools consisted in “negotiated programming” schemes, providing the basis for interaction between the public and the private sectors.

Contemporarily, the role of European communitarian policies in the innovation of the territorial and urban government tools in Italy has been crucial. The Community Initiatives, such as the Urban Pilot Project 1 and 2, and the Urban programmes, were designed by the European Union as opportunities for innovation in urban policies in the local perspective to enhance the effectiveness of public action (Padovani, 2002). As a result, the Europeanization of urban intervention cultures, together with the innovation and integration of policies concerning social and economic issues and an invitation to overcome the traditional focus on building and planning modelling, has put new inputs to the debate. The Communitarian Initiatives contributed to the definition of novel modes and tools of urban interventions, in accordance with Rivolin and Faludi, “*thanks to a sort of contamination by Community policies (through participation in Integrated Mediterranean Programmes, Territorial Employment Pacts, Urban Pilot Projects, Leader and Urban Community Initiatives), a dozen or so new tools for “negotiated programming” and “complex programmes” for urban regeneration have been created, within the short period of time of only a few years giving rise to a plethora of local territorial actions*” (2005, p. 207).

After the first implementations, these tools could only give partial answers when unbounded from a general planning strategy and vision. Thus, a new planning demand bore for a return to the municipal plan, but radically changed in the form and procedures (Oliva et al., 2002; Salzano, 2008).

Since the half 1990s the Italian National Planning Institute (Inu) has tried to answer the new planning demand with the proposal for a novel national planning act with principles, guidelines, and coordination about the subsequent legislative

action of the regions (Stanghellini, 1997). The articulation of the municipal plan into strategic-structural and programmatic-operative regulations has been the major innovation. Such a new plan is articulated into three tools: Structural Plan (*Piano Strutturale Comunale, PSC*), the programmatic one; Development Plan (*Piano Operativo Comunale, POC*), the prescriptive one; Planning and Building Regulations (*Regolamento Urbanistico Edilizio, RUE*), prescriptive for the management of the existing (Campos Venuti, 2008).

Table 6.3.: The Italian local planning toolchest

INSTRUMENTS FOR MANAGING URBAN DEVELOPMENT	
<i>Public Acquisition</i>	Eminent Domain
<i>Regulation</i>	Planning and Building Regulation Structural plan Development plan Local Sectoral plans
<i>Incentives and fiscal policies</i>	Investment subsidies Tax deductions (on urban development charges)
<i>Non economic incentives</i>	Equalization Compensation Reward-based mechanism
<i>Public-Private Partnership Initiatives</i>	<i>Public-Private Partnership Initiatives</i>
<i>Community Policies and Initiatives</i>	<i>Community Policies and Initiatives</i>

Source: adapted and integrated from (Bengston, 2004, p.275; Bulkeley & Kern, 2006, p.2243)

The structural plan is aimed at outlining the main organization lines and indicating long-term changes; the operational plan is finalised to identify actions and transformations to be carried out in the short-term (Dal Piaz & Apreda, 2010). As a result, a proactive/strategic nature and a regulative one arise for the plan. The former, without a real prescriptive framework, create new hypotheses for transformation. The latter ensures existing and new rights, defined through prescriptive and accurate procedure (Mazza, 1995). Particularly, the main innovative aspect of the PSC should be the non-prescriptive nature of the land-regulation, except for higher-level prescriptions and restrictions (Oliva, 2009), deleting land revenues expectations (Campos Venuti, 2009). Thus, from a normative point of view, the PSC should be a flexible tool for identifying strategies, objectives, invariants, and safeguards, representing more agreements to the administration than duties for the private (Urbani, 2000).

Within this framework, the POC defines the initiatives and the governance of main territorial transformations achievable in the municipal electoral mandate or five-year period on the basis of the programme of the administration (Dal Piaz 2004; Avarello & Properzi, 1997). In this sense, the POC regulates planning interventions and implements according to criteria of priority and feasibility (Dal Piaz & Apreda, 2010) and occurs in strict relation to economic size and procedures of public-private negotiation. After the Tuscany, in 1995, many regions have reformed the concept and structure of the PRG, developing different variations, especially in the form, reflecting, more or less, the model proposed by Inu, with the intention to reform the zoning techniques towards solutions able to foster the co-existence of different land uses.

While strong pressures existed for the reform of national and local planning legislations, several mechanisms have been experimented with contracts among different institutional tiers or between public and private actors, with grants, special purpose vehicles, marketable building rights or potentials, mixed agencies (Mazza, 2004), with a general tendency to locally tailored strategies.

Development rights in land in Italy. Principles of equalisation, compensation and reward-based mechanisms

Pro-market based devices – proposing the exchange of development rights – have been experimented and progressively adopted (Micelli, 2002, 2004a; Pompei, 1998) with the objectives of achieving land justice and allowing administrations to effectively implement planning decisions without using financial resources (Karrer, 2004).

In accordance with the definition of equalisation (not distinct to compensation at that time) of Pompei (1998) “*the principle whose application tends to achieve two equal and concomitant effects: distributive justice towards owners of land which is put to urban uses, and creation, without compulsory purchase and additional costs, of a public areas estate at the disposal of community*” (author’s own translation).

The first objective is supported by equalising the treatment among different individuals who own land lying within a development project by attributing, regardless of the land designed for their land plots, the same amount of development rights expressed by means of a floor area ratio. In such a way it is possible to reduce the discriminatory nature of the planning activity among landowners, even if discrimination still persists relative to those who do not own urban land. The equity resulted from this process is not a generalized equity, but it could be said that the use of land development

rights defines "*an equity of club*" (Micelli, 2011a), that means an equal distribution between the owners of land subjected to urban transformation, especially among owners of areas with similar characteristics. This places the ownership of land in a condition of indifference with respect to the planning choice.

In additions to the social aspects about equity, a greater allocative efficiency has to be mentioned. The redistribution of surplus value generated from all areas subject to urban transformation, capturing part of the externalities that would otherwise be for the exclusive benefit of the private, determines a more balanced distribution of value generated by the planning choices not only between individuals but also between public administration and ownership.

Concerning the creation of the public city, this is related to the aforementioned problem of the efficiency of spatial plans and urban projects. The use of property rights in land gives opportunity to the municipality of acquiring the necessary areas for different public purposes overcoming the growing concern about compulsory purchase. Hence, the private actor maintains the soil sufficient to develop, according to the pre-established minimum density volume index, the amount of construction corresponding to the land development right assigned to the area. The remained area, once the inherent building potential has been completely used, is sold at the local administration at farm price. This implies the overcoming of urban constraints, no longer areas are considered unbuildable, and the assignment of minimum development rights to all urban areas. The non-monetary compensation, however, assumes the merit of certainty, because it will be commensurate with the building potential recognized from the beginning to the land according to its class.

Recognizing advantages and limitations (Micelli, 2010, 2011a), municipalities, which are the land-use planning authorities, have begun to manage land development rights – as instruments to ensure that landowners and developers fulfil certain planning goals. An appropriate use of development rights has recognised three different practices – equalization, compensation, and the reward-based mechanism (bonus-rights) – differentiated on the basis of the nature of development rights granted to developers, on their context and objectives are concerned, according to the socio-economic context and the planning objectives. Three ways are recognised as generating development rights and to each one corresponds a legally different kind of rights (and practice in the Italian regional legislative systems).

The first one is related to the property rights in land and it is an integral part of it. Within the debate it is referred to as a chance of development since it is part of the property right but cannot be used until planning permission is granted (Bartolini, 2009). It emerges from the planning exercise and it is a consequence of the planning activity carried out by the planning authority that shapes the *ius aedificandi*.

The second kind of development rights is a form of compensation to which landowners are eligible after that a planning decision has restricted development on their properties to preserve a portion of land or for any other public purposes or after compulsory acquisition. Such compensation rights are then transferred and used on another development sites. Rights from compensation are classifiable as an indemnity for a loss determined by a public planning action that will be definitely granted to the affected landowner when the obligation is completed. Their use derives from a financial need of the public administration which lacks resources for compulsorily purchasing land or from the wish to preserve a piece of land for its qualitative features that is subject to development restriction (Stefano Stanghellini, 2010). According to Boscolo (2008), a significant aspect which clarifies the differences existing between the equalisation and compensation is that rights deriving from equalisation can be withdrawn by the local authority as a legitimate exercise of its planning power, whereas the same cannot be done for compensation rights once an obligation is already complied with.

The third way of generating development rights is through the practice of bonus-reward mechanism in which developers achieve bonus density and additional floor area in return for qualitative attributes of their developments.

Some planners and scholars (Micelli, 2002, 2004b; Pompei, 1998; Stefano Stanghellini, 2010), have widely explored the concept of equalization (oriented at balancing advantages and constraints produced by zoning decisions by connecting different zones into a single development operation), and the modes of its application, in connection with a number of experiments developed without a specific law at national level but recognized as legal by the Courts. Although the cases were initially focused on the problem of equity in planning, applications are currently evolving towards wider goals, in particular the provision of public spaces and environmental quality. More consolidated is the use of compensation, which is the practice of granting extra development rights balancing constraints on properties, thereby enabling local administrations to avoid monetary compensations.

On the other hand, although the pioneering experiences with land development rights in the last two decades at the municipal level and their constant evolution are significant points of discontinuity, the growing interest arisen by the equalization-compensation models has to consider that the Italian planning system seems destined for many more years to the presence of episodes and innovative plans with roots firmly anchored in the tradition of twentieth-century urbanism (Boscolo, 2010).

However, there is a structural relationship between the mechanisms of zoning and the use of land development rights, already analysed by Renard (1999) and, in the Italian contest, by Camagni (1999a), and subsequently, with the introduction of different local spatial plans (which in some regions coincided with the introduction of a structural plan

and an operational one according to the proposal of INU, while in other regions has influenced the fragmentation of the municipal plan in a plurality of documents, through which explanation are the different functions of government land) from Micelli (2010). The conformative activities of public administration, in fact, can be done in several ways, including through new approaches and new tools and this determines a certain mutation in the paradigm of the municipal development plan (Boscolo, 2010). The equalization is a functional tool to ensure greater efficiency and equity within a generation function of the land development right and its assignment that is competence of zoning and urban planning. The equalization is independent of the size of the plan, is indifferent to the intended use of private character and is indifferent to the form of city development: it is the plan that determines the rules and procedures, equalization is a tool to pursue it. Moreover, the urban equalization does not eliminate other forms of implementation of the plan, particularly authoritative forms based on the urban constraints and the compulsory purchase, which remain available to the government (Micelli – 2002 - mentioned them as: the necessary integration between command-and-control and market-based tools). What can vary is the intensity which the investment authorities are focusing on with balancing tool.

Perequazione - Equalisation: from the principles to the practice

The institution of markets of development rights has been employed in order to manage several urban plans in Italy, which have followed the same basic scheme, oriented to intervene on areas subjected to urban transformation. Although several regional planning bills have introduced the equalisation practice, the same cannot be said for the national planning law.

Some steps would achieve the objectives of establishing a market of development rights. After having identified the areas designed by the plan to urban transformation, these are classified on the basis of legal – the compliance with national and local regulations and plans – and economic aspects, prior to proceeding to allocate uses and development rights and to equalise landowners' situations and development rights. This in fact represents the first and fundamental phase of the equalisation process. The identification of areas does not make distinction between the areas assigned to private and public use and between the areas with and without urban constraints for public purposes. Moreover, the classification of municipal areas “*reflects the objective situation according to the current and legal status in the moment of the elaboration of urban plan*” (Pompei, 1998, p. 160), in an irrespective approach to the land-use choices of the plan. As a result, the ownership of the land designated for conversion is only treated with reference to the class assigned to that area. The classes of areas are successively attributed a building index without attention to the real owner of the land, public or private. The building index, following the perspective of the equalisation practice, only refers to the private building activity assigned by local authority to the land-owners designed to transformation by the plan, while it does not consider the building activity that the local planning administration saves for actions with public purposes. Using this approach the land developed rights are distributed to all the land-owners who afterwards can trade them to implement the plan, resulting in a mitigation of the added land value, due to planning choice, among all the actors involved in city's transformation. Within the categories of urban economics, the definition of building index in according with each class allow the local administration to maintain more control on the land value, and added land value, generated by its activity. Then, every classes of urban land designated by the plan to conversion is then sub-divided into sections (the so-called *comparti edificatori* in according to the law n°1444/1979), inside which the property-owners can negotiate the transfer of the development rights they own. The owners of properties designated for municipal facilities and public infrastructure own rights that can only be used in those areas of the plan designated for private development. The owners of these latter areas use their own land development rights and ‘host’ the rights of the other land-owners. Once the land development rights have been completely used, the property-owners of the areas designated to public facilities relinquish their areas to the administration at farm prices or for nothing at all.

Finally, the equitable distribution and transfer of the development rights allow the administration to acquire the land required for public use at farm prices or for nothing at all, in agreement with the land-owner, whose property value is in any event recognised and compensated.

This general scheme has been applied with two different strategies, the first one to all the urban areas designed for urban transformation, the second one to a portion of the areas subjected to an urban project. Examples of the former approach include the first pioneering experiences in the Emilia-Romagna region, such as Reggio Emilia and Casalecchio di Reno, while the most significant example for the latter is the rehabilitation project for the city of Ravenna's wharf and the concomitant development of the ‘green belt’ surrounding the city.

In the last two decades the practices about equalisation have evolved from a focus on the spatial equity to one on the efficiency of the plan. The weakening of the fair perspective differently effected - in terms of values – the strengthening of an 'instrumental' approach (Boscolo, 2008) (*“the road to allow the equalization is to regard it as not an end in itself*

but a means" Urbani, 2010), that means to make stronger the relationships between an equalisation-compensation approach to the local plan and the need for greater effectiveness and efficiency of the plan in responding to infrastructural and environmental public questions. Putting equalisation in the perspective of more efficient and effective planning process calls the strategy of generalized equalization (one exception: the PTG of the municipality of Milan) into questions. Accordingly, several plans have elaborated strategies on limited areas subjected to transformation, in which the linkages with infrastructural and environmental purposes are evident.

Compensazione - Compensation: from the principles to the practice

Similarly to equalisation, compensation has not still introduced in the national planning framework, although several regional planning bills have already introduced practices dealing with development rights. Development rights granted for the purposes of compensation go under the name of compensation rights. As happened in the innovative experiences elaborated in the first plans where equalisation and compensation were not two distinct urban practices, compensation is very often used along with *perequazione* within urban plans. Generally, compensation schemes aim at achieving public objectives, such as environmental preservation and infrastructure provision, it enables landowners who have been imposed a development restriction to “keep” the economic value of their property by means of a non-monetary indemnity and use their rights in another development area. As a result, compensation is aimed at making economically neutral the land-owners decision to conform to the plan.

Premialità edilizie - Reward-based mechanism: from the principles to the practice

Premialità edilizia is discussed within the literature in terms of a bonus density that allows higher densities on development areas and on receiving sites within a transfer of development rights programmes. The reward-based mechanism is a recent planning practice, introduced by some regional planning laws and recently taken into consideration by national legislation system. In 2008 the Annual Financial Act (law no. 244/2007) introduced at the national level the incentive system.

The property rights surplus is assigned to the owner as recognition for the production of positive externalities. In other words, the public administration creates an additional property right compensating the production of positive public externalities (Micelli, 2011b). This bonus is related to the greater value of the planned buildings and the additional costs required by their better energy performances.

6.3.3. The main references for the Italian market of development rights

Differences between the legal systems originating in Roman Law and the main variants of Anglo-Saxon Law influence the various approaches proposed in Western European Countries and in U.S. The former defines the indivisibility and absolute nature of land ownership, with the exception of compulsory purchase under strict conditions. The latter sees the land ownership as a bundle of rights. Bearing in mind this, the section intends to present the main references of Italian market of land development rights, in particular the experiences of France and Spain in Europe, and that of U.S. in Northern America.

France: the plafond legal de densité

The reform of 1975, due to Galley, introduced the partial separation of the right of building to the land ownership, providing that the right to build is an integral part of that property up to a certain upper limit. The right to build up to the ceiling, in principle, is due to all soils, but can be exercised only where urban planning instruments provide for urban transformations. The construction of a building, whose area exceeds the credit limit, cannot be authorized if the developer does not make a deposit equal to the market value of the surplus of land area.

This model of equalization, thanks to the very high value of the plafond, became effective only in the historical city centres, which, although referring only to the 1, 5% of building permits, however, corresponded to 44% of land values at stake.

*Spain: the *aprovechamiento medio**

The urban planning, with its provisions, determines the legal status of areas. The model is the equalization of volumes, which does not involve monetary transactions between private and public administration. They identified four major classes of land: urban land, the land planned to be used, the land that could be urbanised but it is unplanned, the land that could not be urbanised. The equalization mechanism essentially applies to the land planned to be used and only at the moment in which the program will provide for the implementation, to the land not planned. All the quantity of building designed in the plan is added together and the total is divided by the surface of the entire territory subjected to urbanization, including the buildable and unbuildable areas: it is determined in this way, the *aprovechamiento medio*. In the case that the average index of a parcel exceeds the overall average, the surplus in volume is compulsorily and freely transferred to the municipality in order to cover the permutations that will be necessary. The surplus, if it remains, is added to the municipal land property. In addition to this, are surrendered to the municipality the 10% of the average index when the volume index provided for a certain area does not reach the 90% of the *aprovechamiento medio*, to the owner are given in permutations buildable areas placed in similar situations.

U.S.: the TDR programme

TDR is the probably best-known example of pro-market device, which allows developing land in a free-market system of willing sellers and buyers by a market of land development rights.

An extensive review of the history and evolution of TDR programs in the United States is beyond the scope of this section, which intends to frame the main features of the American perspective about the use of land development rights to achieve planning goals. Many authors have addressed aspects of the development of TDR policy and programming in the United States (among others: Pruetz, 1997; Johnston & Madison, 1997; Machemer & Kaplowitz, 2002; Pruetz, 2004; McConnell, Kopitz and Walls, 2006a and 2006b; Kaplowitz, Machemer & Pruetz, 2008; Pruetz & Standridge, 2009).

TDR programs are based on the notion that development rights are one of many sets of rights associated with fee simple land ownership (Machemer & Kaplowitz, 2002). Johnston and Madison (1997, p. 365) defined TDR as “*the sale of one’s parcel’s development rights to the owner of another parcel, which allows more development on the second parcel while reducing or preventing development on the originating parcel*”.

Generally, according to Pruetz and Standridge (2009, p. 78) such a practice is “*intended to reduce or eliminate development potential in places that should be preserved by increasing development potential in places where growth is wanted*”. Hence, they have had a wide variety of objectives: to protect agricultural lands, to preserve wildlife habitats, to control development densities, to protect environmentally sensitive lands, to protect historical landmarks.

The broad use of TDRs programme in U.S., entirely falls in the category of multi-purpose tool. Indeed, it has traditionally associated with the preservation of environmental areas, farmland and historic landmarks (Pruetz, 2004) and, in addition to them, the communities have developed whole new uses for it, with the goals of revitalisation of downtown areas (Traverse City/Garfield Township, Michigan; Central Business District Redevelopment Project Area in Los Angeles, California and Central City District in Portland, Oregon) and the promotion of desired urban design (Los Angeles, California). Although there are hundreds of cases in U.S. of TDRs applications, none of them combine environmental issues with urban regeneration. Pruetz asserted that “*communities have been very creative in their use of TDR*” and that, “*there is no single formula for creating a successful TDR program*”.

Programs to transfer development rights from areas that society wishes to protect, such as environmentally sensitive lands, farmland, or historic sites, to areas more suitable for intense development have been in existence since 1968, when New York City adopted its landmark program to protect historic buildings. These proliferated in the 1970s and 1980s as concerns over suburban “sprawl” and loss of open space and farmland on the urban fringe began to mount (Johnston and Madison 1997). Pioneering examples, and continuously debated, are Pinelands, Montgomery County, Santa Monica Mountains, Lake Tahoe.

Basically, a TDR programme is made up by 2 elements: (1) sending areas; (2) receiving areas; and two main actions: (a) the definition of two typologies of areas and the specification of land development rights assigned; and (b) the process by which development rights may be transferred.

In according with Pruetz (2004), sending areas generally include resources that a community wants to preserve such as environment and landscape protection areas, agricultural land, historic landmarks, open space, coastal areas, water quality, wetlands and so on. The potential of development (land development rights) is transferred or ‘sent’ from the sending area to designated regions (receiving areas) for development in that area. Typically, landowners in sending areas receive a payment in exchange for the sale or transfer of their properties’ development rights. After selling their parcel’s

development rights, landowners may continue permitted land uses on their property, as defined in the easement or deed restrictions. The purchaser of development rights does not have to actually use the purchased rights for development. The components of TDR programmes are tied together by the procedures adopted for transferring TDR from sending area landowners to receiving area landowners. TDR transfers may take place between adjacent parcels, within a designated district, from non-urban to urban areas within a jurisdiction and also within a region between jurisdictions.

6.4 A framework for the discussion: learning from successful elements in national and international experiences

Scholars, planners and practitioners have focused their attention in recent years on new modes and tools of urban governance, fostering the shift of the role of public administrations from regulators to facilitators and the introduction of a neutral approach to market actions. Within this context, the work intends to analyse how the replace of the traditional command-and-control planning mechanisms with new practices can reflect the energy-sensitive planning success.

The previous paragraphs review different perspectives, planning and urban economics specially, in understanding the current transformation of planning modes in both governance strategies and instruments. The international debate has largely influenced the Italian planning activities, although several specificities on legislation system and planning practices are maintained due to the Roman law tradition and a Mediterranean view. As a result, in addition to other instruments, three practices using markets of land development rights, which are equalisation, compensation and the reward-based mechanism, have begun to be placed in the municipal tool chests and used.

The focus here is on the third one, the reward-based mechanism that, as previously mentioned, is aimed at the refurbishment of existing buildings with a particular attention to energy efficiency and production from renewable sources. Although the choice of the Italian application and related case studies, the recent introduction of the reward-based mechanism into the Italian legislation and the consequent translation into municipal regulations, the work is intended to be of interest to an international audience. By the conceptual model proposed by Tiesdell and Allmendinger (2005), the research intends to develop a framework able to correlate the recent Italian experiences on stimulating tools with international ones. Thus, in other countries there is no strict physical demarcation in the use of property rights, and bonus-rights are quite often used because they can be transferred and marketed (Janssen-Jansen et al., 2008; Renard, 2007; Spaans et al., 2011).

The way a market of development rights (which includes the reward-based mechanism) is designed and implemented determines how effective it is in achieving the identified land use goals. Policies and approaches on markets of land development rights have been reviewed in the planning and economics literature. Most economists have tended to focus on how these instruments can improve economic efficiency in the land market, while planners have concentrated on program design and the political feasibility of establishing such programs. To explore these issues, this paragraph develops an analytical framework based on both these perspectives including a broader approach than the Italian legislative one.

The paragraph is in three main sections. The first (6.4.1) sets out the conceptual model adopted for reading the Italian municipal energy planning toolchest, while the second (6.4.2), in accordance with the Tiesdell and Allmendinger's planning tool typologies, explores both the Italian and international experiences with the market of land development rights in view of some forms of incentivitation. The third (6.4.3) presents the analytical framework collecting the successful elements that are recurrent in the several researches analysed and which also fit the Italian context.

6.4.1 An international conceptual model for reading the Italian reward-based mechanism

The more recent researches have broadened the scope of planning activity and have deconstructed the notion of it as a homogeneous and regulatory activity. This hypothesis is based on the consideration that the usual top-down, public-led, authoritative tools are no longer effective, due to the re-allocation of competencies and resources onto a number of politico-administrative levels (ranging from the EU to the state, regions and municipalities) and semi-private agencies and private companies as well, to the shrinkage of public money, and the increasing number of conflicts when authoritative instruments (such as regulation and expropriation) are used by public authorities. In particular, regulation (that is the definition of rules to be respected by means of conformance control) is a key-planning instrument but it is no longer effective for orientating actions, changing behaviours, stimulating the market. The involvement of the private sector in the attainment of planning goals is related to the trend of public authorities retreating from the role of regulators (Cars et al., 2002), and instead becoming facilitators of new actions preferably to be realized by the market (Van der Veen et al., 2010). Thus, in recent years, the neat separation between public and private sector development has begun to

break down, development is increasingly a process of co-production between public and private sector (Tiesdell & Adams, 2011). Also in Italy, where the legal-administrative tradition is characterized by a prior definition of rules and a subsequent conformance control, novel instruments have been introduced. The goal is to increase the actors' involvement, thus balancing the inequalities provided by planning decisions (in particular advantages and constraints caused by zoning), and preventing the market inefficiency.

Avoid polarising the discussion on the dichotomy of “market” and “state”, several scholars (Buitelaar, 2003; Micelli, 2011a; Tiesdell & Adams, 2011; Tiesdell & Allmendinger, 2005) propose market-aware planning, a planning informed by dynamics and motivations of actors, how the decisions are made and how the actions are taken. It requires a focus on the relationships between these – that is the market-state dialectic. In such a changing period more attention has to be given to the impact of planning tools on market actors' decision environment, analysing of the role of policy and planning in the determination of the levels of development activity.

Within this context, the conceptualisation proposed by Tiesdell and Allmendinger (2005) suggests a model to link the conceptual and empirical issues understanding how particular planning tools affect the decision environment of land and property market actors. Several studies have developed typologies to classify and organise the relationships between planning tools and land and property markets. Typically they derived from a welfare economics tradition, they have tended to concentrate on market-failure and state interventions. On the other hand, authors (2005, and then cited in Adams & Tiesdell, 2011) develop a typology of planning tools based on their relationships to the operation of land and property markets identified in mainstream and institutional economic analysis. The conceptualisation of planning tools and market recognises the role played by property in influencing the performance of market and the consequent relationships between planning, public policy and structure and operation of property market.

As far as policy tools are concerned, they are defined as “*policy actions or initiatives intended to affect the decision environment (and... the behaviours) of market actors and to achieve desirable societal objectives*” (p. 58). The effectiveness of public strategies and actions depends on the ability to make use of the appropriate tools, considering the leverages that can be activated in the diverse contexts. Thus, these do not operate in insolation but rather new tools are frequently introduced “*within an already crowded policy context*”, and deployed in bundles of packages.

In short, the authors identify tools intended:

- (a) to shape markets;
- (b) to regulate markets;
- (c) to stimulate markets;
- (d) to develop the capacity of market actors.

As table 6.8 shows, for each instrument types, authors (also in Tiesdell & Adams, 2011) identify several common subtypes that operate respectively by shaping the decision environment, by restricting the set of choices available, by making some actions more attractive to particular actor and, finally, by facilitating the development of human capital and the reframe of the cultural mind-set.

Table 6.5.: Policy tools typology

INSTRUMENT TYPES	COMMON SUBTYPES	COMMON EXAMPLES
<i>Shaping instruments</i>	<i>Market structuring</i>	Legal framework, property right regime, national taxation system
	<i>Investment provision</i>	Public investments
	<i>Generating information or promoting coordination</i>	Plans, policy statements, guidance, advice
<i>Regulatory instruments</i>	<i>Regulatory instruments</i>	Planning systems and development controls
	<i>Enforcement procedures</i>	
	<i>Regulatory procedures</i>	Various methods of deregulation/streamlining
<i>Stimulus instruments</i>	<i>Development stimulus tools</i>	Direct state actions, price-adjusting instruments, risk-adjusting instruments, capital-raising instruments
	<i>Design stimulus tools</i>	Local design policy, Specific area and/or site design policy and guidance
<i>Capacity-building instruments</i>	<i>Developing human capital</i>	Seminars, job-training
	<i>Enhancing institutional and organisational networks and capacity</i>	Arenas for interaction/networking
	<i>Reframing cultural mindsets/cultural change</i>	Ideas competitions
	<i>Enlarging the stock of ideas and concepts</i>	

Source: adapted from Tiesdell & Allmendinger 2005; Tiesdell & Adams, 2011; Syms & Clarke, 2011

(a) Market shaping tools

This typology of tool works by shaping the context within which market actions and transactions occur. Among these policy tools, plans are the principal directive market shaping tool, and three types of market-shaping plans are recognized: ‘development’ plans, ‘regulatory’ plans and ‘indicative’ plans. In particular, land-use plans affect development decisions working in conjunction with other planning tool types. In a zoning approach perspective, the use of market regulation tools is widely in Italy: they assign building opportunities by allocating development rights and providing constraints in order to affirm a superior ‘public interest’ (i.e. spaces for public utilities, highways, railways, etc.). Then, adopting transfer titles (such as expropriation), public authorities acquire properties also without the owner’s consent, recognizing only a monetary compensation. Considering the variety of planning decisions, apart those that refer to public authorities, the market must accomplish a large number of contents, taking advantage of the opportunities recognized.

(b) Market regulation tools

These seek to regulate and control market actions and transactions by restricting the set of choices available by defining the boundaries of the actors’ opportunity space. Generally it is operated by the state, by requiring the conformation to minimal regulatory standards because it tends, according to Tiesdell and Adams (2011), to operate in a “*one-size-fits-all*” system in pursuit of maintains equity and fairness of public actions. Operating in such way, regulation levels the standard out on the lowest common one, negatively influencing innovation. In addition, this type mainly focuses on one parts (e.g. the building code on building distance, colour schemes, window details, balcony details, etc.) in isolation rather than the whole, losing completely the context and the reasons for certain operations and the implication of such developments. In short, another weak point of regulation is that, although it can direct demand away from specified locations, but regulating instrument cannot generally attract demand and development to a specific location.

(c) Market stimulation tools

They seek to facilitate market working better by the change of the contours of opportunity space making some strategies more (or less) advantageous to market actors. As Tiesdell and Adams (2011), such tools operate “*by making developers realise either they ‘want to’ provide better quality development [design stimulus instruments], or that they ‘have to’ or that it is ‘worth it’ because of remunerative advantage [development stimulus tools]*” (Syms & Clarke, 2011, p.146).

In the development stimulus instruments, direct state actions - provision of public infrastructures and use of compulsory purchase -, price adjusting instruments, as well as risk adjusting instruments and capital raising ones have to be mentioned. Adjusting the price or the risk to an actor for an activity, stimulus tools impose site-specific taxes (tax credits/incentives/breaks/subsidies/grants) or create a better investment environment through, for sample, investment actions. Differently, capital raising instruments permit more availability of financial resources or access different sources of finance previously inaccessible. In addition to fiscal measures and subsidies, there is large evidence (Bulkeley & Kern, 2006) of the use of a variety of devices, from more ‘traditional’ ones, such as promotional activities (education campaigns), to public-private partnerships, in order to provide guidance for architects and developers on energy efficiency and energy production from renewable resources.

Design stimulus tools may also include such regulations and policy statements as guidance on the design and the form of new developments and interventions at the site-specific level by local planning authorities (Syms & Clarke, 2011).

Examples can be local design policy like compulsory as well as voluntary measures oriented, in the policy area of this work, at increasing energy performances of the building sector, and include in-kind incentives. Such policies need careful application through briefing, negotiation and design review. Specific area and/or site design policy and guidance are drawn up and implemented locally to address particular site.

According to Syms and Clarke, the interactions between development and design stimulus tools, can result in four different situations that simulate as many scenarios:

- no design stimulus and no development stimulus instruments: nothing happens;
- design stimulus but not development stimulus instrument: if development happened it would be of high quality, but, due to the lack of a development stimulus tool, no development happens;
- development stimulus instrument but no design stimulus tool: perhaps plenty of development happens but it is of poor quality;

- development stimulus instrument + design stimulus instrument: this should be the ideal situation for real implementation.

(d) Capacity building tools

They build the ability and capacity of market actors. It means of facilitating the operation of other planning tools by the development of skills and ability of individuals and organisations.

The policy tool typology applied to the Italian local energy planning toolchest

If development stimulus tools are generally about incentives and disincentives, among the policy tools used for consensual planning, mechanisms using market of land development property rights are increasingly playing a key role, in particular the bonus density (*Premialità Edilizia* in the Italian context) (Spaans et al., 2011). They are essentially voluntary and work by making the actor ‘want to’ take the incentive or incur the disincentive. Such a development stimulus tool may also be seen as providing the developers with an economic advantage, in the added land value (Micelli, 2011b). They can be intended as a ‘Coase-inspired’ property rights paradigm for the achievement of spatial planning goals. Voluntary market agreements could be used in order to: enforce existing property rights, transfer property rights, and redefine property rights (Ellickson, 1993, p. 1326). The use of reward-based mechanisms, by stimulating the market (the private initiative), can change the “contours of that opportunity space making some strategies more (or less) advantageous to market actors” (Tiesdell & Allmendinger, 2005, p. 68).

Table 6.6.: The policy tool typology applied to the Italian local energy planning toolchest

INSTRUMENTS FOR PLANNING AND MANAGEMENT ENERGY EFFICIENCY AND ENERGY GENERATION
<i>MARKET-SHAPING TOOLS</i>
Municipal Energy Plan
Municipal Energy Efficiency Plan (for municipal buildings)
Municipal Illumination Plan
<i>MARKET-REGULATION TOOLS</i>
Building Code
<i>MARKET-STIMULATION TOOLS</i>
<i>Development Stimulation Tools</i>
<u><i>Incentives and fiscal policies</i></u>
Investment subsidies (infrequent)
Tax deductions (on property tax and urban development charges)
<u><i>Non economic incentives</i></u>
<i>REWARD-BASED MECHANISM</i> (local tailor-made measures)
Public-Private Partnership Initiatives (in particular developed for energy generation)
Community Policies and Initiatives (in particular developed for demonstration projects – building or neighbourhood scale)
<i>Design stimulation tools</i>
<u><i>Local design policy</i></u>
Voluntary assessment scheme
<u><i>Specific area and/or site design policy and guidance</i></u>
Admissibility criteria
<i>CAPACITY-BUILDING TOOLS</i>
City Networks
Job Trainings

Source: author’s elaboration after Tiesdell & Allmendinger 2005; Tiesdell & Adams, 2011; Syms & Clarke, 2011

Between the design stimulus instrument typology, many cities have recently revised their building codes including performance requirements relating to energy and building quality standards, both for new constructions and the refurbishment of the existing ones. Locally, a number of cities has developed provisions regard compulsory as well as voluntary measures oriented at increasing energy performances of the building sector, and include in-kind incentives (financial incentives and, some, a reward-based mechanism).

6.4.2 Successful elements

Considerable attention has received the best-known example of instrument making use property rights, the transfer of development rights. Micelli (2002, 2004), Pompei (1998) and Stanghellini (2010), in Italy, have widely explored the

concept of equalisation, and its applications in specific urban areas or in land use zoning plans. Although the cases were initially focused on the problem of equity of the planning instruments, they are currently evolving towards the development of public cities with the acquisition of green area and public services, such as in the recent municipal plan of Milan. Not similarly consolidated, the use of compensation practice in the Italian reality mainly refers when the public administration cannot compensate in money due to the lack of financial resources. It allows planning administration to avoid in use of eminent domain especially in the case in which compensation implies bonus-rights.

As a result, in the current framework of great uncertainty, the density bonus could represent an important innovation for both the horizons of innovation that bring legal and procedural frameworks and for the opportunities to work in synergy with other practices, in particular with the equalization. Although the advantages of a synergistic use of instruments are certain from the theoretical point of view, the experimentations are mainly on equalization and compensation limiting the comparison process and the discussion for the bonus-rights scheme. In contrast, in some case studies outside Italy there is not demarcation in the use of property rights. The borders between practices are vague. In multi-purpose use of property rights, bonus-rights practice is quite often included and the transferability and marketing can be considered.

According to this approach, the work brings together different international researches on experiences in the use of property rights as instrument to encourage the achievement of some public goals (Bartolini, 2007, 2008; Boscolo, 2008; Camagni, 1999a; Jacobs, 1997; Kaplowitz et al., 2008; Machemer & Kaplowitz, 2002; Micelli, 2002, 2010, 2011b; Pruetz & Standridge, 2009; Renard, 2007, 2008; Spaans et al., 2008; Stefano Stanghellini, 2010; van der Veen et al., 2010) that are relevant for identify successful themes and elements. Considering the different economic, legal and institutional contexts as well as planning systems, the themes for the discussion are selected and adapted in respect of the Italian legal regime of reward-based mechanism.

Market of land development rights in Italy: from local experiences some factors for the success

The institution of markets of land development rights, in particular by the use of equalisation practice, has been used in order to manage several urban plans in Italy. After the pioneeristic experiences in Rionero in Vulture (PRG 1982), Misano Adriatico (PRG 1985), in Bologna (PRG 1986) and Casalecchio di Reno (PRG 1989), scholars have mainly focused their analysis on the “first and second generations” of equalisation programs. The first wave of programs included those in Cesena (PSC 1998), Ravenna (PRG 1993), Turin, Reggio Emilia (PRG 1999), Piacenza and Parma, while the second one those in Milan (PGT 2011-2012), Bergamo (PGT 2010), Parma (PSC 2007) and Ravenna (PSC 2003-2011). The literature on the first generation programs emphasized the equity as principle for distributional justice through the application of equalisation practice to all the municipal areas designed to urban transformation. In this phase the market of development rights is mainly conceptualised and associated with an objective rather than a mean to achieve certain societal goals. This emphasis was not incorporated into the so-called new generation programs. These, therefore, generally intend using of land development rights as a tool for the acquisition of urban areas in view of public purposes.

Considering the market of land development rights a policy instrument, there has been little empirical research on the strength and weak elements that are involved in the success of such programs. In particular, two different perspectives have been emerged, one seeks a balance between planning and urban economics approaches, and the other is more oriented to a legal discussion. On the one hand, Micelli (1999, 2002, 2004 and 2011), Stanghellini (2010) and Camagni (1999, 2011) highlight that the efficiency of land and property market is an essential starting point together with the social acceptability to make a program effective, on the other hand, from the researches of Boscolo (2008) emerge elements about coherence and consistency of program in relation to the planning process.

Each of these contributions is now dealt with in turn.

Several significant elements emerge from the analysis of the major case studies (Cesena, Parma, Piacenza, Ravenna, Reggio-Emilia and Turin) of equalisation in Italy in the Micelli's works published in 1999, 2002 and 2004.

In the first place, markets for development rights do not replace the command-and-control tools traditionally used in planning. In reality, their success seems to depend significantly on their capacity to synergically work with other implementation instruments, alternative and complementary, at risk of affecting the real operationalisation of equalisation program (2004). Hence, integration is a significant condition due to the important role of local government in this process. Secondly, in close linkages with the previous consideration, the market for land development rights does not work automatically, exclusively thanks to the market rules. Ideally, the government's role should be limited to the planning efforts and delineating the sending and receiving zones. A market system should take over once the rules have been established. As cases in other markets for rights and environmental permits show, the visible hand of the administration “takes steps to establish the market rules and to promote its operation, reducing transaction costs as much

as possible". The case analysis finds that intervene in the market seems to require significant managerial and administrative investment "*on which the success of the initiative depends*" (2002).

Furthermore, the local public administration, in order to effectively orient the urban development and to take a leading role (the invisible hand), has to have some ideas on the physical and social outcomes of the use of land development rights market. Thus, it can potentially modify urban areas in their characteristics and needs and on the relationships between this and the purposes and objectives of local spatial plan. Then, the subdivision into sections of every class of land designed by the plan to urban conversion affects the operating mechanisms of urban sections (comparti urbanistici) as a consequence of the state and configuration of property. The fragmentation of property and the consequent operations of negotiation between landowners and economic agents result in the amount of transaction costs, with important implication for the success of program. Hence, in their theoretical paper, Field and Conrad (1975) argue that the benefits of a TDR program will occur only if there is a "well organized auction" where the transaction costs between the buyers and sellers are as low as possible. High transaction costs lower the incentives for both buyers and sellers to participate and thus decrease the quantity of acres protected. Decreasing the number of property-owner (or economic agents) in each urban section, thanks to an appropriate identification of areas, could be useful to reduce these costs. Micelli in 2011 (p. 143-164) in detailed way analyse the feasibility and profitability conditions for the realisation of programs aimed at the building demolition and reconstruction using a reward-based mechanism (the so-called premialità edilizie). The case study is the mainland area of the municipality of Venice. Under what circumstances the balance between the rights gained and the economic value of the incentives can be achieved? Following Micelli, the main condition is about the added value assigned with the extra land development rights. Basically, this has to be greater than or equal to the value of the existing building's volume. The operational rules to make the program work has to consider three important variables: (1) spatial variation coefficient, in relation to the positional quality of area designed to urban transformation; (2) building value depreciation coefficient, in relation to the building age; (3) the urban density.

Summarizing the main findings of the Micelli's research (2011), we could affirm that the bonus density should increase with respect to the growing of building density and quality whereas bonus density should decrease with respect to the land value related to the location. This implies that an efficient implementation should consider the possibility to assign different bonus on the basis of economic criteria. In contrast, the national and regional laws do not provide differences for the attribution of development rights whereas they suggest designating the areas following legal criteria and the zoning approach.

Similarly, Stanghellini (2010) points up, firstly, the implications of the entitlement of land development rights on the physical characteristics of cities, such as the number of citizens and the necessary public services. This, therefore, requires the awareness of what urban form could be the result of the use of equalisation practice resulting in the definition of plan objectives and visions. Then, the author states that the definition of the homogeneous units inside each category have to take into account the structure of land property to guarantee the commercialisation and transfer of property rights. Furthermore, Stanghellini, poses the problem of the definition of building index in the case of the equalisation on all areas subjected to urban transformation. Considering the variation of land value with position, the amount of land development rights to each category of urban land should be assign in consideration of the receiving area. This could be possible if both sending and receiving areas are precisely defined with public-private negotiation processes and agreements. The obvious consequence of this is the involvement in the planning process and in the market of land development rights of landowners, in order to make this public strategy socially shared.

Similar elements to those emerged from the analysis of Micelli and Stanghellini are emphasised in two of Camagni's works (1999 and 2011) on equalisation practice in Italy. The contributions, based on the case study analysis of the 'first-generation' experiences of cities of Turin, Parma, Piacenza and Ravenna and on that of 'second-generation' of the municipality of Milan, confirm the necessity to integrate the market of land development rights with other instruments that provide additional features (1999) and to use such programs as means (not objective) of a rational strategies of planning and urban design (2011). On the other hand, Camagni finds that the application to a portion of the areas undergoing change (1999) and the phase in which the building index is defined are crucial steps. The attribution of land development rights should consider, in addition to the economic and legal features of urban land category, the different planning objectives that every portion of land is aimed at achieving. Considering these previous mentioned elements stability and homogeneity factors, the author gives priority also to conditions have temporal and negotiable flexibility (1999). The assignment, the transfer and the market of land development rights are all actions that strongly influence not only the physical asset of the city but also the economic aspects related to it. It is possible saying that a public strategies using land development rights establishes an obvious market competition, which needs to be regulated and managed.

In this perspective, Camagni expresses considerations on transparency and effectiveness in the negotiation process between public and private actors that should happen in the best information conditions and with the best contractual capacity by the local public authority. "*Transparency should not stop at physical data, because square meters of land or*

floor surfaces have a value very differently within the city” (author’s translation, 2011, p.) and should set up effective and transparent moments of competition between alternative projects (1999 and 2011).

From a legal perspective, Boscolo (2008) stresses points related to the involvement of stakeholders in the process, the economic feasibility in using land development rights as policy tool, and the role of public authority in the definition of market rules oriented to the efficiency and implementation of programs.

Concerning the participation of land owners and citizens, Boscolo claims that both the classification of urban areas designed to urban transformation and the attribution of building index should provide the intervention of owners, in order to make certain the methods applied for the analysis of economic, legal and current status of urban lands and for the attribution of building potentiality. Furthermore, the author emphasizes that the agreements between owners, supported by local administration, and the easily identification of a number of buyers could maintain low the costs and profitable the transactions. Obviously, similarly to Micelli, Stanghellini and Camagni, the owners’ agreement (and, consequently, the efficiency and implementation of programs) is subjected to the economic benefits granted despite the transaction costs and the urban development charges. In addition, the role that the local public administration played remains pivotal. It should be involved in pro-active actions aimed at the facilitation and stimulus of implementation activities since it takes part in pursuit of results on the ground.

International experiences

The scan of the circumstances in which some international experiences make a useful contribution to the achievement of planning goals have to bear in mind the previous mentioned different legal contexts in continental European countries and English-speaking ones. The adoption of the non-financial concept elaborated by Spaans, Janssen-Jansen and Van der Veen (2010) could be useful to maintain an instrumental perspective on the experiences rather than focusing on the divergences. The authors state that:

“Non-financial compensation exists when a government compensates a person or company with an interest in land for the loss of one or more of his property rights therein by creating a new property right that he can either use or sell. It also exists when a government provides an incentive for developers to realise certain planning goals either on their land or on the land of others and the government does not directly subsidise that realisation but creates a property right that they can use or sell when they have realised the goals” (Van der Veen et al., 2010, p. 1).

Thus, non-financial compensation in spatial planning means that a government does not subsidise or compensate landowners or developers financially for their losses or endeavours but instead creates a right that can either be used or sold (Spaans et al., 2008). As the authors clarify, non-financial compensation as a policy concept does not exist, it was introduced as a general category to refer to various incentive and compensation schemes that make use of property rights rather than money to reward or compensate landowners and developers for certain land use decisions.

Following this perspective, this section collects empirical researches that find instruments’ success elements from different countries, from U.S. to Europe.

Jacobs in 1997 introduced the necessity of empirical research on the determining factors for a successful TDR program. He affirms that, in order to achieve a greater economic efficiency of the program, the design of areas should consider creating a market in which there is a low supply and high demand of building development by means of relative small sending areas and relative large receiving areas. The author emphasises also the strategic importance of social acceptability and citizens and stakeholders involvement into the elaboration of TDR programs to assure the implementation phase. Thus, a widespread public recognition of the importance of protecting resources by TDR as well as the willingness of public administrators to assume the risk of implementing such projects and policies can support and encourage the willingness of the owners of the receiving areas to acquire the available land development rights and exploit them where these densities are higher.

Like Jacobs (1997) and Johnston and Madison (1997), Machemer and Kaplowitz (2002) and then Kaplowitz, Machemer and Pruetz (2008), as well as Pruetz and Standridge (2009), have identified various components thought to be necessary for effective transfer of development rights (TDR) programs. The factors most commonly cited in these articles have been isolated and systematically compared by the authors with a substantial number of TDR programs that have accomplished meaningful preservation results to date.

Although leading success factors for examination are here presented separately, they are interdependent components that work together. In other words, these factors should be thought of as interrelated components of a coordinated and integrated regulatory framework. Hence, all the authors mentioned conclude that, in order to make a TDR successful, the land use regulatory process should be consistent and stable, and that Tdr program should be compatible with other implementation instruments such as purchase development right program.

The analysis of TDR programs carried out by Machemer and Kaplowitz (2002) reveal that where the participants to the program are confident that the TDR programmes would be maintained over time are more interested to be involved in it. In order to do this, TDR sending area zoning should not change and that bonus densities in receiving areas should only be achieved through TDR participation (not through zoning changes and variances).

Furthermore, the authors discuss the political and legal foundation as a key contribution to the efficiency and effectiveness of TDR program. It is obvious that political structure can influence the characteristics of program and that the existence of a strong political leadership can foster the initiation of such a program and maintains the due attention to its implementation over the legal fixed terms. On the other hand, the legal foundation for TDR programs may consistently vary from a local political power to a specific “state enabling legislation”. Whereas Machemer and Kaplowitz claim that this variation – from ordinance to a real legal foundation into the national legislative system – affects also the success of programs, whereas Kaplowitz, Machemer and Pruetz find that state enabling legislation is not a significant characteristic of successful TDR programs because several of programs analysed were elaborated and implemented in absence of a national legislative framework. It seems that a legislative basis is not a necessary preconditions for successful TDR programs. A TDR bank is another condition that emerges from all the contributions referenced. It may serve several important functions, including the purchase and sale of TDR, being a buyer of last resort, strengthening programme credibility with banking institutions and being a facilitator. Kaplowitz et al. (2008) conclude that it may serve many functions that positively influence the development and effectiveness of a development right market.

Concerning the achievement of a greater social acceptability of TDR program, all authors agree that a strong public support with all citizens and stakeholders informed about concepts, processes and programme characteristics is important as well as the perceptions from the community of the validity of the resources (in general terms, land, etc.) preserved using TDR programs.

The land and property market efficiency is a key drive to make the TDR practice work. The knowledge of development demands and pattern through comprehensive preliminary studies permit to understand the current market forces and the potential market, the size, the location and the characteristics of the sending area as well as the formation of receiving areas. To appropriately locate sending and receiving sites it is necessary to establish firstly where the development and the growth pressure is high because the demand for development is one of the most important pivotal aspects. Then, the receiving sites should suit the intensity and type of development that could be allowed with the use of TDR. Machemer and Kaplowitz (2002, p. 787) state that:

“TDR receiving sites must be politically acceptable, physically feasible sites (with centralized sewers and water) and feasible from a planning perspective (i.e. meet the comprehensive plan, zoning conditions and design standards).”

In addition to these conditions, Pruetz and Standridge (2009) include two more factors. The first one is the compliance with TDR requirements without any alternative opportunities for additional development. The most successful programs in U.S., such as the New Jersey Pinelands program in the State of New Jersey, do not allow owners and developers to obtain extra development rights if not in accordance with regional TDR program or comprehensive municipal plan. The second one is the planning of market incentives to stimulate the transfer of development rights from sending to receiving areas. The authors find that, in pursuit of the creation of market incentives for sending-area landowners and receiving-area developers, many programs analysed adopt an enhanced transfer ratio, meaning that more than one additional dwelling is allowed in the receiving area for each dwelling unit precluded in the sending area. In their opinion, this means not that the importance of that particular market incentive is significant but that the community understands the importance of making the program attractive to TDR buyers and sellers alike.

Van der Veen, Spaans and Janssen-Jansen (2010) elaborate an assessment analysis of cases from the U.S. (the city of Malibu), Spain (Francia Avenue in Valencia) and The Netherlands (Space for Space programme in North Brabant) on the basis of an international comparative research project proposed in the book “New instruments in spatial planning: an international perspective on non-financial compensation”(Janssen-Jansen et al., 2008).

In line with Kaplowitz et al. (2008), they recognise that three aspects of “non-financial instruments” could affect a successful implementation:

- their case-specific design (called by the authors, specificity). The specificity requirement holds that a non-financial compensation instrument should be elaborated in according with the social and economic characteristics of the specific context. It is expected the program will be tailor-made and site-specific. The inclusion of stakeholders and shareholders in the design process, allows the program to fit the specific needs and goals of the area and maintain the attention high on the implementation phase;
- their capability to facilitate co-production. As affirmed for the ‘specificity’ criteria, also for the requirement of co-production the active presence of private actors – together with the public ones - in the development of the whole process is proved to improve the quality of an area to a greater extent than each could have done alone. The references in

this case are the ‘background studies’ mentioned in Kaplowitz et al. in 2008 and the ‘sense of place’, ‘resource perceived as valuable’, as well as ‘knowledge of local land use demand’ in Machemer and Kaplowitz in 2002;

- their ability to find the right balance when loss of economic value is compensated in rights. Obviously, this condition refers to the economic acceptability of the operations under the TDR programs. The right gained should be worth enough to be regarded as fair compensation for the loss of the vested right. However, the rights should not be worth too much.

The authors emphasise that these instruments – in order to work optimally – should find the right balance between general legal principles and a tailor- made design.

6.4.3 From literature review to an integrated analytical framework

The work is intended neither perform a cross-national comparison of planning practices and initiatives nor transfer planning instruments from one planning system to another. Adopting the conceptual model of policy instruments developed by Tiesdell and Allmendinger (2005) this section discusses the different factors emerged from the Italian debate and the international one. This in order to develop an integrated conceptual framework (table 6.10) for the evaluation and the analysis of the new plan implementation mechanism based on the assignment of extra land development rights aimed at energy saving goals. The work distinguishes and selected themes and elements from the juxtaposition of the different situations, bearing in mind the policy area (energy-sensitive planning) which the research is referred to. Hence, although the differences in the characters of phenomenon and outcomes between nations and within nations (such as in Italy and in the other nations with federal governance structure) are considered, the focus remains on the similarities in using “non-financial instruments” as means to achieve certain planning goals. However, the choice of Italian application and case studies affects the selection of themes and factors mainly with reference to the general objective of the Italian application - greater energy efficiency and generation from renewable sources of existing buildings – and to its current translation in the (the majority of) regional laws and its application into (few) municipal regulations.

The comparison of the reviewed Italian and international empirical researches stresses four main themes, representing the conditions under which the use of market of land development rights in view of greater energy efficiency and production can be efficient and effective:

- (1) local planning framework – these factors set out the needed institutional and political capabilities for appropriately collocate markets of land development rights into the existing planning and legislative framework;
- (2) social acceptability – these set the necessary context and approach to policy instrument elaboration and implementation;
- (3) land and property market efficiency – these elements define the circumstances that make profitable and feasible such a policy instrument;
- (4) environmental relevance – these factors consider the policy area in which this typology of instruments is intended to intervene, the achievement of greater energy efficiency and production from renewable sources in urban areas.

Local planning framework

Despite the new role assigned to the public administration, authors generally agree that planning authorities significantly condition the elaboration and the implementation of policies based on stimulating market tools. It is the administration that identifies the urban areas designed to transformation as well as what strategy apply (Micelli, 2002). In addition, it attributes the building index to areas and develops the rules for the right allocation phase, in the case it can be considered. Then, following the Italian legal literature (Bartolini, 2008; Boscolo, 2008), the generation of land development property rights has to be related to the land use plan (the power to allocate the property rights) and, therefore, to the assignment of dimension characteristics (number of inhabitants, public services, etc) to the future urban transformation.

The “*visible hand of public administration*” (Micelli, 2002) is, therefore, a significant condition due to the important role of local government in this process. Obviously, it is necessary a managerial and administrative investment of municipalities and the willingness to innovate and experiment on which the success of the initiative depends. The market for land development rights does not work automatically, but after the establishment of market rules and public initiatives that can facilitate, support and encourage the involvement of private developers and owners into these operations.

Furthermore, stimulating market instruments should be considered means to obtain defined public objectives integrated into more complex integrated strategies. In this perspective the planning authority should maintain the awareness of the

physical outcomes as a consequences of the use of market of land development rights. Thus, it can potentially modify urban areas in their physical characteristics and needs and on the relationships between this and the purposes and objectives of local spatial plan.

The coherence and the integration of such planning mechanisms with the purposes and objectives of land-use plan are elements identified as successful both by the Italian and international scholars (Kaplowitz et al., 2008; Machemer & Kaplowitz, 2002; Micelli, 2002, 2010, 2011b; Pruetz & Standridge, 2009). Similarly to the coherence between objectives, in theory (Boscolo, 2008), stimulating market tools and land-use plan should be internally coherent. In the Italian context, and in according to the current main reading, the land-use plan determines the entitlement of land development property rights, shaping the *ius aedificandi* and assigning it to the areas. As a result, the use of land development rights has to be made on a basis of planning decision in order to guarantee the adequate legal consistency of the instrument. In addition to this point but closely related, “*the creation of property rights markets never aims to replace the plan’s traditional implementation tools, but rather to integrate the former to make the latter more efficient*” (Micelli, 2002, p. 150). The capacity to synergically work with different typologies of policy instruments, which shape, regulate and stimulate the market as well as foster the capacity building of actors involved, significantly influences the implementation phase. The combination of different characters and different operational paths allows the public administration to consider a number of possibilities in view of a predetermined goal. Authors from the U.S. (Kaplowitz et al., 2008; Machemer & Kaplowitz, 2002; Pruetz & Standridge, 2009) emphasize the effective inclusion of stimulating market tools into a planning system in which other instruments are already activated. The focus here is again on the compatibility and complementary features between planning instruments, in particular between TDR and PDR programs. On the Italian side, equalisation and compensation practices have initially sought to replace the compulsory purchase order in perspective of more distributional equity and less public costs in the acquisition of areas for public purposes. Lately, Camagni (2011) has hypothesised the use of both in synergy: firstly equalisation mechanism in order to identify the categories of urban areas designed to transformation and assign the building index, which can well represent the land value, and then the compulsory purchase to acquire the land at the right cost. In this regard, despite the recent introduction and the few applications, the based-reward mechanism has a potential to be realised.

The consistency between planning goals, regulations and implementation mechanisms reflects firstly the appropriate identification of urban areas involved in the policy, secondly the design of sending and receiving sites and lately the definition of transfer rules by local authorities. The consistent and stable use of stimulating tools such as equalisation, compensation and reward-based mechanisms into land use regulatory processes and overall land use control strategy allows actors to be confident in the maintenance of established objectives and regulation integrity (Machemer & Kaplowitz, 2002). The legal foundation of such planning practices into the national/regional legislation system is debated by all authors to be essential for the initial elaboration of markets of development rights. Either in cases from Italy and U.S., the absence of a national - in Italy only the reward-based mechanism was introduced in 2008 into the national legislation, while in U.S. the cases of New Jersey Pinelands and Manheim Township - or regional legislative frameworks has not avoided the use of land development rights with interesting and pioneering experiences.

Social acceptability

All authors argue that social acceptability is a necessary condition to make a step towards the real implementation of urban public policies. The participation of stakeholders, shareholders and, in general terms, citizens, inside the elaboration of public policy has strongly emerged since the 1980s, during the process of shift from government to governance. The promotion by European Initiatives such as Urban and Leader allows participation processes to be soon included into national legislation (and in the Italian one also), especially for urban regeneration - thanks to the Anglo-saxon tradition - social and local urban development policies. The main aim of participation is to enlarge “*the opportunities for citizens to have a say about the issues they care about*” (Stoner, 2006, p.14) and, from the public administrations standpoint, to seek consensus, legitimation and mobilisation as well as problem solving. The inclusion of stakeholders and shareholders in the design process, permits not only the program to fit the specific needs and goals of the area and but also to keep the attention on the implementation phase. Furthermore, the search of socially shared goals with an inclusive approach can have significant effects on public decisions, participants and institutions. Directions resulting from forums generally influence the orientation of public administration, improve the relationships between actors and build a social capital. On the other hand, from participation derives benefits for public authority, reducing its self-reference attitude and enhancing the capacity of public actors/institutions to operate more effectively within a particular opportunity space (Bobbio & Pomatto, 2007). In view of a market of land development rights, the contribution of landowners into the policy elaboration process is determinant. Boscolo (2008) affirms that they should be involved

into the phase of criteria definition for the identification of the categories of urban areas as well as during the attribution of building index by promoting moments of encounter, dialogue, discussion and group sharing. Precisely, the definition and the design of sending and receiving sites should happen through public-private negotiation under conditions of information transparency and public accountability (Camagni, 2011). The allocation of land development rights is strictly connected to the equity distribution of resources, intending land rents and windfall gains. This has had particular emphasis into the Italian context as a consequence of the zoning approach to urban planning. As a result, the introduction of equalisation practice seeks to make land ownership uninfluenced by planning choices thanks to the application of an “*equalised equity*”. This model hypothesizes the homogeneous assignment of all the land rent resulting from the areas designed to city’s transformation, independent of land features. The treatment of the ownerships of land should consider the current and legal status of area in order to classify it and attribute the building index, “*irrespective of the land-use choices of the plan*” (Micelli, 2002, p. 144). Bonuses should be defined by using criteria and methodologies that guarantee the equitable treatment of property (Camagni, 1999b; Stefano Stanghellini, 2010).

Land and property market efficiency

Traditionally, the real interaction between supply and demand determines the market price, and the market balance can be obtained in the case of demand and supply equilibrium. The introduction of a policy option based on a market-based approach can model the demand and supply sides of the housing and land market. In order for a stimulating market tool to be successful, ideally, there would be a large market for the development rights, including many buyers and many sellers, all with a sufficient amount of information regarding the prices and opportunities available to them. The most difficult element for programs to achieve appears to be generating sufficient demand. Low supply of development rights and high demand for bonus development are argued as the conditions to make efficient this operation (Boscolo, 2008; Jacobs, 1997). In general, the most successful programs have been in locations that were experiencing strong development pressure from large cities, such as Washington, DC, in the case of the Montgomery County, Maryland TDR program and the New York City and Philadelphia areas in the case of the Pineland TDR program in New Jersey, and in Italy where the preference has been on programs limited to parts of the urban areas subjected to the city’s transformation. Since this typology of tool is added to existing zoning rules, the supply and demand for land development rights also depends on the profitability of development under existing zoning, and the demand (or lack thereof) for higher density in some areas. Local zoning rules usually set density limits and, therefore, should affect the choice and the design of receiving (large receiving areas) and sending (small sending areas) sites as well as the selection of particular market segments. All authors agree that the knowledge of the existence of rapidly growing areas with high demand and wealthy real estate market must be available information thanks to background studies of development demands and patterns, market dynamics and property structure. Hence, for instance, if sending areas are designed where there are high potential values in develop, few demand for additional land development rights will be generated. Similarly, if additional density can be attained through means other than “non-financial instrument”, the tool may be underused. Few or no alternatives for achieving extra development rights (Kaplowitz et al., 2008; Machemer & Kaplowitz, 2002) should be considered. Machemer and Kaplowitz (2002), Kaplowitz et al. (2008), Micelli (2002, 2011) and Camagni (1999) as well as Van der Veen et al. (2010) recognise that the balance between the land development rights gained and their economic value is the key driver and initiator of such initiatives. In the particular case of the based-reward mechanism, only Micelli (2011) has empirically investigated the feasibility conditions that make the operation economically viable for the owners and developers. Following Micelli, the main condition is about the added value assigned with the extra land development rights. Basically, this has to be greater than or equal to the value of the existing building’s volume. The operational rules to make the program work has to consider three important variables: (1) spatial variation coefficient, in relation to the positional quality of area designed to urban transformation; (2) building value depreciation coefficient, in relation to the building age; (3) the urban density. Summarizing the main findings of the Micelli’s research (2011), it could be affirmed that the bonus density should increase with respect to the growing of building density and quality whereas bonus density should decrease with respect to the land value related to the location. This implies that an efficient implementation should consider the possibility to assign different bonus on the basis of economic criteria. In contrast, the national and regional laws do not provide differences for the attribution of development rights whereas they suggest designating the areas following legal criteria and the zoning approach. In addition, Fuerst (2009) indicates also that higher rents, higher occupancy rates, lower operational costs and a lower risk premium could influence the willingness-to-pay from occupiers and investors and the necessity to consider pay-back period and retrofitting costs in the balance.

Table 6.7.: The integrated conceptual framework

THEMES	ELEMENTS OF SUCCESS	EVIDENCE
LOCAL PLANNING FRAMEWORK	<i>Leadership</i>	Political and institutional awareness of what kind of city building indexes shape. “The visible hand of public administration” (Micelli, 2002) should be involved in pro-active actions finalized to facilitate and encourage the implementation phase (Boscolo, 2008, 2010; Stanghellini, 2010).
	<i>Coherence</i>	Coherence and integration with the objectives and purposes of land-use plan (Bartolini, 2007, 2008; Boscolo, 2008; Camagni, 1999; Janssen-Jansen et al., 2008; Kaplowitz, Machemer, & Pruetz, 2008; Machemer & Kaplowitz, 2002; Micelli, 2002, 2010, 2011; Pruetz & Standridge, 2009; Renard, 2007, 2008; Stanghellini, 2010; van der Veen et al., 2010); (Jacobs, 1997)
	<i>Integration</i>	The integration of market-based and command-and-control tools. “The creation of property rights markets never aims to replace the plan’s traditional implementation tools, but rather to integrate the former to make the latter more efficient.” (Kaplowitz, Machemer, & Pruetz, 2008; Machemer & Kaplowitz, 2002; Micelli, 2002, 2010, 2011; Pruetz & Standridge, 2009)
	<i>Consistency</i>	Correspondences between planning goals, regulations and implementation mechanisms (Kaplowitz, Machemer, & Pruetz, 2008; Machemer & Kaplowitz, 2002; Micelli, 2002, 2010, 2011; Pruetz & Standridge, 2009)
	<i>Stability</i>	Consistent and stable use of programs based on land development property rights into land use regulatory processes (Machemer & Kaplowitz, 2002)
SOCIAL ACCEPTABILITY	<i>Socially shared goals</i>	Involvement of shareholders, stakeholders and citizens (van der Veen et al., 2010)
	<i>Distribution equity</i>	Bonuses are defined by considering the areas with similar characteristics after an appropriate classification in accordance with the current, economic and legal state (Camagni 1999, Micelli, 2002; Stanghellini 2010)
LAND AND PROPERTY MARKET EFFICIENCY	<i>Balance between supply of development rights and bonus development demand</i>	Low supply of development rights and high demand for bonus development (Boscolo 2008; Jacobs 1997). Background studies of the property structure and attention to the design of sending and receiving sites. Preference for programs limited to parts of the urban areas subjected to urban transformation.
	<i>Balance between the right gained and the economic value of the incentive</i>	Few or no alternatives for achieving additional development rights (Kaplowitz, Machemer, & Pruetz, 2008; Machemer & Kaplowitz, 2002)
		Establishment of a market of land development rights (Kaplowitz, Machemer, & Pruetz, 2008; Machemer & Kaplowitz, 2002; Micelli, 2002, 2010, 2011; Pruetz & Standridge, 2009)
ENVIRONMENTAL RELEVANCE	<i>Internal coherence at building scale</i>	Balance between the right gained and the economic value of the incentive ((Kaplowitz, Machemer, & Pruetz, 2008; Machemer & Kaplowitz, 2002; Pruetz & Standridge, 2009; Micelli, 2011, p.143)
		Determination of density bonus and definition of incentive criteria with attention to the land value of receiving sites (Kaplowitz, Machemer, & Pruetz, 2008; Machemer & Kaplowitz, 2002; Micelli, 2002, 2010, 2011; Pruetz & Standridge, 2009; Camagni, 1999)
	<i>Internal coherence at urban scale</i>	Background studies on existing building stock and annual building rate in order to consider the real condition of building market and the energy pressure of existing building due to the maintenance of fabrics and plants, the building age and obsolescence, as well as the construction materials and techniques.
		Background studies on urban density, urban compactness and land-use mix. In addition, close knowledge of the spatial characterisation of local potential energy sources (sun, geothermal, wind, etc.) as well as the sunlight availability.

Source: author’s elaboration

Furthermore, the determination of density bonus and the definition of incentive criteria must keep attention the land value of receiving sites (Camagni, 1999a; Kaplowitz et al., 2008; Machemer & Kaplowitz, 2002; Micelli, 2002, 2010, 2011b; Pruetz & Standridge, 2009) in the case in which the public administration establish a market of land development rights and the transferability of them. As explained in previous sections, equalisation, compensation and reward-based Italian mechanisms differently provide rules for the market and transfer of the land development rights obtained. In absence of case-laws and national indications and in accordance with the regional jurisdiction on planning area, only Venetian

region has introduced a bank of land development rights and rules for their transfer that include this chance also for rights assigned as density bonus. The successful condition of 'TDR bank' is widely considered by authors from the U.S. where several cases have adopted it with different outcomes. In Italy, especially about the practice of assignment of extra land development rights, it is possible only theoretically hypothesise the same, in consideration of the efforts for the achievement of some environmental relevance of this instrument.

Environmental relevance

As discussed in the previous chapters, the nature of energy issues affecting cities has a multiple dimension, from building to urban scale. Although the current models usually tend to consider exclusively buildings as self-defined entities (Ratti et al., 2005) and the effect of urban geometry on energy consumptions still remains understudied and controversial (Alberti, 1999), it is not possible to neglect the existence of a phenomenon that occur at the urban scale. In a context of increasing concerns about the environmental and economic consequences of energy consumption, a growing number studies have concluded that some characteristics of urban morphology, such as urban and population density, the mixed land use and others, affect the energy performance of buildings and travels. Obviously, the energy demand of buildings is dominated by space heating, and it is influenced by construction materials and occupants' behaviour in the use of energy systems and by the effects of urban heat island on the need of space heating and cooling consequent to the winter urban warmth and the summer heat stress (Oke, 1988b), accounting, accordingly with Baker and Steemers (2000) for a 80% variation in energy consumption. In addition, it is necessary noted that the effectiveness of the measures proposed at the local level in planning for a low-carbon built environment cannot ignore the relationships between age and obsolescence of buildings as well as the maintenance of fabrics and plants and their final energy consumption. Inexpensive social rental apartment blocks built between the end of the Second World War and the mid-1970s, according to the functionalist schemes and making use of aged technologies, dominate the existing housing stock and account for the 30% of final energy consumption of Italy (European Commission, 2007, Energy Mix Fact Sheet by Country).

Within this context, background studies on existing building stock and annual building rate in order to consider the real condition of building market and the energy pressure of existing building due to the maintenance of fabrics and plants, the building age and obsolescence, as well as the construction materials and techniques have to be strongly suggested in order to pursue the internal coherence of the instrument at the building scale in comparison with its objectives.

Providing reflections and background studies on the internal coherence at urban scale, urban form affects the energy demand of building and transport sectors and influences the chance to perform energy from renewable resources on site, such as the installation of solar and photovoltaic panels, or to consider alternative technologies of energy supply and distribution at district level.

Three main points can be mentioned as pivotal for evaluate and analyse the connection between energy, land use planning and strategies and tools for managing it. These are the spatial requirements in pursuit of greater energy efficiency and locally energy production. Spatial requirements to reduce the energy demand and support the production from renewable resources and other energy supply and distribution mechanisms have to fully consider factors as compactness, urban density and mixed land-use. According to hypothesis on the influence of urban form on travel, dense and concentrated urban development is more conducive to sustainable mobility than low-density spatial expansion of the urban area (Naess, 2003, 2005; Newman & Kenworthy, 1989; D. Stead & Marshall, 2001). These relationships between urban spatial structures and travel make up an important part of the arguments in favour of the compact city as a sustainable urban form (CEC, 1990; Jenks et al., 1996).

In addition, close knowledge of the spatial characterisation of local potential energy sources (sun, geothermal, wind, etc.) as well as the sunlight availability.

6.5 Recapitulation

This chapter presented firstly the crucial elements in the literature about the relationships between energy and land use, land value and land mobilisation tools. In particular these elements discussed above refer to the identification of the importance of the implications of public goals as energy efficiency and production on the delineation and allocation of rights and values in land development processes. On the other hand, the shift in urban government model clearly emerged from the review of the mainstream planning theory and urban economics theories (neoclassical and welfare economics) and approaches (new institutional economics), greatly influencing the tools at disposal of public and private actors. The reward-based mechanism for energy efficiency retrofit, recently introduced in the Italian national legislation, was

discussed in a broader framework of planning policy implementation tools, especially those non-financial devices that use property rights in land in accordance to more recent practices and planners and economists' positions.

Following Healey (1992), Van der Krabben (1995) and Buitelaar (2002) the neo-classical economics and the welfare economics approaches do not provide the sufficient theoretical background needed to frame and understand the processes of the built environment and its game rules. Hence, Chapter 6 introduced the conceptual model of Tiesdell and Allmendinger (2005) to read the Italian tool chest and elaborate the integrated framework with which analyse and evaluate the use of the reward-based mechanism in the cases selected. The review of the literature gives the work the background on how to identify the potential successful elements, which the integrated analytical framework uses as starting point. The work distinguishes and selected themes and elements that are considered of success in the literature, bearing in mind the policy area (energy-sensitive planning) which the research is referred to. The selection of themes and factors referred to the general objective of the Italian application - greater energy efficiency and generation from renewable sources of existing buildings – and to its current translation in the (the majority of) regional laws and its application into (few) municipal regulations.

CHAPTER 7: Energy goals and land development rights: novel prospects in Italy

7.1 Introduction

Chapter 7 presents the novel introduction into the Italian tool chest of the reward-based mechanism, in particular Section 7.2 illustrates the spread in the Italian regions and provinces as well as the main and more controversial legal and economic aspects related to this instrument. Section 7.3 provides the description of the two case studies, the cities of Trento and Bolzano-Bozen, drawing attention to the implementation and enforcement of national law at the different institutional levels, the provincial scale and the municipal one. Differently in the two cases, the translation of Provincial laws into municipal regulations was carried out, due to the peculiar political situation, only in the city of Trento, whereas Bolzano-Bozen has an on-going discussion between public levels.

7.2 Land management tools innovation in the recent Italian experience with energy goals

The recent introduction into the Italian national legislative framework of incentive system allowing private properties to be extended so as to re-start the economy and promote energy efficiency. According to the conceptual model proposed by Tiesdell and Allmendinger (2005) and here adopted, the Italian novelty in implementing energy efficiency and generation may provide an interesting addition to the Italian local planning toolchest based on land-used mechanisms and other instruments to manage urban development and support the equal distribution of land value.

As discussed in the previous chapter, the reward-based mechanism (*Premialità edilizie*) is a recent planning practice, introduced firstly by some regional planning laws and recently taken into consideration by national legislation system with the 2008 Annual Financial Act (law n°244/2007, art. 1, subsections 258-258) and the 2009 National Housing Plan (*'Piano Casa'*, *Conferenza Stato-Regioni ed Enti Locali*, 31st of March 2009).

Since some years, without a national legislative discipline, a number of Italian regional laws had recognized additional development rights or 'building credits' in order to support private interventions of an urban and environmental kind (public space, services, green areas provision). In 2008 the Annual Financial Act introduced for the first time into the national planning system incentives in the form of additional land development rights.

This provision (article 1, subsection 259) states that:

"so as to encourage the implementation of interventions aimed at the realization of social housing, urban and housing regeneration schemes, improvement of the environmental quality of settlements, the local authority, within its planning instruments, can grant a bonus-increase in buildable volumes..." (author's translation) .

This law permits municipalities to identify, through its planning instruments, these areas to be relinquished to the administration for social-housing construction. In the same areas the assignment of extra land development rights is considered only if the following conditions are met:

- a) the attribution of bonus density is related to the achievement of social housings, urban renewal and building rehabilitation, improvement of the environmental quality of urban areas and energy building retrofitting;
- b) the amount of land development rights rewarded does not have to exceed the density limit defined for the receiving areas.

Thereafter, with the introduction of an extraordinary and temporary (two-year) measure by the National Housing Plan and its subsequent transposition into regional legislations (the regions are committed to approve no later than 90 days own laws), the granting of bonus-rights has been in such a way supported. The legislation introduced by these regional laws will be valid temporally defined, but not exceeding 18 months from their entry into force, unless otherwise determinations of individual regions.

In order to clarify the real entity of the use of this practice, it has to be highlighted that the regional interest is quite recent and with limited experiences. The first region who dealt with it was the Venetian region and, then, Lombardy, Umbria and the Autonomous Province of Trento. At this time, all regions have declined the agreement between the State and the Regions whereas the Autonomous Province of Trento has already prepared a bill to change its planning law in implementing the provisions of the Housing Plan.

Without a national legislative discipline, regional laws worked with autonomy, resulting in different regional legislative disciplines about the same issue. The dissimilar perspective is evident by including a wide range of terminologies used to indicate the same mechanism: in the Venetian region it is called '*credito edilizio*', in Lombardy '*disciplina di incentivazione*', in Umbria '*incrementi premiali*' and '*interventi premiali*', sometimes '*compensazioni*', and, finally, in the Autonomous Province of Trento it is '*compensazione urbanistica*'. Within this context, the main similarity is the

objective of the reward-based mechanism: in all the regions the assignment of an extra land development rights is allowed in cases of urban and environmental rehabilitation/retrofitting activities. In addition, other aims, variously, are included: the realisation of social housing projects (Lombardy, Trento and Puglia), protection and enhancement of historical and artistic heritages (Lombardy and Veneto) and urban historical centres (Umbria), about the energy efficiency and saving (Lombardy), prevention of seismic vulnerability (Umbria) (Boscolo, 2010).

On the other hand, completely divergent is the regional approaches to the regulation for the identification of areas in which the extra land development rights can be used, as well as different are the criteria to define the amount of these extra density bonuses. Concerning the trading issue, again the regional laws have different position, in some cases absolutely contrasting, such as Veneto and the Province of Trento.

Although the name (National Housing Plan) reminds a coordinated system of public actions finalised to private interventions in view of social housing, this is a series of measures aimed at the intervention of private individuals on single private building structures. Hence, the main objective of these provisions was to stimulate private initiatives as a response to the effects of the economic downturn in the building sector, but the instrument introduced is important also for environmental and energy saving purposes. In fact, it is an implementation mechanism for local spatial plans based on the management of land-use rights connected with building refurbishment/demolition including energy efficiency upgrade goals. In particular, in order to upgrade the energy efficiency of the existing housing stock, the reward-based system introduced by the National Housing Plan supports operations concerning refurbishment with extension as well as re-construction and extension of buildings. The focus of these provisions is the residential sector and in particular single-family and small multi-family buildings, with some regional exceptions. In particular, the bonus density can be assign also for non-residential private buildings with the functions of hotel and accommodation facilities in Friuli Venezia Giulia, Sardinia and Aosta Valley, and for industrial buildings in urban and rural areas in the case of Marche and Sardinia (table 7.1).

Table 7.1: The National Housing Plan and the transpositions in regional laws

REGION	FRAMEWORK LAW	REGULATIONS AND INTERPRETATIONS	DEADLINE
<i>ABRUZZO</i>	L. 19.8.2009, n. 16	L. 28.4.2010, n. 10	31.7.2012
<i>BASILICATA</i>	L. 7.8.2009, n. 25	L. 5.2.2010, n. 11 L. 4.8.2011, n. 17, art. 23	31.12.2011
<i>BOLZANO SUDTIROL</i>	L. 11.8.1997 n. 13, artt. 127-128 Dgr 30.6.2008, n. 2299 Dpp 18.10.2007, n. 55 Dpp 25.06.2012, n.939	L. 9.4.2009 n. 1, art. 51 Dgr 15.6.2009 n. 1609 circ. 20.6.2009 Dgp 17.1.2011, n. 37	31.12.2014
<i>CALABRIA</i>	L. 4.8.2010, n. 21	L. 10.2.2012, n. 7	31.12.2014
<i>CAMPANIA</i>	L. 28.12.2009, n. 19	L. 27.1.2012, n. 1 L. 5.1.2011, n. 1 Dgr 12.4.2011, n. 145	11.7.2012
<i>EMILIA-ROMAGNA</i>	L. 6.7.2009, n. 6	circ. 24.7.2009, n. 168408 circ. 18.12.2009, n. 290000	31.12.2010
<i>FRIULI VENEZIA-GIULIA</i>	L. 11.11.2009, n. 19	L. 21.10.2010, n. 17	19.11.2014
<i>LAZIO</i>	L. 11.8.2009, n. 21	Dgr 23.12.2009, n. 985 L. 3.2.2010, n. 1 L. 13.8.2011, n. 10 circ. 30.12.2011, n. 25383 Circ.8/5/2012, n. 18	31.1.2015
<i>LIGURIA</i>	L. 3.11.2009, n. 49	circ. 12.1.2010, n. 1 L. 16.11.2011, n. 33 L. 1.3.2011, n. 4 L. 5.4.2012, n. 9	31.12.2013
<i>LOMBARDY</i>	L. 16.7.2009, n. 13	L. 4.12.2009, n. 27 L. 5.2.2010, n. 7 Dgr 7.8.2009, n. 10134 Dgr 18.8.2009, n. 8554 Dduo 14.10.2009, n. 10411 L. 13.3.2012, n. 4	31/12/2013
<i>MARCHE</i>	L. 8.10.2009, n. 22	L. 22.12.2009, n. 31 L. 21.12.2010, n. 19 Dgr 16.11.2009, n. 1870 Dgr 20.9.2010, n. 1338 L. 23.11.2011, n. 22	31.12.2013
<i>MOLISE</i>	L. 11.12.2009, n. 30	L. 26.1.2012, n. 2 L. 1.2.2011, n. 3	16.12.2013

		L. 9.9.2011, n. 21	
<i>PIEDMONT</i>	L. 14.7.2009, n. 20, artt. 1-7, 13	L. 4.12.2009, n. 30 circ. 21.9.2009, n. 4 L. 2.3.2011, n. 2	31.12.2012
<i>APULIA</i>	L. 30.7.2009, n. 14	L. 25.2.2010, n. 5 L. 13.8.2011, n. 21 L. 20.2.2012, n. 1	31.12.2012
<i>SARDINIA</i>	L. 23.10.2009, n. 4	L. 23.10.2009, n. 4 Dgr 9.3.2010, n. 9/15 Dgr 28.10.2010, n. 35/11 L. 21.11.2011, n. 21 L. 5.1.2011, n. 1 L. 20.4.2011, n. 11	29.11.2012
<i>SICILY</i>	L. 21.3.2010, n. 6	decr. 7.7.2010	25.7.2012
<i>TUSCANY</i>	L. 8.5.2009, n. 24	L. 29.12.2010, n. 65 L. 5.8.2011, n. 40	31.12.2012
<i>TRENTO</i>	L. 3.3.2010, n. 4 art. 15 L. 4.3.2008 n. 1, art. 86	Dgr 25.6.2010, n. 1531 Dgp 26.8.2011, n. 1858 Dgp 1.7.2011, n. 1427	31.12.2012
<i>UMBRIA</i>	L. 26.6.2009, n. 13, artt. 31-38	L. 23.12.2010, n. 27 Dgr 27.7.2009, n. 1063 Dgr 19.10.2009, n. 1454 L. 16.9.2011, n. 8 Dgr 26.7.2011, n. 855 Dgr 26.7.2011, n. 856	30.12.2012
<i>AOSTA VALLEY</i>	L. 4.8.2009 n. 24 L. 17.6.2009 n. 18	L. 30.6.2010, n. 19 Dgr 18.12.2009, n. 3753 L. 1.8.2011, n. 18 Dgr 12.3.2010, n. 634 Dgr 12.3.2010, n. 635	-
<i>VENETO</i>	L. 8.7.2009, n. 14	Dgr 24.8.2009, n. 2499 e n. 2508 Dgr 22.9.2009, n. 2797 L. 8.7.2011, n. 13 circ. 9.11.2011 Dgr 8.11.2011, n. 1781	30.11.2013

Source: adapted from www.confappi.it

Concerning the amount of density bonus, a reward scale is defined which does not fully consider the urban features. Despite the fragmentary and very heterogeneous regional translations, regions have maintained the national requirements for the refurbishment with extension, sometimes modifying and extending the bonus, while for the demolition with replacement they have considered the entire building stock, not only the obsolete one. Generally, for refurbishment with extension, up to 20% of building's existing volume is allowed, whereas for demolition with replacement and extension up to 35% (Table 7.2).

As the table 7.2 shows, in order to obtain extra land development rights, the interventions have to comply with some minimum energy requirements that mainly refer to:

- (i) High-energy standards;
- (ii) Use of renewable energy sources;
- (iii) Bioclimatic design and technologies.

Despite the implementation in the Italian legislation of the European Directives EPBD (Energy Performance of Buildings Directive – 2002/91/EC) and EPBD Recast (2010/31/EC), the assignment of specific jurisdictions and competencies to the regional level by the Italian constitutional law results in the lack of homogeneity on regulations for energy standards and certification. The table 7.3 highlights the regional differences in the minimum energy requirements and, generally, three different main trends emerge regarding the fulfilment of the energy requirements.

Table 7.2: The provisions of the Italian reward-based mechanism

INTERVENTION	BUILDING USE	BUILDING TYPOLOGY	DENSITY BONUS	REQUIREMENTS
<i>REFURBISHMENT WITH EXTENSION</i>	Housing sector (with some regional exceptions)	Generally single-family and small multi-family housing (with some regional exceptions)	Up to 20% of building's existing volume is allowed. Generally, a reward scale connected to the incentive criteria	Energy efficiency requirements

				is defined. Not considering land /urban features	
<i>DEMOLITION WITH REPLACEMENT (and extension)</i>	Housing sector (with some regional exceptions)	Generally single-family and small multi-family housing		Up to 35% of building's existing volume is allowed. Generally, a reward scale connected to the incentive criteria is defined. Not considering land /urban features	Energy efficiency requirements

Source: adapted from Di Piazza F., 2010

With some slight distinctions between the requirements for interventions of refurbishment with extension and demolition with replacement, Campania, Sicily, Umbria and Aosta Valley refer to the definition of techniques and measures to address energy performance in subsequent regional documents. The majority of Italian regions chooses to impose the reduction of energy requirements in comparison with, on the one hand, the Decree No. 192/2005, and on the other hand, the current status of building. Abruzzo, Liguria, Marche, Piedmont, Veneto and the two Autonomous Province of Bolzano-Sudtirolo and Trento define energy requirements in according with own regional (or provincial) laws that elaborate protocols and methodologies for the identification of building energy standards and certifications.

Table 7.3: Energy Requirements

REGION	INTERVENTION	
	REFURBISHMENT WITH EXTENSION	DEMOLITION WITH REPLACEMENT
<i>ABRUZZO</i>	-	Energy Efficiency Class B
<i>BASILICATA</i>	Reduction of energy requirement of 20% for space heating, bioclimatic design and renewable energy technologies	Reduction of energy requirement of 30%
<i>BOLZANO - SUDTIROL</i>	CasaClima C	CasaClima A
<i>CAMPANIA</i>	Construction techniques and measures to address energy performance in according with subsequent regional documents	Construction techniques and measures to address energy performance in according with subsequent regional documents
<i>EMILIA-ROMAGNA</i>	Regional resolution 156/2008	Reduction of energy requirement of 25% compared to the regional resolution 156/2008
<i>FRIULI VENEZIA-GIULIA</i>	-	-
<i>LAZIO</i>	Dlgs 192/2005 and Lr 6/08	Dlgs 192/2005 and Lr 6/08
<i>LIGURIA</i>	Lr 22/07 and Dpr 59/09	Lr 22/07 and Dpr 59/09
<i>LOMBARDY</i>	Reduction of energy requirement of 10% for space heating,	Reduction of energy requirement of 25% compared to the regional law 24/06
<i>MARCHE</i>	Dlgs 192/2005	Protocollo Itaca Marche
<i>MOLISE</i>	Reduction of energy requirement of 20%	-
<i>PIEDMONT</i>	Reduction of energy requirement of 40%	Protocollo Itaca Piemonte
<i>APULIA</i>	Dlgs 192/2005	Lr 13/08
<i>SARDINIA</i>	Dlgs 192/2005	Dlgs 192/2005
<i>SICILY</i>	Reduction of energy requirement of 10%	Bioclimatic design in according with subsequent regional documents
<i>TUSCANY</i>	Reduction of energy requirement of 20% compared to Dlgs 192/2005 for space heating	Reduction of energy requirement of 20% compared to Dlgs 192/2005 for space heating and limit of 30 Kwh/mq/year for space cooling
<i>TRENTO</i>	Energy Efficiency Class B+ Lp 1/2008	Energy Efficiency Class B+ Lp 1/2008
<i>UMBRIA</i>	Improvement of the energy performance of building in according with subsequent regional documents	Energy Efficiency Class B Lr 17/08
<i>AOSTA VALLEY</i>	Maintenance of the energy performance of building	General energy-environmental requirements
<i>VENETO</i>	Renewable energy sources	Lr 4/2007

Source: adapted from Faggiani, 2010

The diversity of these approaches is the effect of contradictions between regions both in the incorporation of European orientation in the energy policy area and in the adoption of national law Dlgs 192/2005. Hence, some regions have not yet legislated for building energy standards and certification.

In addition to the density bonus obtained if these conditions are satisfied, four regions assign extra land development rights in particular circumstances. Liguria and Venetian regions decided for an extra density bonus in case of use of renewable energy, respectively of 10% and 30%. On the other hand, the citizens of Molise can obtain additional land

development rights (+30%) in case of reduction in energy requirements more than 20% and those of Sardinia if the energy performance of building is reduced of 30% compared with DLgs 192/2005.

7.2.1 The economic aspects

From the public economics standpoint, this instrument makes it clear that planning practice can mobilize private resources – without using public money – for interventions that are coherent with the public purposes through the attribution of density bonuses to landowners (Micelli, 2011). The property rights surplus is assigned to the owner as recognition for the production of positive externalities. In other words, the public administration creates an additional property right in order to encourage and compensate private sector in supporting the increased costs due to the improvements of energy, environmental and formal buildings features. Hence, this bonus is related to the greater value of the planned buildings and the additional costs required by their better energy performance. The value of the density bonus is higher in areas of great urban concentration, where the incidence of rent on the overall cost per unit of surface constructed is very high. The additional benefits due to the extra volume must be more than enough to cover the cost of demolition and reconstruction of the building. If the surgery involves re-allocation must also add the cost of new building area.

Success is therefore linked to economic viability and technical feasibility of exploitation of the system of incentives provided. The bonus provided by the new legislation cannot be traded as such, being connected to the property of the building. Owners can take advantage of the bonus, and after the refurbishment and extension can use or sell the improved building (or its extended part), having accomplished the planning goals of general interest (a better urban quality and improved energy efficiency).

It's difficult to give any exact figure on the results because no monitoring process has been carried out. Despite the theoretical efficiency and effectiveness of these mechanisms, an analysis of the outcomes of the measures introduced by the National Housing Plan and the according regional law shows that a limited number of interventions have been made (Di Piazza, 2010).

7.2.2 The legal aspects

In principle, the Italian legal system recognizes, like other European systems, the divisibility of property rights, “*implying that the use of each of those rights can be defined or controlled by specific public decisions and/or planning tools*” (Zanon & Marcinczak, 2011), but a separate application of such rights requires the innovation of traditional practices. The need to pursue equity and efficiency (in regard to diverse goals, energy use included) – in the above-described framework of reduced public powers and financial resources – entails the innovation of planning and urban development, overcoming the consolidate land-use zoning by applying performance control and the use of non-financial incentives. The three practices cited above – equalization, compensation and reward-based mechanisms – provided for by the Italian property regime and planning system, are currently used according to the socio-economic context and the planning objectives.

In this framework, the density bonus may be an important innovation in planning procedures, and it can be applied in synergy with other practices, in particular equalization, although experiments with the bonus-rights scheme are still rare. In regard to density bonuses, uncertainties both in regional and national legislative systems and in practices are due to the novelty of the mechanism and the lack of case-law. What is certainly lacking at present is sufficient clarity firstly on the legitimacy to create the land development rights and transfer those obtained by the reward-based mechanism and secondly on the relationships between regional implementation of the National Housing Plan and the interpretation given by municipalities.

The adoption in Italy of land development rights as implementation tools in the three planning practices is regulated by the role played by land use plans in defining the rights of use of urban land (Bartolini, 2007). According to the Italian legal literature (Bartolini, 2008; Boscolo, 2008), the creation of land development rights to be used as density bonuses is a prerogative of zoning mechanisms. In fact, the provisions of urban plans impose prohibitions, limitations or constraints on urban construction, generating building rights and regulating their transfer. In addition, the urban plan can define additional building rights in terms of reward to owners or developers. The legal nature of *ius aedificandi* is exercised through the land-use plan that has the power to allocate property rights. In abstract, the urban plan constitutes an instrument that shapes the content of the private property rights, in practice, the public authorities attribute the building permit in order to authorize the construction. Whereas the regions and provinces have legislative power defined by the

Constitution Law also in planning policy area, the municipalities can only implement and manage the measures legislated by regions. In other words, the Italian municipalities, which are the land-use planning authorities, manage property rights – together with development rights – as unique instruments to ensure that landowners and developers fulfil certain planning goals within the national and regional laws and regulations. As a result, the extra land development right assigned to owners which have accomplished some planning goals, can only be the result of the planning instrument that shapes the *ius aedificandi* and determines the urban development and growth.

Table 7.4.: The legal aspects of Italian reward-based mechanism

THE REWARD-BASED MECHANISM		
<i>Legislative base</i>	The National Housing Plan provides bonus-rights as rewards but does not determine their generation and the possibility of transferring and marketing them (Bartolini, 2008). Regions can have different legislations.	
<i>Purposes</i>	Bonus-rights for achieving certain public goals. Generally recognized in the case of urban and environmental re-development.	
<i>Legal regime</i>	Generation phase	The power to allocate property rights is exercised through the land-use plan. The development right (buildable volume expressed by the Building Index) is the result of the planning instrument that shapes the <i>ius aedificandi</i> (Bartolini, 2008; Boscolo, 2008)
	Building index	Whereas the Building Index is undifferentiated in respect to the land/ urban features – with the exception of historic centres – it is progressively differentiated, with considerable variations among regions, with respect to the existing building’s volume and the incentive criteria.
	Transferability and trading	No unique position. Significant differences from region to region. Following the Italian legal system, density bonuses are strongly related to the accomplishment of planning goals (the “green” refurbishment or “green” new building). As a result, the transfer of development rights is not possible.

Source: authors’ elaboration based on the literature cited

The precise amount of density bonus to assign is another important consideration. The bonus needs to be valuable enough to offset the cost of refurbishment or demolition without becoming a windfall. In the national law and in the regional interpretations, the determination of the amount of density bonus is undifferentiated in respect to the land and urban features – with the exception of historic centres and areas with pre-existing constraints where a density bonus system is precluded –, whereas the bonus percentage can be progressively differentiated with respect to the existing building’s volume and the additional incentive percentages.

Concerning the land development rights transferability and trading, there are significant differences from region to region, resulting in no one unique position. Some authors and legal practitioners are amenable to considering bonus-rights as autonomous from the land, whereas others stress the difficulty of implementing such a provision because the development right is considered strongly related to the accomplishment of planning goals and, therefore, to the specific plot of zoned land. Following the Italian legal system, since density bonuses are strongly related to the accomplishment of planning goals (the “green” refurbishment or “green” new building), the transfer of development rights should not be possible. Theoretically, the bonus provided by the new legislation cannot be traded as such, being connected to the property of the building. Owners can take advantage of the bonus, and after the refurbishment and extension can use or sell the improved building (or its extended part), having accomplished the planning goals of general interest (a better urban quality and improved energy efficiency).

However, the uncertain nature of bonus-rights in Italy has not prevented interesting experimentation: the Veneto Region has approved a law defining a ‘TDR bank’, thereby creating a development rights market. In other countries there is no strict physical demarcation in the use of property rights, and bonus-rights are quite often used because they can be transferred and marketed.

The implementations of the National Housing Plan given by regions mainly highlight three different intentions:

- The National Housing Plan in support to urban plan and programme (among others the case of Lombardy region);
- The National Housing Plan to modify the urban planning law (the case of the Autonomous Province of Trento);
- Aggravation of the anti-cyclical feature of the measure (among others the case of Aosta Valley).

Generally, the regional legislations have been more constraining than the national one, limiting the space for local actions due, in part, to the lack of general strategies. Within this context, the measures legislated at the regional level become a normative model that can/should be implemented with a regulatory model at the local scale. Hence, the exact structure of a density bonus system can vary, depending on how the municipality handles density in its zoning and building code. Basilicata, Emilia-Romagna, Lazio, Liguria, Lombardy, Piedmont, Puglia, Umbria and Veneto regions have decided a deadline for the translation of the regional text by means of municipal deliberations. However, although some regions and municipals have together elaborated the systems, may exist two parallel density bonus incentive models not coherent

in growth and development. In addition, the majority of regional models permits exception to development standards of the local planning instruments, in order to simplify and boost the private interventions. Also in the case in which these two systems are homogeneous, they are not cumulative but exist at the same time and are subjected to a choice by the citizens.

7.3 Two Italian cases: the cities of Trento and Bolzano

The cases of the cities of Trento and Bolzano-Bozen require a short introduction on the provincial policies, because the Autonomous Provinces of Trento and Bolzano-Bozen have a strong legal status and considerable financial resources. Trentino-Alto Adige has residual competencies and the autonomous provinces of Bolzano and Trento have important competencies in energy efficiency and production and spatial planning policy area in addition to financial resources, around 2 ½ to 3 times as much as those of the Veneto region on a per capita basis (table 7.5). Municipalities have similar competencies and resources than in the other Italian regions, but Bolzano and Trento have generally more money per capita.

Table 7.5: Budget 2011 (Expenditures)

MUNICIPALITY	ADMINISTRATION BUDGET 2011 [euro]	POPULATION (2010)	PUBLIC EXPENDITURE FOR INHABITANTS [euro]
<i>BOLZANO - BOZEN</i>	273413003,54	104029	2628,24
<i>TRENTO</i>	324043169,28	116298	2736,3

Source: administrations' budget documents

The Autonomous Province of Trento, with the provincial law n. 14/1980, approved a series of measures to promote energy conservation and use of alternative sources of energy. The law has undergone numerous changes over time (the last one in 2009) but it remains one of the most important measures in the energy sector in the province.

There are also those that, on the basis of Law 14/1980 have regulated the provision of grants and incentives for energy efficiency and use of renewable sources of energy (for 2009 see DGP April 9, 2009, n.908). In particular, the provincial law on urban development and territorial government (Lp March 4, 2008, n.1) laid the foundations for the discipline of sustainable construction. With the decree of the President of the Province July 13, 2009, n.11-13/Leg has been regulated the energy certification of buildings. The new rules started on 1 November 2009 and then fully considered in the provincial planning law March 4, 2008, n.1.

With regard to energy-conscious spatial planning, Provincial Environmental Energy Plan was adopted by resolution of the October 3, 2003, n. 2438, which sets out the actions of the Province for the reduction of emissions and the use of renewable sources of energy. The verification of the results achieved at December 31, 2008 and an update of the objectives of Pear until it expires in 2012 have been approved by resolution of the provincial July 16, 2010, n.1645.

Of significant interest is the recent Lp March 9, 2010, n.5, which outlines strategies and actions of the Province in the medium and long term to address climate change, with a programmatic action aimed at significant reduction in greenhouse gases by 2050 and energy self-sufficient province.

In 2011 the Province of Trento introduced a reward-based mechanism into its legislative system as a result of the quoted National Housing Plan (2009), providing additional development rights to incentive the building sector. The extraordinary and temporary (two-years) measure is focused on new construction, refurbishing and demolition and reconstruction practices that reach an energy efficiency standard (Energy Class A, A+ and B+, in the provincial protocol) higher than the mandatory one (Energy Class C). The assignment and the amount of density bonuses depends on the class level, with the maximum incentive of 17,5% of existing building's volume.

The Autonomous Province of Bolzano-Bozen promotes the development of renewable energy through two incentive instruments: the Provincial Laws 19 February 1993, n.4 and 13 February 1997, n.4. The two laws, amended several times over the years, are the two key disciplines in aid for the development of the renewable energy sector, the first reserved for individuals, the second to businesses. The law of 19 February 2010, n.9 repealed the Lp 4/1993, providing new criteria with which the Province will pay the contributions. The law came into force on 18 August 2010. The provincial planning law (Lp August 11, 1997, n.13) dictated the rules on energy savings in buildings. The implementation of the law has occurred with the Regulation approved by Decree of the President of the Province in September 29, 2004, n.34, by the Province of Bolzano, the first institution to adopt a law on energy certification of buildings. The code, amended several times over the years, is the key regulation on certification. Other provisions have introduced special rules for new buildings (PGD June 30, 2008, n.2299), the retrofit of buildings with extension (PGD June 15, 2009, n.1609), as well as

provisions for the energy certificate for apartments (DGP July 27, 2009, n.1969). CasaClima is the method of energy certification of buildings presented in 2002 in compliance with the EEC Directive 2002/91/EC, which, as a result of the Kyoto Protocol, is the issue of energy certification of buildings. The Province of Bolzano-Bozen with DPGP 29/09/2004, n.34 determined that all new buildings built in the province, from 12.01.2005 should comply with at least the energy class C. As of today there are many municipalities that are self-regulating and requiring the class B. CasaClima-KlimaHaus Agency is a public independent certifiers, accredited in 2005 as a certifying agency of the Province of Bolzano. Concerning the use of renewable energy at the provincial scale, the Provincial Energy Plan for the use of renewable sources, was approved by the Provincial Council n. 7080 of 22 December 1997.

With the provincial law April 9, 2009 n. 1 amended Article 127 of the Provincial Planning Law August 11, 1997, n. 13 in order to support efforts to revive the economy and to introduce strong measures of procedural simplification in construction. A simplified bonus density system was introduced, reviewed in 2011.

In addition to the competencies on energy efficiency and saving, building standards and certifications, spatial planning competencies reside with the provincial administrations as far as legislation and development policies are concerned, whilst the cities maintain land-use competencies. Although the two provinces have both a similar legal status, there are growing differences in how the competences are managed over the last decades. However, both the provinces have been aimed at a careful management of their natural and territorial resources; they have promoted and encouraged a development that considers own territory as a strength departure point. Whereas Bolzano has developed a territorial model that supports the distinctive features of own cultural and ethnic identity, protecting the traditional agricultural activities and the mountain settlements without a real spatial plan (LEROP, 1995), the province of Trento, with the provincial Plan (*Piano Urbanistico Provinciale*, PUP, 2008) recently approved, reflects on many European discourses, in particular sustainability, subsidiarity, competitiveness, and territorial cooperation defining a number of aspects and contains in land-use terms (Zanon, 2013). This model of territorial governance, between federalism and subsidiarity, has also characterised the approach to environmental and energy matters of the two provinces, towards on-going conservation strategies and local innovation.

The institutional relationships between the two cities and the provinces are complex. Concerning the issues about energy efficiency, renewable resources and spatial planning, provinces are playing a leading role in the national context, financially and methodologically encouraging Trento and Bolzano to innovate own planning instruments and develop energy-sensitive city visions.

Climate Alliance member since 1994, in 2002 the municipality of Bolzano, in accordance with provincial laws, introduced in the building code the legal requirements of energy building certification CasaClima, in particular, it becomes necessary the energy efficiency class C to obtain the permission to build. Subsequently, in 2007, the building case was reviewed and the energy efficiency certification class B and installation of solar and photovoltaic technologies have been imposed.

Table 7.6: City Profiles

	BOLZANO - BOZEN	TRENTO
<i>POPULATION</i>	104029	116298
<i>MUNICIPAL AREA [km²]</i>	52,34	157,9
<i>POPULATION DENSITY [pop/km²]</i>	1987,56	729,85
<i>NATURAL GAS CONSUMPTION [mc/pop]</i>	658,9	630,4
<i>ELECTRICITY CONSUMPTION [kWh/pop]</i>	1094,5	944,1
<i>VOLUME OF DISTRICT HEATING SYSTEM [mc/inhab]</i>	11,5	00,00
<i>SOLAR PANELS [msq/1000inhab]</i>	2,4	4,6
<i>PHOTOVOLTAIC PANELS ON MUNICIPAL BUILDINGS [kWh/1000inhab]</i>	1,5	0,6

Source: municipal statistical departments, ENEA, Legambiente, Ecosistema Urbano (data 2010)

At the same time, the city of Bolzano, it proposed to carry out a process of urban planning towards greater energy and environmental sustainability using their intrinsic characteristics of compact and high-density cities. Through a season of planning by project, are promoted binding standards of environmental excellence (energy efficiency class A) creating, on the one hand, new parts of the city, and, on the other hand, redeveloping the urban periphery. Important examples are the sustainable districts Casanova and Firmian in south of Bolzano, which acted as a flywheel of the Strategic Development Plan of the city of Bolzano in 2004, which identifies the environmental objective of qualifying in the excellence of the future of the city. Also in 2009, the city signed the Covenant of Mayors that, in the intention of the administration, should propose strategies related to the objectives of the Strategic Development Plan. This includes the creation of an excellence

environmental economy, development and redevelopment of the area to improve the liveability and the adoption of sustainable mobility. In addition, the Strategic Development Plan expects that all the existing building stock of the city of Bolzano must be retrofitted to achieve the standard Casaclima B for private buildings and Casaclima A for public ones. This initiative is synergistic to the official statement of Bolzano as Alpine Town of the Year for 2009.

In 2010, the city of Bolzano has innovated its planning by focusing on a selected number of development (mostly re-development) projects, experimenting with strategic planning and defining a 'Master Plan', a framework within which more focused activities are developed. The Master Plan identifies a key strategy in the energy dimension of the plan that requires not only technical but also financial actions, which know how to act through the reduction of all consumption.

In 2009, the municipality launched the plan 'Towards a CO2 Neutral city', setting itself the target of Achieving CO2 neutrality by 2030. A thorough comprehensive study has analysed the total amount of CO2 emissions in the city, Proposing new Measures for Reducing them to a minimum; These principally regard the sector of buildings and Their related infrastructure.

With a process started in 1995 and concluded during the 1999, the municipality of Trento and in particular the City Department of Environment approached the constraints related to the development of a municipal energy plan. With the support of above-mentioned Ambiente Italia Research Institute, and in accordance with its protocol, an analysis of historical data (1995-1998) of energy flows in the municipal territory and an action plan with measures on energy supply and use were developed. Beyond the validity of the proposed public action, the problem was an incomplete procedural path. Approval and adoption phases were lack. In 2006, it was decided the revival of energy management and planning and, as a consequent, in the two followed years the city of Trento, always supported by Ambiente Italia Research Institute, started a participatory process finalised to identified shared key areas in which focalise the action. The plan, called Participatory Energy Plan Trento x Kyoto ("*Piano energetico partecipato Trento x Kyoto*") was approved in 2008. In recent years, the city of Trento has developed an important strategic planning process in parallel with revision of its land-use plan. This has involved the analysis and selection of development strategies in accordance with the suburbanization feature of the city, although decisions have not been well connected to the legal framework of the land-use plan and other administrative programmes. A key role has the participation in a number of agencies and companies which are in part the heritage of initiatives in the field of energy, water services, economic activities, and in part the result of the privatization process. The city of Trento in 2007 approved a Sustainable Building Regulation (*Regolamento per l'Edilizia Sostenibile*, currently under review), which is a permanent instrument that provides, when specific standards are met, a density bonus and some economic incentives. The main actor of this initiative was the City Department of Buildings, on the push of a motivated civil servant, with little interactions with the Department for the Environment, responsible for the development of the municipal energy plan, and the Urban Planning Department, responsible for urban planning.

7.3.1 The Piano Casa into the provincial laws

Trento

It's not a real implementation of the National Housing Plan that was launched by the Province of Trento with the Provincial Law March 3, 2010, n. 4. In fact, the Province, alone among local authorities, had not decided to join the agreement between State-Regions on the National Housing Plan signed on 1 April 2009, claiming to be sufficient the different rules on construction already in force in the Province.

The Provincial Law 4/2010 art.15 (as amended by Law 18/2011) amending the Provincial Planning Law 1/2008 of art.86 introduces extraordinary measures to the retrofit and rehabilitation of existing buildings. Then the resolution of the Provincial Government No. 1531 of 25 June 2010, as amended by resolutions No. 1427 of July 1, 2011 and No. 1858 of 26 August 2011, determining the density bonus, aimed at encouraging the use of sustainable construction techniques. Were introduced minimum standards for the deduction from the building indexes under urban planning instruments as well as density bonuses for buildings with levels of energy performance above those required.

The provisions are intended to allow the immediate implementation of incentive measures waiting for the approval by local authorities of any more favourable measures.

The final date for the submission of applications was the March 5, 2011, was first moved to December 31, 2011 (PGD June 25, 2010, n. 1531) extended until 31 December 2012 (DGP August 26, 2011, n. 1858). The projects will be approved by the provincial government and published on the Bur.

The facilities provided are also counted in addition to any increases in building indexes already under urban planning instruments and building code for different situations from that considered here. In addition, the facilities provided shall also apply to buildings in compliance with the energy standard required.

SUMMARY BOX 7.1:

THE AUTONOMOUS PROVINCE OF TRENTO'S IMPLEMENTATION OF NATIONAL HOUSING PLAN

FRAMEWORK LAW:

L. 1/2008 art.86, L. 4/2010 art.15, DgP 1531/2010, DgP 1858/2011, DgP 1427/2011

DEADLINE:

31.12.2012

PROVINCIAL MEASURE OBJECT:

All buildings, not just housing. The incentives are also applied to buildings in compliance with the energy performance required.

URBAN AREAS AND BUILDING TYPES NOT INCLUDED IN THE PROVINCIAL MEASURE:

building subjected to planning constraints on historical settlements, environmental and cultural heritage, mountain building or incompatible with the standards of material risk and hazard established by the general plan for the use of public waters and the provincial development plan

NEW BUILDINGS AND BUILDING REHABILITATION WITH EXTENSION

Bonus density system: the bonus density percentage is in accordance with the existing building's volume and the energy efficiency classes A+, A e B+. The additional density ranges between del 3% (energy efficiency class B+ 1500-4000 mc) and 20% (energy efficiency class A+ <500 mc)

Energy Efficiency Class	< 500 mc	500-1500 mc	1500-4000 mc
B+	7%	5%	3%
A	14%	10%	7%
A+	20%	15%	10%

Energy performance requirements: minimum energy efficiency class B+

Planning constraints: for interventions in accordance with the highest building index provided by the existing planning instruments, an alternative to the increase in volume is expected to require the reduction of the planning fee in an amount equal to the sum due for the volumetric incentive

Building constraints: the deduction of the index construction of the perimeter walls of buildings, floors and other structural elements aimed at improving energy performance is guarantee. In the case of new buildings such work shall be counted for the determination of the distance, but not in determining height

DEMOLITION WITH REPLACEMENT AND EXTENSION

Bonus density system: the bonus density percentage is in accordance with the existing building's volume and the energy efficiency classes A+, A e B+. The additional density ranges between del 5% (energy efficiency class B+ 1500-4000 mc) and 25% (energy efficiency class A+ <500 mc)

Energy Efficiency Class	< 500 mc	500-1500 mc	1500-4000 mc
B+	8%	7%	5%
A	17%	13%	10%
A+	25%	20%	15%

Energy performance requirements: minimum energy efficiency class B+

Planning constraints: for interventions in accordance with the highest building index provided by the existing planning instruments, an alternative to the increase in volume is expected to require the reduction of the planning fee in an amount equal to the sum due for the volumetric incentive

Building constraints: the deduction of the index construction of the perimeter walls of buildings, floors and other structural elements aimed at improving energy performance is guarantee.

SOCIAL HOUSING:

Increase up to 25% of the existing building's volume for interventions of demolition with replacement aimed at social housing. Interventions must regard residential buildings with at least 15 years, which do not fall in the historical settlements or between the cultural and / or environmental. The increase in volume under that provincial provision is an alternative and can not be combined with any density bonus already provided by the local land-use plan.

ADMINISTRATIVE PROCEDURE AND PLANNING FEE:

Those owners and developers must submit the appropriate application within 12 months after entry into force of the law to the appropriate provincial office. These offices shall send a copy of the project to the municipality in which the intervention is planned for the expression of its opinion. The contribution of construction is commensurate to the volume incentives.

AUTONOMY FOR MUNICIPALITIES:

the facilities provided shall apply in exception to the provisions of the planning instruments and municipal regulations in force, if they are more favourable, subject to compliance with the minimum distances. In any case, the volumetric incentive shall also be assigned in addition to any increases in building indexes already under instruments of urban and municipal building regulations for different situations. The municipalities are free to adopt any measures more favourable.

SUMMARY BOX 7.2:

THE AUTONOMOUS PROVINCE OF BOLZANO'S IMPLEMENTATION OF NATIONAL HOUSING PLAN

FRAMEWORK LAW:

L. 13/1997 art.127-128, Dgr 2299/2008, Dpp 55/2007, L. 1/2009 art.51, Dgp 37/2011, L. 4/2012, Resolution n.939 del 25/06/2012 art.11

DEADLINE:

New building (31.12.2014 and 31.12.2019)

Building rehabilitation with extension: 31.12.2019

PROVINCIAL MEASURE OBJECT:

Existent buildings on January 12, 2005, which has at least 300 cubic meters whose at least half with residential use.

URBAN AREAS AND BUILDING TYPES NOT INCLUDED IN THE PROVINCIAL MEASURE:

Are expressly not included in the provincial measure only forest, alpine pastureland and productive areas. Actions are possible even in historical centres (zone A) and buildings with historical, artistic and landscape constraints, but with the same protections and permissions required by provincial laws. The extension of buildings subject to the protection of cultural heritage or landscape can only be approved in accordance with the complying opinion of the competent authority. For buildings located in areas subject to "tutela degli insiemi" or in zones A (Old Town) are to observe the special characteristics that gave rise to such protection and destination.

NEW BUILDINGS

Bonus density system

Within 31.12.2014

Energy Efficiency ClimaCasa B nature: +10%

Energy Efficiency ClimaCasa A: +10%

Energy Efficiency ClimaCasa A nature: + 15%

Within 31.12.2019

Energy Efficiency ClimaCasa A nature: +10%

BUILDING REHABILITATION WITH EXTENSION

Bonus density system: it can be authorized a bonus up to 200 mc in case of rehabilitation of existing building. In residential areas, it can be authorized an extension of no more than 20% if this determines new autonomous dwellings.

Energy efficiency and production requirements: is required for the whole building the energy efficiency class CasaClima C, that provides for new buildings

Planning constraints: in principle it is not possible to realize autonomous dwellings. Now this is possible and the local planning authorities can define, in case of extension in residential area, city areas in which a new detailed plan or the refinement of existing detailed plan is necessary.

Building constraints: May be waived in the limits of volume and height of buildings in compliance with all other provisions established by the provincial planning law, regulations and instruments of urban planning. The permissible height of the existing building may be exceeded up to 1 meter. In the absence of specifications by the way, should be retained the legal distances between buildings and roads, railways and the minimum provision of parking areas.

The attics are recognized as existing airspace if they are recovered for residential purposes. The relative contribution to the building permit as regulated by municipal regulation is also due to parts of buildings made habitable.

In the case of building extension up to 20% in residential areas, is allowed an exception to the building height up to 3 meters without having to formulate an implementation plan. If you exceed the 3 meters is necessary to develop a detailed plan.

DEMOLITION WITH REPLACEMENT AND EXTENSION:

Would be excluded, with the exception of extensions that provide for partial demolition and reconstruction, in the case these involve more than half of its volume. However, a previous resolution (no. 2299 of 30 June 2008, as last amended by resolution no. 1233/2009) already took care of volumetric gains both for new construction as well as demolition and reconstruction of residential and non-residential property. Are involved all the buildings that had not received the license for the use on 30 June 2008, in case they have certain energy requirements.

With the resolution of Provincial authority n.939/2012, the demolition with replacement and extension would seem allowed. The bonus density would be authorised only if the "new building" is in compliance with the energy efficiency class CasaClima A.

Bonus density system: up to 20% if in residential areas, up to 200 mc in the other ones

SOCIAL HOUSING

The extra land development rights is covered by a construction agreement between the local authority and owner/developer to maintain the price lower ('*regime dell'edilizia convenzionata*', art.79 provincial planning law)

ADMINISTRATIVE PROCEDURE AND PLANNING FEE

It is necessary, however, the request of a building permit. Law no. 1/2009 provided that the Provincial Government, in consultation with the council of local municipalities, would establish the exemption for the extra density of the construction cost and the reduction of the related infrastructure costs, but this provision was not included in resolution applications (resolution of 15 June 2009, n. 1609).

AUTONOMY FOR MUNICIPALITIES

Municipal councils, within 18 months of entry into force of these guidelines, can determine the areas in which the development of a detailed plan or the alteration of existing implementation plan is necessary. In addition, the city council can determine areas in which the assignment of extra land development rights is not allowed.

The Province of Bolzano, thanks to its exclusive jurisdiction on the territory, decided a very limited and strict compliance with energy standards State-Regions Agreement of 1 April 2009 on the National Housing Plan.

With the provincial law April 9, 2009 n. 1 amended Article 127 of the Provincial Planning Law August 11, 1997, n. 13 in order to support efforts to revive the economy and to introduce strong measures of procedural simplification in

construction. The implementation of the framework, however, has been delegated to the provincial government, which laid down the rules by resolution of 16 June 2009, n. 1609.

The operation was initially scheduled for the years 2009 and 2010, but the Lp January 22, 2010, n. 2, did not provide deadline to the application of the measure.

With Resolution no. 37 of the Provincial Council of Bolzano on 17 January 2011, was updated the decision of the Provincial Council n. 1609 of 15.06.2009, introducing important news for uninhabited attics. At that time, these were not taken into account in the definition of building volume. The new version of the resolution, art. 7, paragraph f, indicates that the attics, but so far no existing legally counted as airspace, are recognized as existing if they are recovered for residential purposes. The relative contribution to the building permit is also due to parts of buildings made habitable. This decision appears to be important from the urban point of view, increasing the availability of existing volume for the density bonus assignment of 200 cubic meters, which is in addition to all the cubic space that is not in fact urbanistically recognized. As regards the infrastructure costs, they must be calculated for the whole portion of volume made habitable.

The Provincial Law of 06.21.2011 No. 4, article 9, paragraph 4 reintroduces, in a manner not entirely clear, the extension of "*no more than 20% of existing space requirements and at up to 200 meters cubes, as long as the entire building is at least equal to the standard CasaClima C or, in the case of demolition and reconstruction, the standard CasaClima A*)" (author's translation).

With the decision of the provincial government n.939 of 25.6.2012 and its article n.11, called "*Density bonus incentive scheme*", the Province of Bolzano has made any significant changes to the measures concerning the promotion of greater energy efficiency and production from renewable energy through the density bonus for new buildings, rehabilitation and retrofitting, demolition with reconstruction and expansion. The greatest news is the introduction of bonus for new buildings and demolitions with reconstruction. The deadline for the application is different for each type of intervention.

With this provincial decision, the provincial decisions 1609/2009 (energy building rehabilitation with bonus density), 2299/2008 (energy building standards and certification), 1969/2009 (energy building standards and certification for dwellings), and 2545/2004 are repealed. These guidelines come into force after the end of the relevant notification procedure in accordance with Articles 8 and 9 of Directive 98/34/EC of the European Parliament and of the Council of 22 June 2008. Until the entry into force following the closure of the correct procedure, the above-mentioned decrees of the President of the Province remain in force.

7.3.2 The translation into municipal regulations

Trento

The city of Trento in 2007 - two years before the provisions of the national law (*Piano Casa*) - approved a Sustainable Buildings Regulation (*Regolamento per l'Edilizia Sostenibile*, currently under review), which is a permanent instrument that provides, when specific standards are met, a density bonus and some economic incentives. This instrument is a supplementary planning guidance on energy efficiency design for new buildings, defining a more coherent document than the usual building code, but giving it an 'exceptional character'.

The scope, methods and criteria for the assessment of building sustainability are different from the usual building labels - such as those of Protocollo ITACA (a methodology proposed by the association of the Italian regions) and KlimaHaus Nature (the protocol of the Province of Bolzano-Bozen), and is more similar to the LEED protocol (LEED for Home Program). The main actor of this initiative was the Department of Buildings (*Servizio Edilizia Privata*), following the clear vision of a civil servant, with little interactions with the Department for the Environment, responsible for the development of the municipal energy plan, and the Urban Planning Department, responsible for urban planning.

The regulation implies a voluntary assessment scheme, taking into consideration a wide range of environmental issues (site quality, efficient use of materials, use of environmentally friendly materials, construction waste reduction, indoor air quality improvement) and energy efficiency, in particular as far as the building envelope and heating and cooling design are concerned. The attainment of different degrees of sustainability allows getting progressive in-kind incentives, in terms of building rights, and deductions of urban development charges. Applicants can choose, instead of the density bonus, a partial development charge exemption or they can decide to cumulate both.

In compliance with the Sustainable Buildings Regulation, the municipality of Trento assigns, a small amount of additional development rights, up to 10% with the achievement of total score.

In addition to these considerations, the allocation criteria of bonus density do not consider in the provisions of the municipality of Trento, urban features such as building density, urban compactness, the availability of sunlight and the

presence of renewable sources of energy. The effects in terms of urban reorganization and densification are not yet measurable and in any case do not seem to have been considered.

A conflict can arise with the incentives provided by the Province, which introduced, following the national law, the bonuses for the rehabilitation of existing buildings with a focus exclusively on the energy performance of buildings.

SUMMARY BOX 7.3: THE MUNICIPALITY OF TRENTO

MUNICIPAL REGULATION:

Regolamento per l'Edilizia Sostenibile – Sustainable Buildings Regulation (2007)

DEADLINE:

-

MUNICIPAL REGULATION OBJECT:

Residential and tertiary new and rehabilitated buildings

URBAN AREAS AND BUILDING TYPES NOT INCLUDED IN THE MUNICIPAL REGULATION:

Hotels can require only the deduction of planning fees

NEW BUILDINGS AND BUILDING REHABILITATION WITH EXTENSION

Bonus density system: voluntary assessment scheme that takes into consideration a wide range of environmental issues (site quality, efficient use of materials, use of environmentally friendly materials, construction waste reduction, indoor air quality improvement) and energy efficiency, in particular as far as the building envelope and heating and cooling design are concerned. Some actions increase their effectiveness if coordinated and integrated and allow owners and developers to achieve higher score. The attainment of different degrees of sustainability allows getting progressive in-kind incentives, in terms of building rights, and deductions of planning fees. The assignment of extra land development rights can be cumulated with the deduction of planning fees.

The system is organised on six different axis with mandatory and recommended actions:

Axis 1: environmental integration and preparatory requirements

Axis 2: building energy performance

Axis 3: building construction techniques and materials

Axis 4: comfort and reduction of indoor pollution

Axis 5: social values

Axis 6: coordinated actions

SCORE	PERCENTAGE OF PLANNING FEES TO BE PAID	BONUS DENSITY
50-99	15%	-
100-149	14%	-
150-174	13%	-
175-199	12%	-
200-224	11%	-
225-249	10%	-
250-274	9%	-
275-299	8%	-
300-319	7%	1%
320-339	6%	2%
340-359	5%	3%
360-379	5%	4%
380-399	5%	5%
400-414	5%	6%
415-429	5%	7%
430-444	5%	8%
445-459	5%	9%
> 460	5%	10%

Energy performance requirements: energy efficiency class B

Planning constraints: -

Building constraints: -

SOCIAL HOUSING:

The density bonus provided by the municipality can be combined with the provincial measure on social housing: Increase up to 25% of the existing building's volume for interventions of demolition with replacement aimed at social housing. Interventions must regard residential buildings with at least 15 years, which do not fall in the historical settlements or between the cultural and / or environmental. The increase in volume under that provincial provision is an alternative and can not be combined with any density bonus already provided by the local land-use plan.

ADMINISTRATIVE PROCEDURE AND PLANNING FEE:

The owner or developer must submit an application for the assignment of incentives together with environmental sustainability project accompanied by adequate technical annexes. In the event that the intervention is subject to authorization by the municipality, the application for the award of incentives volumetric and / or economic must be submitted together and is examined in conjunction. The administration can carry out checks on the correct execution of the works in relation to sustainability project approved, according to the forms and procedures prescribed by law.

These are more convenient than those of the municipal regulation (going up to 17.5% of the existing volume), influencing the internal and external coherence of municipal voluntary assessment scheme. As a result, about a 10% of the projects that in 2011 joined the voluntary building regulation of the municipality of Trento, decided to choose the provincial reward-based system and the others (around 100 projects) preferred the development charge reduction rather than the additional development rights. The assignment of additional development rights is not in relation with the building age and obsolescence and do not consider urban or district scale regeneration interventions.

Moreover, after the revision of the local urban plan, the determination of building volume does not take into consideration the wall thickness, with a difference up to 30% in relation to the gross volume, and this is currently applied to the definition of the municipal density bonus system. Differently, the provincial measure does not deduct the depth of external walls in the calculation of existing building's volume to which assign the extra land development rights. This results in a significant difference between the two approaches.

Bolzano-Bozen

In 2010, the municipality of Bolzano with the definition of 'Master Plan' proposed, in a preliminary study, the use of volumetric incentives in order to rehabilitate the existing buildings, by adding a storey and putting on the market the extra volume in order to finance the energy retrofitting. The measurement provided specific guarantees: by the municipality, issuing the building permit, by CasaClima Agency, which, in South Tyrol, is the only authorized to certify the protocol of calculation and control of the entire process (design, construction, building). In the absence of correspondence between project and building the municipality do not issue the warranty of habitability.

The assignment of additional land development rights was suggested differently in the case of building rehabilitation with energy efficiency Class C and Class B, 15% and 20% respectively.

For the restoration of historic buildings, which are in the care of the regional board of the ministry of cultural heritage and environmental conservation, it was suggested, since every physical alteration are forbidden, to obtain the extra volume virtually, and to market it through the activation of a bank of development rights. The land development rights would be sold exclusively through the local bureaus to those who build new buildings or demolition with reconstruction in areas of urban transformation.

According to experts consulted by the municipality of Bolzano, the incentive system would have been structured as cost-effective, given the property values of Bolzano (2900-6000 euro / sqm), even in areas of less value.

The opportunity to change the rules seemed apparently the local implementation of the National Housing Plan introduced by the national government and the drafting of the new PUC. These conditions seemed ideal for creating legal and regulatory instruments. However, from that moment, the implementation of the National Housing Plan into the provincial legislation system has continuously been in progress, as the discussion of the provincial decrees, resolutions and regulations highlighted. In addition, the peculiar Italian situation in the division of powers between different institutional levels gives the exclusive jurisdiction on planning matter to Provincial authority. In other words, the incentive scheme determined by the Province can be always applied, despite other municipal regulations into force. As a result, only in the case of more favourable municipal measures the local action takes on a significant meaning.

In this perspective, the city of Bolzano has not already approved any measures to locally develop the provincial implementation of the National Housing Plan, on the other hand, it has exclusively permitted the actuation of 20 cases of density bonuses of about 200 m³.

CHAPTER 8: Analysis of two Italian local cases: Trento and Bolzano-Bozen

8.1 Introduction

This chapter has two main objectives. The first one is to apply the analytical model developed in Chapter 6 to the two Italian local cases: Trento and Bolzano-Bozen discussing the more recurring elements of success highlighted in the literature. The second and subsequent objective consists in the comparison of the results in the two cities and identifies the main shortcomings and limitations that affect current implementation in the identified topic. The impacts of each element on each municipal reward-based system is qualitatively evaluated and presented by tables.

This chapter is structured as follows: Section 8.2 deals with the results from case studies, namely illustrates the main evidences in relation to the four key-themes identified in the analytical model: local planning framework, social acceptability, land and property market efficiency and environmental relevance. Section 8.3 compares evidences from Trento and Bolzano-Bozen case studies, presenting both from the provincial and the municipal sides.

8.2 Results from case studies

The results of this analysis are summarized in Table 8.7. A detailed discussion of the data and analysis underlying Table 8.7 will be forgone in light of the following in-depth discussion of the application of the integrative conceptual framework. More information on the particulars concerning the detailed case studies can be found in the previous chapter. This section focuses on the use of proffered analytical model (Table 6.7) and results of a systematic analysis of two based-reward mechanisms of the city of Trento and Bolzano-Bozen.

Leadership

The peculiar strong legal status of the two provincial institutions, with a number of legislative competencies, powers and large financial resources, determines a set of coexisting areas of interest among the urban activities. They have been displaced across two institutional levels, provincial and municipal ones.

The concentration of powers in the provincial politico-administrative levels, generally, results in a continuous negotiation process between the cities of Trento and Bolzano and their provinces for every planning decision and project, for which the cities are in a weaker condition (Zanon, 2013). Consequently, the relationships between spatial dimension, urban functions and urban government are not an effect due entirely to the regulative and proactive activity of the city but a consequence of municipal-provincial administrations interaction. The land-use decisions and urban regulations of the cities of Trento and Bolzano “*are not enough to balance (partially) the provincial administration’s power*” and this is evident in urban energy matters. Similarly to energy-sensitive planning, evaluated and analysed in the Part 2, also in the case of the reward-based mechanism the roles played by the municipalities appears residual.

The ‘*Participatory Energy Plan Trento x Kyoto*’, approved in 2008, was accompanied by a supplementary planning guidance on energy efficiency design for new buildings, making use of density bonuses. Two years before the provisions of the national law (the National Housing Plan – *Piano Casa*) and one before the provincial implementation, the city of Trento adopted the *Regolamento per l’Edilizia Sostenibile* (Sustainable Building Regulation) as permanent (but voluntary) instrument that provides, when specific standards are met, a density bonus and some economic incentives in terms of deduction of planning fees.

Following this sectoral approach, the voluntary planning instrument could be considered a restricted and limited episode that does not take part to any planning strategies and is not able to encourage a revision of local public actions, in particular in relation with the provincial initiatives. These, with the implementation of the National Housing Plan, have determined an incentive scheme, on the one hand, more economic profitable for owners and developers and, on the other hand, with a different calculation system for the building’s volume. The Autonomous Province has usually expected that the local administration approve “*any more advantageous measures*” (art.86, provincial planning law, 4 March 2008, n. 1) to locally tailor the provincial scheme. Despite this, although the Province of Trento has improved its planning law considering the reward-based mechanism, in addition to the equalisation and compensation practices, and the national leadership in the actions related to energy issues, no local experimentations can be recognised. As a result, the reward-based mechanism proposed by the municipality of Trento is naturally limited in its real implementation.

Bolzano is a case in which the relationships between different institutional levels have influenced the local approach to public actions in terms of capacity to guide the city development and transformation. The provincial translation of the National Housing Plan is subjected to continuous transformation and improvements, changing not only the amount of extra land development rights that can be assigned, but also the object of the incentive scheme and its nature, shifting from a stable measure to an episodic and extraordinary one. On the other hand, the city of Bolzano elaborated a preliminary study in 2009, within the documents of 'Master Plan', focused on the use of density bonus in view of greater energy efficiency of existing housing stock. This proposal, in accordance with the contemporary approval of the National Housing Plan, determined the percentage of additional building's volume after an analysis of different land and building value in the municipal area, in order to propose an incentive scheme economically feasible. In addition, the authors suggested some clauses to be implemented into the municipal building code to permit the real application as well as the establishment of a bank of development rights. Successively, the provincial translation posed limits to the private actions in terms of object (only building refurbishment with extension until the last provincial resolution, June 2012) and extension of intervention ("up to 200 mc", until the last provincial resolution, June 2012) that have excluded the introduction of the results of the municipal preliminary study. Only the increase of the deduction of planning fee in case of CasaClima A has been added to the building code of the city of Bolzano. The recent new provincial measure would extend, in theory, the autonomy of the municipal level by setting local planning conditions for dealing with the assignment of extra land development rights. In particular, the land-use plan has to define urban areas subjected to a detailed plan in order to obtain the incentive. The next 18 months will be crucial to evaluate the level of institutional capacity and leadership in implementing locally these measures.

Coherence and Integration

The coherence and the integration of reward-based mechanism with the purposes and objectives of land-use plan are elements identified as successful both by Italian and international scholars.

Being internally coherent means that the objectives and actions of an instrument should be in relations between each others. In these terms, the cases analysed show that the influence of provincial levels in the real locally implementation and tailoring affects the effectiveness of local public actions. Although the challenging objectives of such reward-based mechanisms, the implementation strategies are weak.

The city of Trento has created a voluntary assessment scheme which considers a wide range of environmental issues (site quality, efficient use of materials, use of environmentally friendly materials, construction waste reduction, indoor air quality improvement) and energy efficiency, particularly as regards the building envelope and heating and cooling design. The choice to encompass such a wide number of sustainability matters does not reflect in sophisticated implementation strategies, also considering the contents of the provincial regulations. The attainment of different degrees of sustainability gives entitlement to progressive in-kind incentives in terms of building rights and deductions of urban development charges, that can be added. The municipality has nevertheless shown little interest in this new practice, as evidenced by the small amount of additional development rights granted (up to 10% when the best performances are achieved) and limited deduction of planning fees.

The city of Bolzano has not developed any proper measure, different from that of the province, but it is limited to the issuance of certificates of permission needed. It is therefore not possible, until it is no incentive system implemented locally, to assess internal consistency.

Concerning the external coherence, this work considers the relationships between purposes and objectives of the reward-based mechanism and the land-use plan. Hence, it is necessary that local planning authorities have some ideas on the physical and social outcomes of the use of bonus-rights. On the relationships between this and the purposes and objectives of local spatial plan, these can potentially modify urban areas in their characteristics and needs. Furthermore, the land-use plan gives legal basis to the use of extra land development rights.

Although the preparation of the *Regolamento per l'Edilizia Sostenibile* of the city of Trento was contemporary with the revision of the density indexes of the land-use plan, the regulation has not been able, similarly to the plan, to identify consistent and share visions of the future of the city. Despite some limits, the reward-based mechanism poses urban questions than an urban development plan has to consider. The indifference of the incentive mechanism for any peculiarities of the urban settlement of the city of Trento undermines the achievement of those objectives that the government has set. The decision to influence the transformation of the city with limited assignment of extra land development rights could be one explanation of an evident external incoherence. In addition, the incentive system of the provincial differs in the calculation of the volume from that of the building code of the city of Trento, an increase that

reaches almost 30%, if it is considered that the provincial system uses the gross volume, while the municipality the net one.

As assumed in the study included in the 'Master Plan', the city of Bolzano would like to implement locally the system of incentives in such a way as to make it an active tool in the solution of restoration projects and urban regeneration. In particular, the provision of the province inherent obligation to define urban areas to be subjected to the implementation planning goes in this direction. In addition, the project "EPOurban", within the municipal strategy towards "Neutral Climate City Bolzano - zero CO₂ emissions", with 22 existing apartment blocks as case studies, would test the real capabilities of this tool to work in synergy with others.

Theoretically, market-based and command-and-control tools should synergically work. According to Micelli, "*[T]he creation of property rights markets never aims to replace the plan's traditional implementation tools, but rather to integrate the former to make the latter more efficient*" (Micelli, 2002, p. 150). As mentioned in the discussion on leadership element, the integration of the implementation strategy based on bonus-rights with the land-use plan is theoretically based on the provision of legal basis to the generation of property rights. Notwithstanding, both the National Housing Plan and the specific definitions given to each measures in the subsequent regional laws, do not define a system of coordinated actions carried out by individuals and coordinated by local authorities, but rather a series of measures aimed at the action of private individuals on individual building structures.

Regarding the simultaneous use of the density bonus with other tools and practices, regional laws seem to expect it whereas experiments still lacking. In both cases, the cities of Trento and Bolzano, the potentialities and the limitations of this market stimulating tools have not yet been fully understood, and this limits its use and integration with the tools available to municipalities.

Consistency and Stability

Consistency between planning goals, regulations and implementation mechanisms means, in the case analysed in this work, to ensure no contradictions between policies, in particular with the land-use plan. The lack of consistency showed in the case studies can be explained on the one hand, by attempts to take into account and reconcile contrary political aims that generally do not consider energy matters and, on the other hand, by the extraordinary nature of the national measure that influence the local public approach. Inconsistencies are also related to the lack of adequate and integrated municipal strategies to deal with energy efficiency and production from renewable resources.

In parallel with the activation of energy planning, the national law has introduced this reward-based mechanism intended to support the building sector and which assigns additional development rights so that private properties can be enlarged. This may have important implications for energy efficiency promotion if appropriately coordinated with local urban and energy policies. The analysis generally shows that there is insufficient relation between energy and spatial planning, and that implementation actions and mechanisms are largely inconsistency because of the multi-dimensional nature of energy issues. Furthermore, the reward-based mechanisms have been introduced within an already crowded policy tools context. The Municipal Energy Plan, especially for the city of Trento, with a view to greater energy efficiency and energy production from renewable sources, and taking a regulatory approach, affects decisions on properties by restricting the set of available choices. Connections with land-use plans are generally weak, while stronger relationships are defined by the building codes, which intervene on the performance and design of buildings. The mandatory measures introduced into the building codes of the cases analysed tend to conform building development to minimal energy performance requirements, while voluntary measures are intended to foster innovation in building technology and materials. The promising instrument of density bonus is in the hands of municipalities, but they are mostly concentrated on new buildings, while the challenge to be addressed is the energy efficiency of the existing building stock, and this requires mobilizing private actors by also using capacity building actions, such as educational campaigns and demonstration projects. The city of Trento has introduced reward-based mechanisms in parallel with the equalization and compensation instruments, which have recently come into use but still need to be consolidated, and with the approval of the '*Piano Partecipato Trento x Kyoto*'. The pro-market methods are based on the appropriate management of property rights and the assignment of extra development rights, in general associated with the transfer of development rights mechanism. The assignment of a density bonus should operate as a market-stimulation tool "*by making the actor 'want to' take the incentive, [...] and some actions more attractive to particular development actors*" (Tiesdell & Adams, 2011, p. 24) and the space for energy improvement goals should be clear. The consistency of the measure is heavily invalidated by the small amount of additional development rights (up to 10% also in the case of total score) that can be assigned to owners/developers.

As a result of the national perspective on the incentive system, in the regional transposition the implementation strategy generally refers to a standalone episode with a specific deadline. However, despite the temporary nature of this measure, some regional planning laws have stably included a reward-based system. Until the recent resolution (June 2012), the Autonomous Province of Bolzano was an example of stable inclusion on instruments.

Concerning the introduction at the municipal level, the Sustainable Buildings Regulation (*Regolamento per l'Edilizia Sostenibile*), despite the provincial implementation measure, includes a stable system, defining a more coherent document than the usual building code, but, being a supplementary and voluntary planning guidance, giving it an 'exceptional' character. Differently, the provincial administration of Bolzano has recently imposed new deadlines, changing approach from the previous approved provincial laws and decrees (2014 and 2019, respectively), whereas the position of the city planning authority remains stalled, waiting for a more stable provincial means to deal with this type of instrument.

Socially shared goals

The participation of citizens is a factor that considerably enhances a market stimulating tool to become more socially acceptable. The involvement of entire community is considered everywhere crucial, such as in Canada in which this is also provision for appeal to the polls if local residents have come out in strong local oppositions to the TDR programme. Considering the case studies, in neither case the definition and implementation of measures was shared with organizations, groups of stakeholders and shareholders and individual citizens. The work has been questioned whether this non-involvement approach may be widespread in the two provincial capitals. The experimentations with the participatory approach to urban planning and design are considered, in particular the objectives and the typology of outputs of such processes.

In the city of Trento, in particular, in recent years, three participatory processes regarding urban development have been activated:

- in 2003, involvement of organizations, groups and private citizens finalised to the definition of preliminary guidelines for the urban regeneration of local public transport company headquarter;
- in 2003, involvement of organizations and groups for the elaboration of project proposal for urban redevelopment of historical centre of Trento;
- in 2001-2003, in the development of the Strategic Plan 2001/2010 of the city of Trento, organizations and groups of stakeholders and shareholders were involved in the elaboration of objectives, visions and guidelines; and only one concerning energy in urban area:
- in 2008, 'Piano Partecipato Trento x Kyoto' (Participatory Plan Trento for Kyoto). Bobbio and Pomatta in a study commissioned by the Autonomous Province of Trento on the democratic quality in the Province of Trento (2008), analysed 18 cases of participatory processes developed in Trentino, including those named above. They believe that it is difficult to understand the degree of empowerment of the participants. "*The movement [of participation as a democratic practice seems] is at an early stage, very uneven and often random*". Does not seem to exist a defined orientation on the investment in the province. Most of the participatory processes aim to define approaches of a general nature which are not intended, at least immediately, to produce operating results.

Differently, in the municipality of Bolzano the city Department of participation promoted in 2009 the revision of municipal statute including the chance to activate more participatory practices in several matters. In particular, in the city of Bolzano two urban processes supported also by private citizens were activated:

- in 2004, the pilot urban regeneration project of Oltreisarco-Aslago area;
- in 2012, the pilot urban regeneration project of the San Vigilio square in the Oltreisarco-Aslago area.
- The city of Bolzano-Bozen, with the European Project "EPOurban", recently financed (2012), is intended to mobilise citizens and property managers of 22 pilot projects to develop locally tailored measures for the municipal implementation of provincial legislation.

The processes are mainly focused on urban regeneration projects, both in terms of urban design, that regeneration of the economic, environmental and social conditions. As previously analysed, the weak integration of market stimulating instruments within a policy context so crowded, makes it difficult face and facilitate the participation of the public and interest groups in the different choices regarding its use, such as the definition of the areas of intervention, the determination of density bonus and the possibility of transfer. Participation seems a distant practice until the tool cannot find its own legitimacy in the tool chest of the local public administration, specially, taking into account the considerations of Bobbio and Pomatta about the situation in Trentino and the shift / broadening of leadership on urban development between the municipality and the provincial institutional level.

Distribution equity

The distributive equity has been one of the main purposes of the introduction of equalization in Italy, in order to avoid large differences in the treatment of land resulting in windfall gains. It seems obvious that the extra land development rights, in the case of achievement of quality energy, can be obtained by the landlord or by the developer do not have equal value throughout the territory of the municipality. This varies, according to the theory of urban economy, in part for different spatial and positional variables. The definition of areas, which should be relatively homogeneous in terms of economic and legal criteria, and the application of corrective factors have been considered as basic rules by many scholars, and now returned to the headlines because of the PGT (*Piano di Governo del Territorio*) of Milan, mitigating inequality and windfall gains obtainable through building rights. Differently from the equalization, and in particular the case of the PGT of Milan with its 'boundless equalization' (*perequazione sconfinata*), the use of a reward-based mechanism involves the physical location of the additional land development rights and therefore the definition of a proper value linked to the urban quality of the area.

It is wondering therefore whether a mechanism for obtaining a density bonus indifferent to land characteristics could create a surplus value that generates unfairness. In fact, this would give equal rights (density bonuses) to the holders of property rights in land quite different, and thus appraised differently. It might embody a new and completely artificial, speculative path, with attribution, for public decision of striking differential rents.

The non-application of any correction or determination of the incentive system, as proposed by Luigi Mazza in 2004 in the case of equalization, arise again problems long debated about the, so-called, unique building index (*indice unico*).

Considering the two case studies, the work intends to discuss the theoretical assumption about the introduction of a reward-based mechanism, which is the economic balance between the costs of building rehabilitation and the value of extra land development rights. Both Trento and Bolzano, at the provincial and municipal level, did not carried out background studies, with the exception of the documents included in the 'Master Plan' of the city of Bolzano, with analysis of the potential market in order to understand the local development and the land and building values at stake.

In order to debate on the distribution equity of the two cases, in accordance with the Summary Boxes 7.1, 7.2 and 7.3 and taking into account a residential apartment block with 2.000 square metres (Energy Efficiency Report, POLIMI, November 2011), firstly, the maximum extra land development rights that could be obtained by owners or developers in the cities of Trento and Bolzano is determined.

Secondly, the total cost for the energy refurbishment of existing building is compared with the amount of density bonus. The Energy Efficiency Report (2011, pp. 211-217) determines the costs of retrofit measures for multi-storey building for residential use (of 2.000 m²) in € 590.000, considering the use of high performance energy efficient windows, thermal insulation of external walls and floors and heating and cooling systems.

(1)

$$V_N = C$$

(2)

$$V_N = C_E + C_N$$

where:

V_N = the value of extra land development rights obtained thanks to the reward-based mechanism;

C = costs;

C_E = costs due to the rehabilitation of existing building's volume;

C_N = construction costs.

Then, the construction costs of the extra land development rights have to be evaluated and summed to the costs due to the rehabilitation process (2). This has been appraised by the Agenzia del Territorio about 1500 € / m² in case of high-quality building materials. The table 8.1, in which, with the same hypothesis, three completely different scenarios emerge, provides all these data. The mechanisms implemented by the two provinces are, in the results, quite similar, whereas the system of the municipality of Trento results more onerous for owners and developers.

It is necessary to point out a major assumption as a basis for this simulation: the transaction costs associated with the acquisition of the properties and their actual availability shall be considered void.

Table 8.1.: Data calculated

	AUTONOMOUS	REWARD-BASED MECHANISM	MUNICIPALITY OF TRENTO
	PROVINCE OF TRENTO	AUTONOMOUS PROVINCE OF BOLZANO	
<i>Density bonus</i> [m ²]	475	400	200
<i>Rehabilitation cost/density bonus</i> [€ / m ²]	1242	1475	2950
<i>Total costs</i> [€ / m ²]	2742	2975	4450

Source: elaboration from Energy Efficiency Report, POLIMI, November 2011 and www.agenziadelterritorio.it (access: 10th of September 2012)

The table 8.2 reports the building values in Trento and Bolzano, for normal and excellent conditions respectively, of a general residential apartment block located in three different urban areas.

Table 8.2.: Value of the extra land development rights

CITY	URBAN AREA	VALUE FOR BUILDING CONDITION	
		NORMAL [€/m ²] Min / Max	EXCELLENT [€/m ²] Min / Max
<i>Trento</i>	Central	2700 / 3200	3500 / 3800
	Semi-central	2500 / 2900	3400 / 3600
	Suburban	2200 / 2400	2400 / 2800
<i>Bolzano-Bozen</i>	Central	3000 / 3400	3400 / 4500
	Semi-central	2600 / 3200	3100 / 3900
	Suburban	2100 / 2700	2800 / 3600

Source: www.agenziadelterritorio.it (access: 10th of September 2012), Data: semester 2-2011, residential use

The table 8.3 shows, as last step, the simulation of the income due to the extra land development rights in the cities of Trento and Bolzano-Bozen calculated on the basis of the different values of the extra land development rights and the total costs in accordance with the different reward-based mechanisms. It has been supposed that the apartment block is in normal condition and that, after the rehabilitation intervention, becomes of excellent condition.

Table 8.3.: Income simulation

CITY	URBAN AREA	INCOME SIMULATION	
		Provincial measures [€/m ²] Min / Max	Municipal measures [€/m ²] Min / Max
<i>Trento</i>	Central	758 / 1058	-950 / -650
	Semi-central	658 / 858	-1050 / -850
	Suburban	-342 / 58	-2050 / -1650
<i>Bolzano-Bozen</i>	Central	425 / 1525	-
	Semi-central	125 / 925	-
	Suburban	-175 / 625	-

Source: elaboration from www.agenziadelterritorio.it (access: 10th of September 2012), Data: semester 2-2011, residential use

As can be seen, in the totality of cases concerning the use of municipal measures in Trento, the interventions can not be covered by the density bonus, whereas the provincial systems, in a great majority of cases, with exceptions of suburban areas, largely balances total costs through extra rights. In addition, the table 8.3 suggests that the simulation results partially confirm the hypothesis. The significant difference in income between suburban and central conditions – maximum of income in central area and minimum in suburban one – and between municipal and provincial measures highlights the potential inequity of an equal approach to different conditions.

Balance between the supply and demand

The introduction of a policy option based on a market-based approach can model the demand and supply sides of the housing and land market. In order to make the instrument works, scholars find that the public administration should determine urban options with large demand and low supply. In the cases analysed in the U.S. (Kaplowitz et al., 2008), the success of TDR programme is enhanced by limiting the public-private actions on strong development pressure areas - areas subjected to the city's transformation, in terms of new development or urban regeneration –.

Looking at the two cases reveals the inadequacy of both local implementations in this sense because no specifications were gave in terms of spatial localisations. With the exceptions of these areas expressly excluded for environmental and

historical preservation reasons, they cover all the municipal territory where the growth pressure appears relatively low, due to economic downturn and stagnation of construction sector.

Furthermore, the TDR literature (Pruetz & Standridge, 2009) repeatedly points out that the opportunities to obtain additional development without having the compliance with the bonus density system limit the chance to achieve the energy efficiency goals. Most successful experiences, in particular TDR programmes, rarely allow actions to avoid the satisfaction of minimum requirements.

As discussed, theoretically, there should be no other way to obtain a volumetric incentive, in the manner that would affect the efficacy and generate economic rivalry. Obviously, the provincial and municipal systems can not be combined, the owner or developer have to chose to which reward-based mechanism would like to apply for. However, the provincial authority of Trento allows density bonus – up to 25% of existing building’s volume - for interventions of demolition with replacement aimed at social housing. Interventions regard residential buildings with at least 15 years, which are not included in the historical settlements or between the cultural and / or environmental assets. The additional development potential under this provincial provision is an alternative to the municipal system and can not be combined with any density bonus already provided by the local land-use plan. Given the choice and considering the higher density bonus, many developers would achieve additional development using features that enhance the value of their buildings in compliance only with the minimum energy efficiency requirements set by provincial legislation rather than achieving high performance.

Balance between the rights gained and the economic value of the incentives

What are the feasibility conditions that make the building rehabilitation operation economically viable for the owners and developers? Theoretically, considering exclusively the renovation for energy improvements, the investor will mainly upgrade if (Norman, MacLean, 2009):

$$[\gamma p m_i (e_0 - e_1)] / [(1+r) - \psi] \geq C$$

in which:

γ = investment inefficiencies

p = cost of energy

m_i = intensity of energy use

ψ = opportunity costs

C = costs

And if pay-back period:

$$P = C_n / S_n$$

The introduction of an additional land development rights and, so, a potential additional building volume slightly changes the perspective. In the absence of fiscal and economic incentives, the pay-back period, according to the Energy Efficiency Report, is 7/8 years and over 20 years in the case of heating and cooling conditioning and windows and opaque structures, respectively. In these conditions, appears obvious that these interventions have to make more attractive but under what conditions the balance between the rights gained and the economic value of the incentives can be achieved?

The main condition is related to the value of the building’s volume with the density bonus that has to be greater than or equal to the value of the existing building’s volume (3).

$$V_T \geq V_E$$

In which:

V_T = value of the refurbished building with extension due to the extra land development rights assigned (total value);

V_E = value of existing building.

According to Micelli (2011, p.146), the above-mentioned equation to implement the volumetric incentive in the urban areas (3) can be specified considering three important variables:

- a) spatial variation coefficient, in relation to the positional quality of area designed to urban transformation;
- b) building value depreciation coefficient, in relation to the building age;
- c) the urban density.

It is necessary to remember that the transaction costs associated with the acquisition of the properties and their actual availability shall be considered void.

The equation (3) can be simplified, using the hypothesis debated in the previous section, considering exclusively the value of new part of building, thanks to the extra density, and the costs for the rehabilitation and construction (4).

(4)

$$V_N \geq C_E + C_N$$

In which:

V_N = the value of extra land development rights obtained thanks to the reward-based mechanism;

C = costs;

C_E = costs due to the rehabilitation of existing building's volume;

C_N = construction costs.

However, despite the simplification approach, it is crucial bearing in mind that through the rehabilitation process the value of buildings in the existing conditions, generally poor, can be increased. The current quotations in Trento and Bolzano for buildings with normal and excellent state significantly vary as the table 8.4 shows.

Table 8.4.: Value of the extra land development rights

CITY	URBAN AREA	VALUE FOR BUILDING CONDITION		VALUE INCREASE
		NORMAL [€/m ²] Min / Max	EXCELLENT [€/m ²] Min / Max	
<i>Trento</i>	Central	2700 / 3200	3500 / 3800	+30% / +18%
	Semi-central	2500 / 2900	3400 / 3600	+36% / +24%
	Suburban	2200 / 2400	2400 / 2800	+10% / +17%
<i>Bolzano-Bozen</i>	Central	3000 / 3400	3400 / 4500	+13% / +32%
	Semi-central	2600 / 3200	3100 / 3900	+19% / +22%
	Suburban	2100 / 2700	2800 / 3600	+33%

Source: www.agenziadelterritorio.it (access: 10th of September 2012), Data: semester 2-2011, residential use

Furthermore, the positional quality of area influences the economic quotation of building. Hence, returning to the case studies, the change in value relative to the location is +45% in Trento moving from the periphery (2200 € / m²) to the centre (3200 € / m²) and +61% in Bolzano, always from the periphery (2100 € / m²) to the centre (€ 3,400 / m²).

At the first sight, with an increase in extra volumes and, similarly, with higher positional quality of the property, the chances of higher feasibility conditions in the process of renovation and demolition and reconstruction increase. From Table 8.5 it is clear that, in the case of building in normal conditions - in Italy generally this refers to buildings with energy efficiency class G, built in the 1960s and late 1980s with low efficient materials and techniques - the transaction is convenient if the property is located in central or semi-central area using the provincial mechanisms. The incentive system of the city of Trento is not profitable in any case.

Summarizing the main findings of the Micelli's research (2011), it could be affirmed that the bonus density should increase with respect to the increasing of building density and quality whereas bonus density should decrease with respect to the land value related to the location.

The simulation here carried out confirms this. Thus, since the cost of land has been already amortized from the existing building, in the case of rehabilitation process with extension and demolition with reconstruction with extension the profitability of measure is in the sum of the construction cost of the new volume with the retrofit cost of the entire building, which obviously has to be covered by the sale of the new dwellings. If the building property is in a good condition, as is assumed by both provincial implementations that can consider residential blocks built up to the year 2500 – at that date in both provinces has come into force the energy efficiency requirement to get permission to build - the cost of restructuring weighs very little compared to the construction costs of the extra volume gained thanks to the density bonus system. It therefore appears that the increase of the quality of the building operation becomes gradually more and more convenient.

Table 8.5.: Income simulation

CITY	SPATIAL VARIATION	VALUE OF EXISTING BUILDING [€/m ²]	INCOME SIMULATION	
		NORMAL CONDITION Min / Max	Provincial measures [€/m ²] Min / Max	Municipal measures [€/m ²] Min / Max
<i>Trento</i>	Central	2700 / 3200	758 / 1058	-950 / -650
	Semi-central	2500 / 2900	658 / 858	-1050 / -850
	Suburban	2200 / 2400	-342 / 58	-2050 / -1650
<i>Bolzano-Bozen</i>	Central	3000 / 3400	425 / 1525	-
	Semi-central	2600 / 3200	125 / 925	-
	Suburban	2100 / 2700	-175 / 625	-

Source: elaboration from www.agenziadelterritorio.it (access: 10th of September 2012), Data: semester 2-2011, residential use, refurbishment costs = 590.000 € (Energy Efficiency Report, POLIMI, November 2011)

This implies that an efficient implementation should consider the possibility to assign different bonus on the basis of economic (and energy, as we will discuss in the next point) criteria, in terms of correction factors. In contrast, the provincial laws and local regulations do not provide differences for the attribution of development rights whereas they suggest designating the areas following legal criteria and the zoning approach. Accordingly with the guidelines elaborated in the ‘Master Plan’, the city of Bolzano is intended, in the next future in application of the provincial provisions, to limit the urban areas subjected to the reward-based system and define detailed planning rules.

Environmental relevance

The focus on the effectiveness of the measures proposed at the local level in planning for a low-carbon built environment cannot ignore the relationships between existing developments and their final energy consumption. Inexpensive social rental apartment blocks built between the end of the Second World War and the mid-1970s, according to the functionalist schemes and making use of aged technologies, often dominate the existing housing stock and account for the 30% of final energy consumption of Italy (European Commission, 2007).

With similar national final energy consumption distributions, the strategies and measures for existing housing stock are field of large academic debate in the northwest European countries. The 40% House Project (Boardman et al., 2005) elaborates a complex study on UK residential sector in order to deliver a 60% reduction in carbon dioxins emissions by 2050. Following the authors’ perspective, such an urgent problem requires radical solutions; three million of demolitions (14% of UK housing stock) are necessary. Its demolition thought is based on complex modelling that with punctual modifications can produce very different results.

In contrast, the UK Sustainable Development Commission (SDC, 2006) as well the German Federal Housing, Urban and Transport Ministry argue the urgent need to upgrade the existing housing stock, with different strategies. The upgrading is preferred to a program of demolition not exclusively for economic reasons but also for considerations on the embodied carbon costs such as volume of new materials, energy use in producing concrete, steel and other structural and infrastructural elements, and other factors affecting the environment such as land use, infrastructure and area blighting. The environmental benefits of refurbishment could be also shown with the support of autonomous research streams. Like the study if the British Sustainable Development Commission, Itard and Klunder (2007) calculate the environmental impacts of renovated housing stock in the Dutch context, in accordance with the Life Cycle Assessment method. Their findings show the disadvantages to demolition in the renewal options of maintenance, consolidation, transformation, and redevelopment for two typical cases of Dutch urban renewal are compared. Similarly Power (2008), concludes that, according to the German experiences and the SDS case study, “*the case for planned large-scale demolition for energy reasons is greatly weakened when we consider embodied energy as well as energy in-use*”.

Following these considerations, weak aspects can be recognized in the reward-based mechanism introduced by National and regional legislation systems and finalized to upgrade the energy efficiency of existing housing stock:

- the allocation criteria of bonus density do not consider features of urban pattern such as building density, sunlight availability, presence of renewable sources of energy;
- the assignment of development rights as incentive does not in relation with the building age and obsolescence. This is granted for all those buildings generally built before 2005 (but also before 2008);
- the national and regional laws provide greater density bonuses (up to 35%) for actions of building demolition with replacement than for building refurbishment with extension;

- despite the large inefficient existing building stock with difficulties has good results in the energy consumption labelling scheme, the energy efficiency requirements usually determine energy standards better than the energy performance set in Municipal Building Code to obtain bonus-rights.

8.3 Comparing Trento and Bolzano-Bozen

All the Italian regions have legislated, in a different way, upon the assignment of extra land development in view of greater energy efficiency, in accordance with the legislative powers and concurrent competencies given to the political-administrative level of regions in urban planning and energy (Di Piazza, 2010).

The transition to the municipal level has been less obvious. Municipalities can implement and define measures in respect to the regional law when it is provided and these, generally, should be more economically attractive than the regional (and provincial) ones. It should be no doubt, however, that local leadership heavily conditions the elaboration and the real implementation of such policies. Hence, although the use of market-stimulation tools can change the “*contours of that opportunity space making some strategies more (or less) advantageous to market actors*” (Tiesdell & Allmendinger, 2005, p. 68), this does not mean that local authorities should not take initiative for encouraging private sector to act for public purpose. Establish the market rules, facilitate, support and encourage the real implementation are determinant public actions. The local planning administration plays a key role in all the steps – determination of incentive scheme, definition of urban areas subjected to the measures, development of rules for the entitlement of land development rights, the transfer, if any, and the market of property rights rewarded owners or developers -. Furthermore, the reward-based mechanism has been introduced within an already crowded policy tools context, in which the connections with spatial planning and, especially, land-use plan and municipal energy plan are generally weak, while stronger relationships are defined with the building codes, which intervene on the performances and design of buildings. The mandatory measures introduced in the building codes of the analysed cases tend to conform building development to minimal energy performance requirements, while voluntary measures are oriented at fostering innovation in building technology and materials. In addition, incentives in terms of fiscal and development charges reduction are used by all the two cities examined. These are promising instruments in the hands of municipalities, but they are mostly concentrated on new buildings while the challenge to be addressed is the energy efficiency of the existing building stock, and this requires mobilizing private actors by using capacity building actions, such as educational campaigns and demonstration projects, as well as market stimulation tools.

Table 8.6.: The case studies and their policy tool chest

	MARKET – REGULATION TOOLS		MARKET - STIMULATION TOOLS			CAPACITY BUILDING TOOLS	
	Municipal Energy Plan	Building Code	Fiscal incentives	Reward-based mechanism	Non-financial instruments	Education Campaign	Demonstration Project
Trento	Elaborated	Done	Yes	Yes	Yes	Yes	Yes
Bolzano	No	Done	Yes	No	Yes	Yes	Yes

Source: authors' elaboration

Table 8.6 provides additional information about the policy tool chest of case studies. As can be seen, in both municipalities, the policy context contains quite all the policy tool typologies and usually, deployed in bundles of packages. The existence of instruments does not mean the real effectiveness of public strategies and actions that depends on the ability to make use of the appropriate tools, adequately integrated, considering the leverages that can be activated in the diverse contexts.

The city of Trento has introduced reward-based mechanisms in parallel with the equalization and compensation instruments, which have recently started to be used but still need to be consolidated. Such methods are based on an appropriate management of property rights and the assignment of extra development rights, in general associated with the transfer of development rights mechanism. The assignment of a density bonus operates as a market-stimulation tool “*by making the actor ‘want to’ take the incentive, [...] and some actions more attractive to particular development actors*” (Tiesdell & Adams, 2011, p. 24). The space for energy improvement goals is clear. The municipality of Trento has demonstrated anyhow a low interest in the new practice, as is evident by the small amount of additional development rights recognized (up to 10% also in the case of total score).

The Participatory Plan Trento x Kyoto, elaborated in 2008 but not approved and adopted, was a process that involved groups of stakeholders and shareholders and organizations, contextual to the introduction of the *Regolamento per l'Edilizia Sostenibile*. This did not influence the design approach of such a market-stimulating tool that did not consider

the participation of private citizens, categories of stakeholders, such as apartment building managers and local developers, and the integration between the city department of environment, that of urban planning, as well as the city department of buildings, which promoted the instrument.

Moreover, a conflict has arisen with the incentives provided by the Province, which introduced, following the national law, the bonuses for the rehabilitation of existing buildings. These are more convenient than those of the municipal regulation (going up to 17.5% of the existing volume), influencing the internal and external coherence of municipal voluntary assessment scheme. Whereas the municipal building regulation focuses mainly on new buildings, the provincial bonuses are aimed at promoting the refurbishment, the demolition with reconstruction and the refurbishment with extension. However, the assignment of additional development rights is not in relation with the building age and obsolescence and do not consider urban or district scale regeneration interventions. In other words, despite the large inefficient existing building stock, the energy performance requirements associated with the density bonus are not well balanced and better support interventions of building demolition with replacement and building refurbishment with greater density bonuses (up to 17,5%) are assigned than for refurbishment practices. In addition to these considerations, the allocation criteria of bonus density do not consider, both in the provisions of the municipality of Trento and in the Provincial ones, urban features such as building density, urban compactness, the availability of sunlight and the presence of renewable sources of energy. The effects in terms of urban reorganization and densification are not yet measurable and in any case do not seem important.

The attractiveness of an investment project can vary considerably in relation to the locational quality of property and its status, but the influence of government intervention by introducing stimulating market tools does not succeed in making sufficiently feasible the actions to private investors. The density bonus guaranteed by local authorities is too weak to obtain economic benefits or, at least, completely cover the costs.

The implementation of the National Housing Plan of the Autonomous Province of Bolzano-Bozen has varied significantly over the last years. The instability of provincial administration in dealing with density bonus has influenced the process of elaboration of own measures at the local scale. Preparatory documents included into the 'Master Plan' of the city of Bolzano, approved in 2009, designed an instrument tailored locally, with background studies on property structure, building and land values in the municipal territory and cost-benefit analysis, coordinated with the current building code and integrated with urban development strategies, in particular urban regeneration projects. The uncertainty of the provincial bodies has significantly interfered with the development of a coherent municipal regulation, causing a situation in which local progresses are weak and mainly referred to fiscal and economic incentives. In response, the city planning authority has focused public actions on elaborating scenarios to reduce greenhouse emissions through the research project "Neutral Climate City Bolzano - zero CO₂ emissions", and promoting education campaigns and demonstration projects. Due to the peculiar situation - the city of Bolzano has not developed any proper measure - the work takes into account the provincial incentive system as that now applied in the city of Bolzano, analysing and evaluating its coherence, integration, its consistency, social acceptability and efficiency in terms of land and property market. Regarding the simultaneous use of the density bonus with other tools and practices, the research finds that the recent provincial law seems especially to expect a horizontal integration between land-use plan, detailed plans and implementation tools, whereas experiments are still lacking. In both the provincial administrations and the local one, the potentialities and the limitations of this market stimulating tools have not yet been fully understood, and this limits its use and complete integration with the tools available to municipality.

In the perspective of a local incentive system, the city of Bolzano has to bear in mind the need to design an instrument firstly equal, in terms of distribution of value, and then economic feasible.

An efficient implementation tool should consider the possibility to assign different bonuses on the basis of economic criteria, or use correction factors. In contrast, the provincial law does not provide differences for the attribution of development rights whereas they suggest designating the areas following legal criteria and the zoning approach. Hence, although the provincial system largely balances total costs through extra rights, the significant difference in income between suburban and central conditions arise questions on the potential inequity of an equal approach to different conditions.

Furthermore, the economic profitability of actions is guaranteed in the central areas of Bolzano due to the high land and building value and because of the limited costs of restructuring compared to the construction costs of the extra volume. Therefore it appears that with the increase of the building quality, the operation gradually becomes more and more convenient, illogically respect the objectives of this policy tools.

Table 8.7.: Comparative analysis of selected case studies

THEMES	ELEMENTS OF SUCCESS	TRENTO	BOLZANO
Local planning framework	<i>Leadership</i>	Low	Low
	<i>Coherence</i>	Medium	Low
	<i>Integration</i>	Low	Low
	<i>Consistency</i>	Low	Medium
	<i>Stability</i>	High	Low
Social acceptability	<i>Socially shared goals</i>	Low	Low
	<i>Distribution equity</i>	Low	Low
Land and property market efficiency	<i>Balance between supply of development rights and bonus development demand</i>	Low	Medium
	<i>Balance between the rights gained and the economic value of incentive</i>	Low	Medium
Environmental relevance	<i>Internal coherence at the building scale</i>	Medium	Medium
	<i>Internal coherence at the urban scale</i>	Low	Low

Source: author's elaboration

Table 8.7 shows the comparative analysis of the selected case studies, evaluating the case of the municipal reward-based system of Trento and the provincial measure of Bolzano, implemented by the city.

The provincial approaches are quite similar, albeit more structured, detailed and stable than that of the province of Trento. Both are viable from the economic point of view but they produce substantial unfairness of building value treatment from the periphery to the center, in case a building of normal conditions is considered how sample. There are differences in the real estate value simulation obtained in Trento and Bolzano, with greater benefits for buildings in central areas of the city of Bolzano. The two incentive systems appear both unprofitable for private action in particular if the property is placed in the suburban, and in semi-central areas.

From the point of view of the municipal implementation, although both have not their own instruments, the result appears the same, namely the non-use of the local system and the preference for provincial ones. Hence, the incentive system of Trento is not economically feasible, any type of property that is subject to redevelopment and would apply for the Regolamento per l'Edilizia Sostenibile is not able to balance the costs with the revenues. As a result, all operators have preferred the reduction in planning fees or the application to the measure of the province. In addition, the Regulation, although also applicable to buildings subjected to substantial rehabilitation, was especially promoted for the new building, so insisting on an area of clear stagnation and crisis, with insignificant growth rates in the construction industry (+0.5% annually).

Differently, although the preliminary studies carried out during the development of the 'Master Plan' were pioneering, the city of Bolzano has suffered from the unbalanced relationship with the provincial administration that has limited the elaboration of own measure. The pending local implementation of the latest provincial law (within 2013) enlarges the chances to fully incorporate into the incentive scheme themes and matters, involving citizens and groups of stakeholders thanks to the European project "EPOurban".

PART 4: CRITICAL ANALYSES TOWARDS THE NEXT STEP

CHAPTER 9: ANALYSES AND DISCUSSION OF RESULTS

9.1 Introduction

This research focuses on the ‘performance’ of energy-sensitive urban planning responses in terms of planning process, strategies and tools for planning implementation. In particular, the research presents the Italian experience, taking as research subjects the municipal energy plan (*Piano Energetico Comunale*) and a new plan implementation mechanism based on the assignment of extra land development rights in view of the inclusion of energy saving goals.

The study proceeds from the assumption that energy and land use are related and that the operationalization of this planning theme involves and modifies the traditional approach to land and building value formation, property market and strategies and tools for property mobilization.

Nonetheless, at first sight, it seems possible to conclude that, in comparison with the building scale, the urban model is attracting much less attention from decision-makers, politicians, officials and practitioners. Whereas much of the progress identified in recent years in the construction sector towards more sustainable practices and products was a response to EU policies, the same cannot be said for the definition of consistent and specific regulatory framework in the majority of the European national planning systems about energy-sensitive urban planning.

In the cases in which energy-sensitive planning instruments are applied, in general energy questions in local planning measures are interpreted as a sectorial field of action. This has slowed down the inclusion of such a theme into a more general theoretical framework of urban governance, not addressing the complex relationships between energy performance and urban morphology and between energy issues and land use management. As a result, despite few local cases showing advanced and ambitious zero carbon targets and appropriate policies, the translation of energy efficiency awareness into planning design and implementation phases is far from being straightforward.

This study addresses current planning policies and strategies in Italy for dealing with energy efficiency and production from renewable sources in urban areas, delineation of urban strategies and inertia in their implementation in cities. Given the peculiar institutional organisation in Italy and the international studies’ findings, the research focuses on the local scale. It has the most appropriate political jurisdiction and institutional competencies for bringing about any necessary measures and, at the same time, showing the more promising downscaling experimentations of supranational policy strategies and objectives.

The research is based on an interdisciplinary understanding of the relationships between urban energy planning and spatial planning and of potential role of land-use management and tools for the achievement of low carbon society: energy is considered less an environmental policy and more a new urban policy.

The problem is formulated as follows:

- (a) What actions at the local level are being taken in response to energy efficiency matters in cities, and what are the main obstacles to achieving carbon savings, using the Italian municipal energy plan as example?*
- (b) is a stronger market intervention possible and necessary for improving energy efficiency in the existing urban areas in Italy, and how can this market stimulating policy approach contribute to the environmental relevance of local actions, using the reward-based mechanism as example? and*
- (c) considering the unsuccessful attempts in achieving desired goals, how is possible manage existing lock-in situations by applying a property rights approach in terms of policy tool, and where and when the application of the rights system makes sense, using the renovation of existing building stock as example?*

The problem was supported by three primary research questions and six subsidiary questions, which were addressed in chapters 3 through 10:

- (a) What actions at the local level are being taken in response to energy efficiency matters in cities, and what are the main obstacles to achieving carbon savings, using the Italian municipal energy plan as example?*
 - a.1 Would this planning approach be likely to produce an effective, efficient and integrated response strategy for reducing global greenhouse gas emissions in urban settlements (Part 2: chapter 3, 4 and 5)?*
 - a.2 What barriers lie behind the inertia regarding energy efficiency and low carbon supply of energy-sensitive urban planning process (Part 2: chapter 3, 4 and 5)?*

(b), Does energy-sensitive planning require new methods based on public-private partnership and how can this market stimulating policy approach contribute to the environmental relevance of local actions, using the reward-based mechanism as example?

b.1 Is a stronger market intervention possible and necessary for improving energy efficiency and supporting energy generation from renewable sources in the existing urban areas in Italy (Part 3: chapter 6, 7 and 8)?

b.2 How can the design of new practices, which replace the traditional command-and-control planning mechanism, affect the effectiveness and the efficiency of the energy planning process (Part 3: chapter 6, 7 and 8)?

(c) Considering the unsuccessful attempts in achieving desired goals, how is possible manage existing lock-in situations by applying a property rights approach in terms of policy tool, and where and when the application of the rights system makes sense, using the renovation of existing building stock as example?

c.1 What are the conditions under which the assignment of extra land development rights can delineate an efficient and effective market, besides political will (Part 4: chapter 9)?

c.2 What should be the mix between planning, regulation and market in saleable property rights and how and by whom the market should be structured and managed (Part 4: chapter 9)?

To answer the first question, current energy planning process, housing policies, regulations and fiscal instruments in four case studies in Italy were analysed and evaluated making use an ‘as is’ policy analysis (Part 2: Chapters 3, 4 and 5). The second research question was addressed in the second empirical part of the thesis, which analysed and evaluated the recent introduction of a reward-based mechanism using land development property rights in the Italian legislation, in two case studies (Part 3: Chapters 6, 7 and 8). The third research question will be addressed in conclusion of the thesis, Part 4, in particular Chapter 9 (Paragraphs 9.5, 9.6 and 9.7), in which the energy problem was re-framed applying a planning approach through property rights, in accordance with the necessity of renovation actions on existing housing stock.

At this point, the study made some predictions about the expected outcomes, basing on prior literature and studies on the topic that suggest potential outcomes. In summary, the three research hypotheses addressed are essentially about tensions, conflicts and interactions between emerging approaches about spatial (and energy) planning and the ways in which these are currently practised. The work expects that then testing and answers to the research questions by case studies would enable a greater knowledge of energy-sensitive planning dynamics and a conclusive exploration of the possible alternatives and improvements of current approach.

Hypothesis 1: Governance versus government in energy planning

The work expects that the conflicts and interactions between different contemporary perspectives would differently affect the response of public authorities to energy efficiency needs, influencing, on the one hand, the way in which local public actors structure the process and, on the other hand, the way in which the leading local role is exercised through the shape of local planning instruments.

Hypothesis 2: Rhetoric versus reality in energy planning

Within the dominant rhetoric context of energy efficiency, sustainable and climate change urban policies, the research supposes that the increased awareness of environmental issues and the shift in demand for energy efficient sectors would boost novel voluntary forms of local responsibilities, influencing the way in which authorities tackle with growing energy consumption and greenhouse gas emissions.

Hypothesis 3: Role of local spatial planning and land-use management strategies in achieving energy efficiency goals

Considering the Italian ‘urbanism tradition’ centred on urban design, the conflicting influences between different institutional levels about energy matters and the insufficient knowledge of environmental issues and its implications for urban environment, the work expects that no substantial changes have occurred in the way in which environmental issues are addressed in the last two decades and that this would influence the result. Then, the introduction of pro-market instruments, such as financial and economic supports for upgrading residential buildings and technical equipment, giving rise to new markets and constellations of sub-market, would influence a distorted perception of local administration about

own role. Public authorities should bear in mind that they always affect private decisions by exerting its influence in shaping the rules of market and the forms of access to it. And lastly, the work expects that the recent introduction in the local tool chest differently shaping the assignment of additional land development property rights in view of greater energy efficiency and energy production from renewable sources would influence a novel approach to the energy planning process and the way in which the strategies are implemented.

These hypotheses have been tested by applying two research methods to two case studies, the municipal energy plan (Part 2) and the reward-based mechanism (Part 3). Each of those cases is considered in order to understand how to improve energy planning process and energy planning instruments and tools.

9.2 Summary of main evidences: Part 2

Part 2 was aimed at investigating the capacity of public administration to deal with energy concerns achieving results by using the instrument at disposal. It seeks to understand the factors influencing the successful (or unsuccessful) outcomes. Considering energy less a sectorial field of action and more an urban and planning policy, this part proposes the combination of the 'traditional' interpretations of energy planning with less conventional perspectives, to explore the results of energy planning instruments through efficiency, effectiveness and policy integration criteria.

As case studies, the issue of municipal energy plan (*Piano Energetico Comunale*) was analysed in four cities, Bologna, Modena, Venice and Trento, assuming that there is a relationship between planning instruments and results on the ground. Generally, the case studies reveal that Italian cities face considerable barriers in addressing objectives oriented to energy efficiency and energy production from renewable sources. However, great differences and similarities emerge among the Italian four case studies.

(1) The innovative character of the analytical phase of the MEPs of Bologna and Modena, which includes a spatial dimension of energy demand and supply.

The analytical phase of the plans of these two cities is based on a correlation between urban models and energy consumption making use of spatial investigation of the main variables using GIS technologies. The identification of homogeneous urban areas in terms of geographical location, land and building use and intensity of energy exploitation was new in the Italian context. Despite this, the research finds that, from the point of view of the causal relationships between the nature of the problem and the objectives of the plan, generic and similar objectives about the reduction of energy demand and the support of energy production were formulated. There are not particularly robust linkages between the outputs of the analytical phase and the objectives, aligned with the actions really viable for local administrations.

In particular, this is greatly evident in Modena that after having classified its municipal territory in homogeneous areas in accordance with the energy pressure and after having consolidated its energy database with an enormous effort, the plan does not pursue objectives oriented to area-level interventions and related spatial planning policies. On the other hand, it generically describes a number of possible measures to achieve greater energy efficiency and production from renewable resources. Concerning the municipal energy plan of Bologna, according to the categorization of urban areas subject to transformation in different energy basins (BEU), it has the objective of the containment of each urban areas' energy demand, although this perspective is not appropriately supported.

Unlike Bologna and Modena, the objectives of the Venice's MEP approximately follow the outputs of analysis. Hence, the plan presents an accurate data analysis of energy demand and supply combined with statistical data and urban dynamics per sector, with a focus on industry, transport and existing housing stock.

(2) The existence of a 'good' analytical phase and of a 'weak and standardized' Action Plan in Bologna, Modena, Venice and Trento.

Many municipalities have emphasized the importance of being able to measure progress and demonstrate results through long and costly process of collecting and analysing data. According to Bulkeley et al. (2009), acquiring more data and more local knowledge have neither strongly influenced the development of measures tailored to local needs nor maintain the appropriate focus on the development and implementation of urban policies.

The case studies make clear that municipalities tend to prefer policies that are feasible in the short term, where the necessary technology and technical component is predominant, as in the case of new buildings with high energy efficiency standards - completely forgetting that the existing housing, representing 40% of total energy consumption in the European Union, is the main source of emissions and has the greatest potential to increase energy efficiency - and where it can be relatively simple to take decisions and have direct control, as policies on municipal buildings and park vehicles.

The guidelines and the handbook developed by two research centres (ENEA and Ambiente Italia), were initially taken as a reference guide to draft an energy plan at the municipal level. Subsequently, these institutions operated as consultants for the local governments by developing in most of the plan. These quoted handbooks provide a common language and methodology that includes a cognitive stage, followed by a phase of implementation and management. Whereas these protocols have been the main catalysts and promoters, supporting the inclusion of MEP into the local tool chests, they have generally standardised the planning process in terms of procedures and solutions. The potential of “*localising*” (Bulkeley et al., 2009, p. 19) energy matters, linking policies and strategies with relevant local issues is missed. In the situations in which municipalities have had the ability to reframe energy questions as a ‘local’ problem this turned out to be a key factor for success.

(3) The weakness of the plan implementation strategies and tools in the four cases.

The research suggests that the appropriateness of energy plan implementation mechanism is critical. It is important to clarify that in Italy various public actors and various levels of government are involved in the implementation of municipal energy plans, and this results in a fragmentation in the way in which resources are managed and objectives implemented. It follows that the particular balance of powers that takes place between the different levels of government on the basis of a distribution of resources and expertise strongly influence the energy policy at the local level. Furthermore, local authorities can rely on a limited number of implementation strategies and tools and they have to deal effectively with the economic downturn that affects to a large degree their financial capacities.

The key actors are the state (retaining general regulation duties and fiscal and financial powers) and the regional governments (responsible for planning and land-use laws and the allocation of economic resources), which have defined the main implementation mechanisms in terms of financial instruments. These include economic incentives to promote the energy efficiency of new and old buildings and energy generation (especially photovoltaic and solar panel systems), as well as fiscal measures. Generally, local governments tend to encourage and persuade private actors in using national or regional subsidies such as those for clean investments, conversion of energy supplies and building insulation. Participative and collaborative schemes of close cooperation between public (local) and private partners seek to involve “the market” using fiscal approaches developed at other institutional levels. By doing so, social gains can be achieved at the local level although this can be only considered a final user, similarly to private actors. On the other hand, always in terms of effects, the risk of free-riders (those who would make the investment anyway without the grant) is considerably high and real (Ürge-Vorsatz et al., 2007) as demonstrated by the sudden construction of large photovoltaic plants on industrial and agricultural areas (Legambiente & CRESME Ricerche, 2010), sometimes generating conflicts on the use of fertile areas or for the impact of technical equipment on the landscape.

The local planning authorities generally use market shaping and market regulation tools, such as building codes and sustainable building regulations, based on condition-based regulation approach, in order to satisfy some conditions, and performance-based regulation to state the desired results. As previously mentioned, these typologies of policy tools have had paradoxical effects, especially when the plan objectives have regarded existing property rights. Economic and societal trends as well as lower operational costs, lower risk premium and potential higher rents have favoured the rise of investment in energy efficiency buildings (or eco-certified buildings) supported by higher standards in the legislation and building codes. Nevertheless, new construction rarely constitutes more than 1% of the existing stock of buildings and public actions have any significant impact on total greenhouse gas emissions. Differently, the public strategies about existing buildings appear weak, limited to enable private actors the knowledge and access to subsidies.

(4) The different attempts to include and integrate energy questions into a more general framework of urban governance in Bologna, Modena and Venice.

From a technical point of view, the crosscutting nature of energy, with full responsibility and a wide range of important matters to deal with, make it difficult to define one precise institutional place with all the necessary skills. As a matter of

fact, however, jurisdiction is limited and centralized in some municipal offices, and that is extremely difficult to involve all levels of government and all the different structures of the same administration that theoretically are required to promote integrated solutions. Consequently, the preparation of the energy plan is kept in a sectorial policy domain, which centralizes responsibility and expertise for the development of this plan in the areas of environment and energy.

This stresses the different attempts to include and integrate energy issues into a more general framework of urban governance in the municipal energy plans of Bologna, Modena. These attempts were processed in parallel to the revisions of the structural urban plans with the aim of integrating their analysis, objectives and strategies by adopting a new approach. Even Venice, although "*poorly*" (interview), has experienced the interaction between energy and urban planning in its own variant of the land-use plan for the area Campalto, in which the municipality has plans to incorporate bioclimatic criteria for the detailed plan, in terms of building energy standards and volumetric and functional incentives. Moreover, many Italian cities have undertaken the revision of building codes in order to include energy-performance requirements for new construction and substantial renovations, with the aim of regulating the energy aspect of building transformations and give application to the public strategies. Mandatory measures are aimed at reducing energy consumption and certification of performance in accordance with European Directives and national and regional standards, while voluntary measures refer mainly to good design practices, in terms of technical and construction criteria, typological and engineering rules. The municipal organizational units of Bologna, Modena and Venice involved in the drafting of municipal energy plan have directly coordinated (or are coordinating) the revision process of their building code, considering the crucial integration between the requirements of the urban plan and the municipal energy plan. Trento, however, has developed a set of regulations for sustainable building without any collaboration with the City Department for the Environment.

(5) The fragmented and confused approach of the municipality of Trento in addressing objectives as greater energy efficiency and production from renewable resources.

Trento seems to have suffered the unquestionable political, institutional and financial leader position of the Autonomous Province of Trento in the areas of energy policy and urban development. The example set by the municipal energy plan in this regard is interesting. Although the City Council was committed to structure its energy policy (really in part done, as we have seen), it knowingly waived his technical role, requiring a legislative and methodological support from the Provincial Energy Agency in the case a new impetus to energy planning is given through the instrument of municipal energy plan and / or the voluntary sustainable energy action plan. The theoretical and methodological framework is still considered, by officers and directors, doubtful and uncertain.

Moreover, due to the novelty of the instrument, the weakness of the legal framework and the lack of case studies to be considered as best practices, Trento has decided to be supported by Ambiente Italia Research Institute, not taking the opportunity to lead and manage the process. On the one hand, this has enabled the city of Trento to develop its own energy strategies earlier than other municipalities (in 1997), on the other hand, this has restricted the provision of tailored solutions to local matters.

9.2.1 Effectiveness, efficiency and policy integration criteria

In conclusion, the work turns to consider effectiveness, efficiency and policy integration criteria, in order to take into account the specific lessons that may be drawn from the cases.

Considering effectiveness, in the comparison of the survey results in Chapter 5 it emerges that a selection of municipal indicators constantly monitored by ENEA agrees with the general increasing in the consumption of natural gas and electrical energy in the last decades. In the short period the emphasis on conversion of energy supplies and introduction of technologies for the energy production from natural sources stimulated by the national policies (Conto Energia, a feed-in tariff) results in the installations, by 2011, of more photovoltaic plants than any other country in EU, causing the distortion of power market, and the increased number of solar panels. In this regards, table 9.1 provides more data about the variation between 2010 and 2011 of photovoltaic plants with respect to the power classes. The significant increase in 'industrial' plants is outside urban policies and strategies concerning energy but these are strictly financial operations supported by long-term contracts and FIT schemes. In confirmation of this, the Statistical Report by GSE (2011) puts the subdivision for sectors of current installation, highlighting that at national level, 65% of installed PV capacity is in industry, 13% in agriculture and the same percentage is installed in the service sector, and finally 9% in domestic.

In addition, the Statistical Report of ISTAT (Indicatori Ambientali Urbani, 2012) shows that municipalities have increased the production of energy from renewable sources: the installed capacity for photovoltaic reaches 2.4 kW per 1,000 inhabitants and it doubled over the previous year for solar thermal. Every 1,000 inhabitants, there are about 1.3 m² of panels installed on municipal buildings. This means that the municipal energy plan instrument barely influences the achievement of better energy performance of cities and shape the nature of energy demand and supply. Emphasis is posed on the self-governing approach which produces controversial results, and on the enabling approach that appears not very significant in the short term while hopefully produce good results in the long run.

Table 9.1.: Variation in Photovoltaics
% 2010-2011

Power Classes (kW)	n°	MW
1 < P ≤ 3	+79	+81
3 < P ≤ 20	+118	+127
20 < P ≤ 200	+210	+246
200 < P ≤ 1000	+323	+337
1000 < P ≤ 5000	+322	+400
P > 5000	+441	+270
Total	+112	+268

Source: Rapporto Statistico 2011, Solare Fotovoltaico, GSE (Gestore Servizi Energetici)

Concerning efficiency, the discussion on coherence and coordination in Chapter 3 and 5 shows that the municipal energy plan does not appear as an appropriate planning instrument to develop urban policy and strategies towards a better urban environment. Thus, as discussed in Chapter 3, objectives and institutional frameworks of urban governance should be adapted to and focussed on key local problems, taking into account linkages and trade-offs. In addition the standardisation of public actions and the general indifference for local peculiarities do not support both the economic efficiency of the measures and the process efficiency.

Policy Integration findings reveal why energy themes are relatively low on the agenda, with few opportunities to develop joint policy and appropriate and locally tailored implementation tools. It also explains why some cities have to date taken little action. In the midst of other pressing environmental, health and economic concerns, the issue does not have the traction or the support required to ensure that it is on the urban agenda.

9.3 Summary of main evidences: Part 3

Part 3 connects the recent Italian experience in energy implementation with property rights theory and stimulating market tools, framing them within the topic of urban development policies. It analysed and evaluated the novel plan implementation mechanism based on the assignment of additional land development rights (*bonus volumetrico* or *incentivo volumetrico* or *credito volumetrico*, depends on the regional legislations) in view of the inclusion of energy saving goals as a proper land management strategy and a property mobilization tool.

The innovations in tools and modes of land management are presented firstly in the international debate, focusing on devices based on a different approach to the relations state-market and public-private (in particular the tools using land development rights), and then in the Italian experience (the two planning practices: *perequazione* and *compensazione*). Studies carried out about International and national experimentations permit to identify the most recurrent elements of successful results that are the propositions on which to analyse the chosen application and related case studies.

The comparison of the reviewed Italian and international empirical researches stresses four main themes, representing the conditions under which the use of market of land development rights in view of greater energy efficiency and production can be efficient and effective:

- (1) local planning framework – these factors set out the needed institutional and political capabilities to appropriately collocate markets of land development rights into the existing planning and legislative framework;
- (2) social acceptability – these set the necessary context and approach to policy instrument elaboration and implementation;
- (3) land and property market efficiency – these elements define the circumstances that make profitable and feasible such a policy instrument;
- (4) environmental relevance – these factors consider the policy area in which this typology of instruments is intended to intervene, the achievement of greater energy efficiency and production from renewable sources in urban areas.

As in the previous part, the municipal level is preferred because it is a strong centre of local autonomy that retains jurisdiction over land-use plan and land-use regulation and potentially has a key role to govern energy as an urban issue.

The Italian (short) local experience is investigated by the application to the cases of the cities of Trento and Bolzano-Bozen, bearing in mind that the reward-based mechanism of the local government of Bolzano-Bozen is not fully developed.

9.3.1 Themes and elements of success

(1) Local planning framework

The local planning framework is firstly considered, in terms of leadership, coherence, integration and consistency. Needham and Hartmann (2012, p. 220-221) state that “*p[Public] authorities are empowered – within constitutional boundaries – to change property rights and impose or relax regulations. So, they always have options, between doing nothing and doing something. Even the libertarian perspective of reducing planning to a ‘minimum’, and let people themselves decide how to use their own land and property, requires a decision about planning, law, and property rights, namely regarding the definition and the initial assignment of the rights*”. Also Micelli (2002) puts emphasis on the crucial significance of the “*visible hand of public administration*”. He argues that, similarly to the markets for rights and environmental permits, the visible hand of administrations should take steps to establish the market rules and to promote its operation, reducing transaction costs as much as possible. The creation of a market of land development rights paradoxically requires significant managerial and administrative investments.

On the other hand, the research’s findings show a residual role played by the municipalities in this regards. This weaker position of city governance in comparison with the upper institutional levels appears as a consequence of the municipal-provincial administration interaction. Hence, the strong legal status of the two provincial institutions determines a set of coexisting areas of interest among urban activities, which have been displaced across the two institutional levels. The municipal reward-based mechanism of Trento is in competition with the provincial system and this naturally limits its real implementation, whereas the continuous transformation and improvement of the Provincial translation of the National Housing Plan limits the implementation of the municipal study carried out for the 2009 “Master Plan”.

In addition to this point but closely related to it “*the creation of property rights markets never aims to replace the plan’s traditional implementation tools, but rather to integrate the former to make the latter more efficient*” (Micelli, 2002, p. 150), creating that “mix” between planning and market which is required in accordance with Buitelaar (2003) and Needham (2012).

The synergy between different typologies of policy instruments, which shape, regulate and stimulate the market as well as foster the capacity building of actors involved, significantly influences the implementation phase. Although the combination of different characters and different operational paths should allow the public administration to consider a number of possibilities in view of a pre-determined goal. Both cases differently reveal a marginal interest in this planning practice. In the cities of Trento and Bolzano, the potentialities and the limitations of this market stimulating tools have not yet been fully understood, and this limits its use and integration with the tools available to municipalities, although the provincial laws seem to expect this. In this regard, the simultaneous preparation of the *Regolamento per l’Edilizia Sostenibile* with the revision of the density indexes of the land-use plan does not result in the identification of consistent and share visions of the future of the city. Moreover, the indifference of the incentive mechanism for any peculiarities of the urban settlement of the city of Trento undermines the achievement of those objectives that the government has set. Differently, the city of Bolzano has not developed any proper measure, different from that of the province, but it is limited to the issue of certificates of permission needed.

Consistency between planning goals, regulations and implementation mechanisms reflects firstly the appropriate identification of urban areas involved in the policy, secondly the design of sending and receiving sites and lately the definition of transfer rules by local authorities. The lack of consistency showed in case studies can be explained on the one hand, by attempts to take into account and reconcile contrary political aims that generally do not consider energy matters and, on the other hand, by the extraordinary nature of the national measure that influence the local public approach. Inconsistencies are also related to the lack of adequate and integrated municipal strategies to deal with energy efficiency and production from renewable. The analysis generally shows that there is insufficient relation between energy and spatial planning, and that implementation actions and mechanisms are largely inconsistent because of the multi-dimensional nature of energy issues. Furthermore, the reward-based mechanisms have been introduced within an already crowded policy tools context, without any considerations about the framework in which could better fit. Concerning the introduction at the municipal level, the Sustainable Buildings Regulation (*Regolamento per l’Edilizia Sostenibile*), despite the provincial implementation measure, includes a stable system, defining a more coherent document than the

usual building code, but, being a supplementary and voluntary planning guidance, has it an ‘exceptional’ character. Differently, the provincial administration of Bolzano has recently imposed new deadlines, changing approach from the previous approved provincial laws and decrees (2014 and 2019, respectively), whereas the position of the city planning authority remains stalled, waiting for a more stable provincial means to deal with this type of instrument.

(2) Socially shared goals

All authors argue that social acceptability is a necessary condition to make a step towards the real implementation of urban public policies. In view of a market of land development rights, the contribution of landowners, building owners and developers into the policy elaboration process is determinant. Precisely, the definition and the design of sites should happen through public-private negotiation under conditions of information transparency and public accountability (Camagni, 2011). Considering the case studies, the municipalities of Trento and Bolzano-Bozen, in neither case the definition and implementation of measures was shared with organizations, groups of stakeholders and shareholders and individual citizens. A response could be found in the interpretation that in both cases is put on the reward-based mechanism in their municipal territories. Administrations elaborate an incentive scheme in which the assignment of extra land-development rights considers neither land features nor applications on specific urban areas. In other words, the treatment of the ownerships of land does not take into account the current and legal status of the area, in order to classify it and attribute the building index. It follows that neither criteria nor methodologies that can guarantee the equitable treatment of property (Camagni, 1999a; Micelli, 2002; Stefano Stanghellini, 2010) are set. It should seem obvious that the extra land development rights, in the case of achievement of quality energy, can be obtained by the landlord or by the developer, do not have equal value throughout the territory of the municipality. This, therefore, varies, according to the theory of urban economy, in part for different spatial and positional variables. The definition of the areas, which should be relatively homogeneous in terms of economic and legal criteria, and the application of corrective factors have been considered as basic rules by many scholars. The non-application of any correction or determination of the incentive system, as proposed by Luigi Mazza in 2004 in the case of equalization, arise again problems long debated about the, so-called, unique building index (*indice unico*).

The cases show that a mechanism for obtaining a density bonus indifferent to land characteristics could create a surplus value that generates unfairness. In fact, this would give equal rights (density bonuses) to the holders of property rights in land quite different, and therefore differently appraised. The significant difference in income between suburban and central conditions – maximum of income in central area and minimum in suburban one – and between municipal and provincial measures, highlights the potential inequity of an equal approach to different conditions. Both Trento and Bolzano, at the provincial and municipal levels, did not carried out background studies, with the exception of the documents included in the ‘Master Plan’ of the city of Bolzano, with an analysis of the potential market in order to understand the local development and the land and building values at stake.

(3) Land and property market efficiency

The *conditio sine qua non* in order to make efficient market schemes based on the assignment of land development rights appears the generation of sufficient demand, low supply of development rights and high demand for bonus development (Boscolo, 2008; Jacobs, 1997).

This could be valid, firstly, in cases in which confined municipal areas are planned for development to the planning practice. Differently, the two cases reveal the inadequacy of both local implementations because no specifications were given in terms of spatial localisation. With the exception of areas expressly preserved for environmental and historical reasons, all the municipal territory is interested the growth pressure appears relatively low, due to economic downturn and stagnation of the construction sector.

Secondly, the TDR literature (Pruetz & Standridge, 2009) repeatedly points out that the opportunities to obtain additional development without the compliance to the bonus density system limit the chance to achieve the energy efficiency goals. Although the provincial and municipal systems cannot be combined (the owner or developer have to chose to which reward-based mechanism would like to apply for), the provincial authority of Trento allows density bonus – up to 25% of existing building’s volume - for interventions of demolition with replacement aimed at social housing. Given the choice and considering the higher density bonus, many developers would have additional development using features that enhance the value of their buildings in compliance only with the minimum energy efficiency requirements set by the provincial legislation rather than achieving higher performances.

Furthermore, the balance between the land development rights gained and their economic value has to be considered. Considering the upgrade of buildings, the choice of owners or investors is influenced by reduced holding costs (due to lower vacancy rates and higher tenant retention), reduced operational costs (due to energy and other utility savings), reduced depreciation (linked to the use of latest technologies) and reduced regulatory risks. In the absence of fiscal and economic incentives, the pay-back period, the period of time required for the return of an investment to "repay" the sum of the original investment, according to the Energy Efficiency Report, is 7/8 years and over 20 years in the case of heating and cooling conditioning and windows and opaque structures, respectively. In these conditions, it appears obvious that a reward-based mechanism has to make the investment more attractive by assigning additional land development rights, greater than or equal to the costs for the major renovation action. This implies that an efficient implementation should consider the possibility to assign different bonuses on the basis of economic (and energy, as we will discuss in the next point) criteria, in terms of correction factors. In contrast, the provincial laws and local regulations do not provide differences for the attribution of development rights whereas they suggest designating the areas following legal criteria and the zoning approach. Accordingly with the guidelines elaborated in the 'Master Plan', the city of Bolzano intends in the next future, in application of the provincial provisions, to limit the urban areas subjected to the reward-based system and define detailed planning rules. It follows that incentive schemes provide owners/investors of central city areas, where the market value is higher, with an economic encouragement to rehabilitate low performance buildings. On the other hand, actions in suburban areas, which mainly suffer from poor energy efficiency performance due to building and urban design conditions, have few chances to increase their attractiveness to landlord or developers. In addition, nor incentive schemes of the cities of Trento and Bolzano-Bozen nor those of the autonomous provinces of Trento and Bolzano-Bozen have systematically differentiated the delineation of additional property rights in respect of economic efforts in achieving the energy efficiency rating set by the mechanism. The energy-efficient renovation of a "G" level energy performance rating building to an "A"- rated performance one requires most significant financial resources than from "B" to "A", or from "C" to "A".

(4) Environmental relevance

The environmental relevance of the instrument appears, from the results of empirical cases treated, the most critical in respect to the themes here analysed and evaluated. This is due to five types of problems, which are then analysed.

Firstly, the impact of environmental issues is not the main purpose of the measure put into force first at the national level and then in various transpositions at the regional (provincial in some cases) and then municipal levels. Rather, this tool was created as an attempt to defuse the national economic downturn of a key economic sector in Italy, that is construction, providing incentives through the allocation of extra development rights for renovation activities of existing buildings. It is not absolutely clear, at any level, the real potential of a stimulating-market tool from the point of view of energy and for this reason the cases reveal many limitations in its use, just to achieve the objectives of energy efficiency of the existing stock. Additionally, the tool imposed on the regions and autonomous provinces was approved in the final document of the Conference State-Regions. Both form the government and the civil society as a measure by which could afford construction activity in exception to the provisions of the land-use plans. Ostracism at the municipal level is clear. This explains even clearer why this tool has remained completely isolated within the tool-chest of municipal government, and is not considered as a useful tool to implement and solve problems arise in municipal energy plans. As evidence of this, the delineation of the extra development rights did not provide background studies on existing building stock and annual building rate in order to consider the real condition of building energy market and the pressure of existing building to the maintenance of two fabrics and plants, the building age and obsolescence, as well as the construction materials and techniques.

Secondly, although the stock of existing buildings is very large and its energy performance is much poorer than new buildings and dwellings, the instruments analysed are still aimed at achieving energy efficiency for 'newly built constructions'. As a matter of fact, even if the instrument appears oriented to existing buildings the incentive schemes promoted both in Trento and Bolzano consider buildings until 2005. At the national level, according to the indications of Directive 2002/91/EC of the Legislative Decree no. Aug. 19, 2005, n. 192 of transposition of the EU Directive, the energy performance of buildings and their classification should be mandatory for every construction project. The city council of Bolzano already in 2002, has approved the first building regulations for environmental excellence in building introducing the procedure CasaClima, according to the protocols of the Autonomous Province, in particular the requirement for certification for any new construction, and the achievement of the minimum standard of "Class C". Even the Autonomous Province of Trento moved independently after the approval of the European directive 2002/91/EC with the development of a methodology for the classification of the energy performance of buildings. Subsequently, the

provincial law March 4, 2008, n. 1 (the provincial planning law) introduced in the provincial territory the obligation of energy certification of buildings. Furthermore, in addition to the law, it is known that the construction methods after the 1990s have been significantly improved concerning the energy performance of buildings.

It follows that a well thought out tool is not aimed at targeting the building stock more energy-intensive, but rather assigns density bonuses to buildings that most likely can get, or are very close to, the minimum standards set by law. In addition, the regulation of the town of Trento is not clear. It appears built on inspiration of LEED NC (New Construction) and LEED HOME protocols, in which buildings subject to renovation actions, perhaps with great works, are unlikely to have good scores, if not in the case of demolition and rebuilding.

Thirdly, the allocation of density bonus in both schemes is obtained in compliance with better energy performance levels (“A” and “B”) than those required by law (“C”). On the one hand, this might encourage owners and developers to continuous stimulation for technical innovation by boosting energy performance agreements for buildings. On the other hand, this may not affect low-income and low-efficient buildings but it could attract a large proportion of free-riders (not a cost-effective allocation of resources for government), "where incentives can benefit parties who would have applied the options anyway "(Beerepoot & Sunikka, 2005, p.25). Authors assert that was the free-rider effect looks like a windfall gain - "a situation comparable to having wind behind them, helping them in the direction they were already planning to take." In fact, both from a technical point of view and from an economic perspective, the main barrier of most buildings is to complete actions that enable the energy performance of the building to switch from a class “G” to a minimum class, the “C”. In fact, this should be the goal of this tool, alignment the building stock with a minimum level of energy efficiency performance.

Fourthly, despite the strong link between energy efficiency and production and its spatial dimension, the bonus-density allocation criteria do not take account, either in the provisions of the municipality of Trento or in those of the Province, of urban features such as building density, urban compactness, the availability of sunlight, and the presence of renewable energy sources. The effects in terms of urban reorganization and densification are not yet measurable and in any case do not seem important.

Lastly, the instrument does not, as previously mentioned, carry out any interaction and combination with financial incentives for the installation of solar panels, photovoltaic systems, and thermal insulation, such as those put in place both at the provincial level that national level. In the case in which the assignment of additional land development rights would vary based on the spatial characteristics of urban areas in terms of urban density, availability of sunlight and therefore potential for renewable energy, they could capture the differences and also modular the use and the real effectiveness of financial incentives.

9.4 Discussion of the results

The energy-sensitive urban planning and policies at the local level generally refer to a mix composed of the municipal energy plan, building regulation, financial incentives, non economic incentives, public-private partnerships initiatives as well as community policies and initiatives that differently take part to the local governance.

The research was aimed at analysing and evaluating the performance of energy-sensitive urban planning process and its implementation tools, especially by focusing on the municipal energy plan and the reward-base mechanism. A general description of the main elements is as follows.

Table 9.2.: The case studies and their policy tool chests

	MARKET – REGULATION TOOLS		MARKET-STIMULATION TOOLS			CAPACITY BUILDING TOOLS	
	Municipal Energy Plan	Building Code	Fiscal incentives	Reward-based mechanism	Non-financial instruments	Education Campaign	Demonstration Project
Bologna	Adopted	Done	Yes	Yes	Yes	Yes	Yes
Modena	Adopted	Done	Yes	No	Yes	Yes	Yes
Trento	Elaborated	Done	Yes	Yes	not used	Yes	Yes
Venice	Adopted	Under revision	Yes	No	Not yet approved	Yes	Yes

Source: author’ elaboration

The Municipal Energy Plan (MEP) is a local sectoral plan that aimed at regulating the municipal development and use of renewable energy sources within the ordinary urban planning instruments (*Piano Regolatore Generale*). This, with a view to greater energy efficiency and energy production from renewable sources, and taking a regulatory approach, affects decisions on properties by restricting the set of available choices. Connections with land-use plans are generally

weak, while stronger relationships are defined by the building codes, which intervene on the performance and design of buildings. Generally, this tends to develop implementation strategies by making use of a number of tools at different politico-administrative levels. Table 9.2 shows the complete tool chest for promoting energy efficiency and energy generation in urban areas.

Direct regulation for new buildings and those subjected to major renovations normally operate by means of standards for singular measures, such as minimum insulation levels for building components, or by means of standards for a general goal, such as the energy performance approach. Generally, in those regions that have already implemented the EU Directive 2002/91/EC, better known as "EPBD", building code is combined with building energy performance certificate requiring a minimum energy standards. To date there is no experience of the imposition of energy standards for existing buildings. Direct regulation of energy use in existing buildings has only been focused on buildings subjected to major renovation actions, which need a building permission. In addition, few municipalities have introduced a density bonus system (the reward-based mechanism) to support the energy efficiency of buildings and energy generation from renewable sources and, when this happens, it is mainly related to the regulation of building. The main objective of the introduction into the national legislation of this volumetric incentive was to stimulate private initiatives in order to combat the effects of the economic downturn on the building sector, rather than to develop an implementation mechanism able to support building refurbishment or urban regeneration with a view to energy efficiency improvement. Neither the National Housing Plan nor the specific definitions given to each measure in the subsequent regional laws define a system of actions carried out by individuals and coordinated by local authorities, but instead a series of measures addressed to single operations.

Compared with the measures already presented, financial incentives, namely taxes and subsidies, are more general incentive structures that assign and price liabilities. Through tax credits and subsidies, mainly the national and regional politico-administrative levels support clean investments, conversion of energy supplies, home insulation and so on, and the local level is limited to coordinate and integrate them into more general local strategies. Similarly, the municipality is an enabler in encouraging public-private collaborations oriented to partnerships and initiatives in energy generation systems and technologies and in the improvement of energy performance of public properties, building and vehicle fleet. In addition, community policies and initiatives provide adequate funding to municipalities for the performance of a number of capacity building tools, such as education campaigns and demonstration projects.

These are promising instruments in the hands of municipalities, but they are mostly concentrated on new buildings, while the challenge to be addressed is the energy efficiency of the existing building stock and existing urban areas, and these requires mobilizing private actors by using capacity building actions, such as educational campaigns and demonstration projects, as well as market stimulation tools.

9.4.1 Testing the research hypotheses

Three hypotheses were formulated on how to consider energy as an urban policy and how this would affect the performance of energy-sensitive urban planning responses. Here the expectations are compared with the results from the two empirical analyses carried out in this research.

Hypothesis 1: Governance versus government in energy planning

The first hypothesis was that conflicts and interactions between contemporary perspectives of planning would differently affect the response of public authorities to energy efficiency needs, influencing, on the one hand, the way in which local public actors structure the process and, on the other hand, the way in which the leading local role is exercised shaping local planning instruments. This turned out to be partly inexact, to a greater or lesser extent, in all case studies analysed and evaluated. Applying the framework that results from the combination of a policy analysis approach, recently proposed in the literature (Bulkeley & Betsill, 2005; Bulkeley & Kern, 2006; Kern & Alber, 2008) and a neo-institutional economics approach (Tiesdell & Allmendinger, 2005), what appeared are the unbalanced governance modes and the consequent not fully developed mix of planning, regulation and market. Hence, despite the evidences about the inefficiency and ineffectiveness of some approaches in addressing energy efficiency and production goals, rarely local governments have taken action in developing new local planning instruments. On the one hand, they have adapted existing government modes, such as 'by authority' and 'self-governing', on the other hand, local administrations have assumed a significant role as enabler in taking advantages from communitarian, national and regional initiatives. Local authorities tend to adopt a 'self-governing' model by appropriately governing their own activities, for example by improving of the

energy efficiency of their buildings and facilities. The implementation of measures of this kind can be relatively simple insofar as they intervene in decisional areas in which municipalities have full responsibility. Similarly to many countries, the majority of climate protection measures are, also in Italy, concentrated on initiatives of this type, highlighting examples of noticeable administrative capacity. Secondly, as enabler, city governments co-operate with non-public actors, encouraging and facilitating voluntary actions undertaken by businesses and citizens, by making use of EU funds or, mainly, national and regional financial incentives. By developing demonstration projects on renewable and efficiency energy – e.g. making use of EU or state funds – the public administration can demonstrate the financial soundness of these measures but, on the other hand, it does not really assume a leading role. Finally, the use of traditional command-and-control forms of authority, such as statutory planning, building code and the use of sanctions, it appears no longer effective in orienting actions, changing behaviours, and stimulating the market. Regulative mechanisms have been introduced into the building codes of many cities by means of performance requirements relative to building quality standards and energy efficiency, both for new constructions and the refurbishment of existing ones. Mechanisms consist in compulsory as well as voluntary measures, and include binding standards and in-kind incentives.

Hypothesis 2: Rhetoric versus reality in energy planning

The second hypothesis was that the increased awareness of environmental issues and the shift in demand for energy efficient sectors would boost novel voluntary forms of local responsibilities, influencing the way in which authorities tackle with the issues of energy consumption and greenhouse gas emissions. This was partly confirmed in all case studies, both concerning the municipal energy plan and the reward-based mechanism, in particular concerning the role of local administrations as enablers. The disseminations of information and best practices, the suggestions of voluntary certification schemes and the encouragement of experimentation and innovation have contributed to raising environmental awareness in the citizens and in the private actors that can actively participate in achieving public goals. The research shows that frequently legislation or direction ‘from above’ requires local governments to ‘enable’ other actors to take action directly for the public good. Community Initiatives, for example, – namely projects and programmes, such as the Covenant of Mayors – have a positive influence, acting as a “catalyst” for the spreading of environmental issues, accelerating the local actions. In addition, national and regional financial instruments have been strengthened by the coordination and local support assured by municipal offices and local energy service companies, providing also innovative financing methods seldom thanks to the combination between different technical and economic expertise and economic and fiscal tools. However, awareness does not necessarily lead to action and to its effectiveness and the enabling activity might be incorrectly (inadvertently?) oriented not to those who have the greatest ability and capacity – in terms of potentiality of GHGs abatement - to influence the externality reduction but it can benefit actions that would be applied the option anyway. In other words, the free-riders problem exists in all countries that are experienced in sustainable/green housing and Italy is not an exception. Local governments are not able to manage this phenomena.

The development of the recent reward-based mechanism can be the chance for a more proactive role played by the municipal administration. Theoretically, this pro-market tool could stimulate private initiatives with additional land development property rights, used as incentives. Making the renovation activities more attractive and rewarding can stimulate developers and owners to ‘want to’ do them. It requires an effective involvement of municipality as enabler, focusing on its power to allocate property rights, exercised through the land-use plan. The land development right (buildable volume expressed by the Building Index) can be only the result of a planning instrument that shapes the *ius aedificandi*. The potentialities to intervene in the most energy consuming and demand sector are strong and clear, but they remain, as the case studies of Trento and Bolzano show, only on the paper.

Hypothesis 3: Role of local spatial planning and land-use management strategies in achieving energy efficiency goals

The third and final hypothesis was that the local spatial planning and land-use management strategies would not be completely involved in achieving energy efficiency goals. This was confirmed, with a few distinctions across Italy. A first consideration concerns the integration into the local spatial planning process of energy efficiency and production goals, recognising the close correlation between energy performance and spatial features of urban settlements. The connection between single legal provisions, policies and implementation tools within a common framework, which considers both the influence of urban factors on energy performance and the availability of local resources, and how they affect land uses in most cases is missing. Generally, energy-sensitive urban plan is still considered a sectoral plan that

does not affect the urban policy and development strategies, with the exception of the cities of Bologna and Modena. The Italian energy planning process remains anchored to a traditional and sectorial approach, not addressing the complex relationships between urban environment, energy supply and use and environmental consequences. The formulated policies have often been developed without an integrated urban planning framework. Local administrations maintain the emphasis on policies that are feasible in the short term, mainly oriented to mono-disciplinary and technical focuses, in which the required technological expertise are predominant, such as the policy area of new buildings with high energy efficiency standards, and in which it is comparatively simple to take decision and have a direct control, such as policies regarding municipal buildings and vehicle fleet. Correspondingly, long-term perspectives, such as land use and transport planning, are not well integrated into the existing planning tools.

A second consideration concerns the inclusion of climate change control and energy saving goals in planning implementation mechanisms. The results of the case studies highlight that there are weak connections among Municipal Energy Plans, building codes, mandatory building energy performance certificate and land-use plans. Moreover, financial strategies, developed mainly at national and regional level, are not appropriately connected to local urban policies and planning measures. The reward-based mechanisms introduced by the national legislation have proved ineffective in regard to their main goal, namely economic development, but they exhibit potential for the pursuit of urban energy efficiency. The key issue is the possibility to mobilize the market. The process of including energy goals in spatial planning and urban policies requires tailor-made solutions able to encompass the legal, economic, and social aspects of energy. By contrast, national and regional laws provide standardized procedures, and as a result, municipalities – which represent strong centres of local autonomy – operate with great difficulty. Despite the potential of the local level in appropriately responding to the climate-change and energy-saving challenges, the use of innovative land-use based mechanisms has yet to be fully implemented and further research is needed.

After discussing the expected outcomes of the research, in order to further understand the findings of the research, the answers to the research questions are the following.

9.4.2 Answering To The Research Questions

Question (a) What actions at the local level are being taken in response to energy efficiency matters in cities, and what are the main obstacles to achieving carbon savings, using the Italian municipal energy plan as example?

Question (a.1) Would this planning approach be likely to produce an effective, efficient and integrated response strategy for reducing global greenhouse gas emissions in urban settlements?

The discussion on effectiveness, in terms of environmental relevance, in Chapter 5 shows that the municipal energy plan, and in more general sense the Italian energy planning process, may not be perceived as having been successful given energy efficiency and production objectives as priorities. Although the analysis and evaluation are aware that the environmental relevance of these municipal energy plans and their implementation mechanisms are difficult to ascertain because of long period considered (and the majority of the plans have been adopted few years ago). The long-standing influence of other local urban policies suggests that they have not a significant role in shaping the nature of energy demand and supply. Neither land-use plans nor transport plans have been considered pivotal planning instruments in achieving crucial public goals such as the reduction of GHG emissions and the building of shared knowledge and awareness between administrations, planners and practitioners on how the geometrical and physical features of urban settlements contributes to demand and consumption of fossil sources.

As described and discussed in Chapters 4 and 5, the energy-sensitive urban plans – in general, considering their seeming variety – are mainly oriented to suppose buildings as self-defined entities to which direct their efforts and, what is more problematic, to focus on the new constructions. In Italy the annual newly built production is roughly 0,5% of the existing residential building stock and it has seen a growing policy attention from the introduction and implementation of EPBD European Directive. Although the stock of existing building stock is very large in Italy and its energy-saving potentials has been recognised in all municipal energy plans analysed, most regulations and instruments, therefore, are still aimed at achieving energy efficiency of new constructions. There is little doubt that capacity building tools such as education campaigns and voluntary certification schemes have boosted energy efficiency of new buildings and the consequent technological innovation of construction sector, influencing a large national debate and increasing awareness on the necessity to build new housing and office with high-energy performance. On the other hand, this does not affect the real effectiveness of public actions.

Moreover, Chapters 4 and 5 clearly illustrate the effects of the emphasis on a self-governing approach of the municipal energy policies, able to increase the energy efficiency of municipal operations, through retrofitting buildings or through improving the energy efficiency of appliances used by the municipality, especially with respect to the opportunity to install active solar technologies such as solar panels on municipal building roofs. For a number of reasons related to the national context, the use of photovoltaic panels on municipal buildings has not had the expected results.

Concerning efficiency, Chapters 4 and 5 found that the municipal energy plan and the energy-sensitive planning model are inappropriate. It is recognized that objectives such as energy saving and the reduction of fossil fuels in urban areas are affected by a number of urban policies, that makes policy coherence essential.

Coherence and coordination between public actions are required as well as a close articulation, theoretically.

In respect to the policy sector analysed in this research, policy coherence implies that municipal energy plan, land-use plan and building code “go together” because they should share a set of ideas, strategies and objectives. Actually, they mainly do not this, with the exception of Bologna, but they limit to elaborate and develop different mandatory planning instruments without seeking a situation in which they overlap and “have a dialogue”. Furthermore, the linkage inside the municipal energy plan between objectives, actions and modes of plan implementation is less clear and, in some circumstances, is weak. All the cases analysed show similar actions and similar strategies for the implementation of the Action Plan, not in complete accordance and relationship with the objectives and actions elaborated. The “standardization” of local responses to energy matters can be attributed, on the one hand, to the novelty of policy area and the effects of applications of national protocols and, on the other hand, to the limited number of implementation tools at disposal of local governments. Thus, in addition to the above-discussed the self-governing approach, oriented to consider local governments as energy consumers, through enabling and governing by authority seem those overused.

It is perfectly clear that the choice between objectives and actions is in close relationship with the set of tools locally provided. Considering the economic downturn, and the consequent limitation of financial resources, as well as the lack of knowledge and willingness to experiment new approaches and new methods, the set of choices decreases. This results in the limitation of the role of city authorities in shaping local energy scenarios. The mix of policy tools to implement the municipal energy plan consists in regulatory (such as the building code), economic (such as subsidies and tax reduction), communicative and educative (information and publicity campaigns), and organizational instruments. Regulation in view of general goals can stimulate innovations in that it encourages firms to find cost reductions in meeting the goals: for example, by developing new, more cost-effective, energy-saving measures. However, this type of regulation still does not provide a continuous stimulation for innovation to perform better than the standards. Beerepoot and Sunikka (2005) find that this disadvantage could be partially overcome by regular tightening the standard. However, in the Italian cases no long-term ambitions are formulated when the energy performance standards have been introduced.

Considering the production from renewable sources, the city authorities take a role as enabler, boosting public-private partnerships and the engagement of local stakeholders in demonstration projects and education campaigns, and as consumer, acting on own properties. Then, although monitoring and evaluation of the outcomes and effects of planning and policy are recognized as fundamental parts of the mainstream planning, they are here underused and overlooked. Part of the cases considers them rhetorically but not actually carries out them and others do not even include them into the planning process.

Lastly, the participative governance approach applied to all the cases means, from the citizens’ perspective, no more than just participation. It is oriented neither to built consensus, nor policy integration, nor “win-win” solutions. Thus, it does not include collaborative implementation by citizens but mainly phases in which local governments look for public-private partnerships or getting private actors to take over public tasks.

Policy integration discussed in Chapters 3 and 5 regards the concepts of horizontal and vertical policy integration, within and across governmental levels. Horizontal policy integration refers to cross-sectoral measures and procedures by the government, or a governmental body, whereas vertical integration refers to the integration of energy policies into a specific sector. Although making generalizations can run into a number of undesirable oversimplifications, evidences suggest that both horizontal and vertical integration is critical, no case studies have developed temporary project coordination units and this has influenced the achievement of joint policies. Concerning horizontal integration, the cities of Trento and Venice actions were limited to the definition of objectives in their own administrative planning (*Relazione Programmatica Provisionale*) whereas Bologna and Modena have also clearly identified the political and technical people in charge, the public officers and other departments involved. Neither local government has assigned financial resources to these objectives/programmes, making difficult the real development of own strategies and policies.

If vertical integration, with a certain approximation, is represented in view of centre-periphery municipal organization, findings reveal three different behaviours within the municipalities. The first case, well represented by the local administration of Modena, consists in a full risk-taking by locally elected councillors to whom are assigned, nominally, the achievement of objectives and programmes and that guide the technical sphere. Secondly, with a completely different

approach, both Bologna and Trento share the risk between the political and technical sphere. Whereas the local government of Bologna strongly integrates the political component with the technique one, resulting in a harmony of objectives and programs, Trent suffers from the risk sharing, for a very specific institutional context, and this does not seem very balanced. Lastly, the case of the Venetian Energy Agency AGIRE, shows that there may be a strong technical direction in the absence of a full assumption of risk by the political sphere outsourcing the implementation and revision of municipal energy plan to a non-profit organization owned (in part) by the city of Venice. Although the public administration maintains the coordination of the plan, AGIRE has the full mandate to monitor and implement energy and environmental strategy of the City of Venice.

Policy Integration findings reveal why energy themes are relatively low on the agenda, with few opportunities to develop joint policy and appropriate and locally tailored implementation tools. It also explains why some cities have to date taken little action. In the midst of other pressing environmental, health and economic concerns, the issue does not have the traction or the support required to ensure that it is on the urban agenda.

Question (a.2) What barriers lie behind the inertia regarding energy efficiency and low carbon supply of energy-sensitive urban planning process?

Scholars increasingly recognize that the strength of adopted plans is not necessarily correlated with the implementation of their contents, and that research is needed to understand the degree to which policies are being implemented after plans are adopted. The barriers to the implementation which are mostly recognised in the literature are related to four distinct but overlapping themes. The policy tools at disposal, the policy process, the policy implementation tools and the technical and political capacity and competency of local authorities clearly emerge as the main reasons for the weakness of local energy planning instruments from the main disciplinary traditions.

The discussion on barriers in Part 2 and in particular in Chapter 5 generally confirm them and shows that the institutional capacity, namely a strong public leadership and the ability of public administration to learn from experience, the policy integration and consistency into the policy process as well as the weakness of implementation phase, are considerable limitation to the efficiency and effectiveness of municipal energy plan and, in general, planning and policy responses to energy concerns.

In the comparison of the findings in Chapter 5 it emerges that some cities have been able to take advantages from the considerable experience in energy and sustainability through a number of innovative projects and initiatives since 1980. The promotion of the process of Local Agenda 21 in Italy, the Aalborg Charter as well as other international and national networks, such as ICLEI, results in a continuous process to improve the available tools, such as municipal energy plan, and to adapt to the local context. On the other hand, other municipal governments seem not to have learnt by doing, limiting in this way their own capacity to deal with complex and uncertain processes, as are the environmental ones. Certainly, the relationships between this and the political and technical leadership are clear.

Inserting the energy as a problem in municipal agendas (the phase of the policy process generally called agenda setting) has allowed some cities like Bologna and Modena to catalyse national and international opportunities in terms of projects, campaigns and awards to pursue innovative actions and to build policies with long-term visions. On the other hand, Trento seems to have suffered the unquestionable political, institutional and financial leader position of the Autonomous Province of Trento in the areas of energy policy and urban development.

Generally, in contrast to the exceptional innovation of a few plans, most local planning authorities have been externally supported by two research institutes that have been the main catalysts and promoters of two standardised methods for the development of the Municipal Energy Plan. It follows that these local administrations have been not taking the opportunities to lead and manage the process. However, from a technical point of view, the cross-cutting and multi-scale energy concerns, corresponding to a wide range of relevant issues to be addressed, would make it difficult to find accreditation in a unique and specific institutional site that has all the needed skills. As a matter of fact, the jurisdiction is limited to some central and municipal offices, with extreme difficulty in involving all levels of government and all the different structures of the same administration, theoretically required to promote integrated solutions. Consequently, the drafting of the energy plan and the planning of energy types was kept in a unique policy domain, which centralizes the powers and responsibilities generally in the environment or energy sectors. They usually have to do with a whole range of environmental issues and where the demands of the multi-disciplinary, the political leadership and financial resources may be limited.

As a result of the weak political and technical leadership and the limited capacity to improve by experience, Chapters 4 and 5 found that the relations between the proposals of the plan and the results obtained from the reconstruction of the historical evolution of supply and demand of energy has not always been successful. Many municipalities have

emphasized the importance of being able to measure progress and demonstrate results - a complex endeavour - through long and costly processes of collecting and analysing data. The focus on technological challenges such as acquiring more data and more local knowledge have not, on the one hand, strongly influenced the development of measures tailored to local needs, and, on the other hand, "*may distract from the deeper challenges of building local capacity to develop and implement policy to which we now turn*" (Bulkeley et al., 2009, p. 13). Increasing energy efficiency, switching from fossil fuels to renewable sources, reducing energy demand (in buildings and transport) are generally indistinct from context to context, particularly in those prepared by following national protocols.

Fundamentally, the analysis of case studies highlights the major difficulties in defining the problems and the identification of causal relationships between the nature of the problem and the actions to be addressed. Also in those cases in which the analysis phase has proposed innovative methodologies, able to recognize the influence of local conditions for the energy supply, urban policies do not attempt to govern interdependencies, that is the simultaneity of the processes connected to the multi-dimension feature of energy efficiency, and are not even designed in accordance with the attributes and priorities.

Then, Chapters 4 and 5 illustrate that the involvement of various public actors and various levels of government creates a certain fragmentation in the way by which resources are managed and objectives implemented. The results of case study analysis reveal the lack of public resources at the municipal level and the difficulties of promoting 'green' urban regeneration processes. Generally, the key actors are the state (retaining general regulation duties and fiscal and financial powers) and the regional governments (responsible for planning and land-use laws and the allocation of economic resources), which have defined the main implementation mechanisms in terms of financial instruments. These include economic incentives to promote the energy efficiency of new and old buildings and energy generation (especially photovoltaic and solar panel systems), as well as fiscal measures. It follows that the energy policy at the local level suffers from a particular balance of power that takes place between the different levels of government on the basis of a distribution of resources and expertise.

The combination of implementation instruments developed at different level can be considered most effective for new constructions and energy generation – in particular photovoltaic and solar panel technologies. In terms of effects, the risk of free-riders (those who would make the investment anyway without the grant) is considerably high and real (Ürge-Vorsatz et al., 2007) with the sudden construction of large photovoltaic plants on industrial and agricultural areas (Cresme & Fondazione Housing Sociale, 2011), sometimes generating conflicts on the use of fertile areas or for the impact of technical equipment on the landscape. Completely different, as previously debated, the impact of these measures on the mobilization of low-income householders, and the 'green' refurbishment of old buildings.

Moreover, the discussion on the implementation tools in Part 2 shows that the limits to translate the actions into real outcomes concern also the nature of the implementation tools available. In general, these rely on a key role of the public administration in replacing the market and correcting its failures – what are called negative externalities – through authoritative tools in form of regulation, as well as taxes and subsidies, in accordance with the Pigovian approach.

As discussed about the efficiency of municipal energy plan in answering the previous research question, the local planning authorities generally use market-shaping and market-regulation tools – such as the municipal energy plan and the building code – when it is recognized that market failures would prevent economic instruments alone from achieving the objectives of the energy or environmental policy. These typologies of policy tools have not had the desired effects, especially when the plan objectives have regarded existing property rights. City authorities are in a unique position to engage local stakeholders and design locally tailored implementation strategies in accordance with specific local priorities and context and this capacity is evident in extraordinary projects carried out by Modena and Bologna about energy production and municipal buildings. Local administrations generally maintain the emphasis on policies that are feasible in the short term, in which the required implementation tools are those at disposal, such as the policy area and tools for new buildings with high energy efficiency standards – completely forgetting that the existing housing stock, which accounts for 40% of the total energy use in the EU. In fact, command-and-control regulations are generally effective for new buildings in the cases in which they are followed by an on-going inspection programme (Ürge-Vorsatz et al., 2007), while these appear – in part - ineffective for improving old inefficient buildings.

Question (b) Does energy-sensitive planning require new methods based on public-private partnership and how can this market stimulating policy approach contribute to the environmental relevance of local actions, using the reward-based mechanism as example?

Part 2 Illustrates the limitations of current governance approach mainly based on regulation and fiscal and economic incentives. The main limitations were found when it is necessary to intervene on situations in which the real powers of

government are lost, considering that expropriation is no more economically viable and socially acceptable, and the controversial effects of national and regional incentives to improve both the building envelope and the technologies for the production of energy.

Considering the findings of Chapter 5 and the international debate on new planning approaches, Part 3 discusses the introduction of new planning practices making use of the assignment of additional land development rights.

At this point, however, it is necessary to distinguish between the potential of this tool and the actual use of the same in the cases analysed in Part 3 and in particular in Chapters 7 and 8. The point (b) poses questions about the actual introduction in Italy of this tool properly oriented to renovation actions of existing buildings and that claims to (c) treat the real potential of planning through property rights and will be largely discussed in the final Chapter 10.

Question (b.1) Is stronger market intervention possible and necessary for improving energy efficiency and supporting energy generation from renewable sources in the existing urban areas in Italy?

On the one hand, Part 3, especially Chapters 7 and 8, found that the real introduction of market intervention with the existing conditions is different. On the other hand, the evidences of the empirical analysis partly confirmed the necessity of introducing market intervention stronger than the existing one for improving energy efficiency and supporting energy generation from renewable sources in the existing urban areas in Italy.

Understanding if a stronger market intervention is possible, Part 3, namely Chapter 6, illustrates the evaluation criteria generally pointed out in the literature and the conceptual framework adopted in Chapter 8 for the case study analysis. Webster & Lai (2003) argue that socio-political (political will and public support) and technological (demarcation, administration & enforcement of access rights) are significant criteria under which is possible to evaluate the market. Buitelaar (2003) states that efficiency in terms of time and money, effectiveness in achieving goals and low transaction costs are necessary elements and, in 2007, the author adds institutional innovation, notably the organisation of a market.

Needham (2006, p.14) affirms that efficiency and equity criteria should be supplemented by one more third criterion, namely the effectiveness in realizing the policy goals, since the criteria of efficiency and equity do not take into account the fact that the land-use control system is being applied to achieve certain planning and policy goals.

Accordingly, the conceptual framework further elaborated the efficiency, effectiveness, equity and low transaction costs criteria in four themes and eleven elements indicated by the literature as determinant. The local planning framework should be investigated in terms of leadership, coherence, integration, consistency and stability, while the social acceptability theme has to focus on the realisation of socially shared goals and distribution equity. Concerning the land and property market efficiency, the balance between supply of development rights and bonus development demand and the balance between the right gained and the economic value of the incentive are to be evaluated. In addition, about the environmental relevance of the measures, namely the effectiveness in achieving goals, internal coherence at building scale and at urban scale are considered necessary to appreciate the capacity of this approach in influencing and shaping the energy demand and supply.

Comparing the results of the case studies in Chapter 8 it emerges that the implementation of regional measures into the municipal level has been not so obvious. Although municipalities should heavily condition the elaboration and the real implementation of such policies by establishing the market rules, facilitating, supporting and encouraging private sector to act for public purposes, the existence of local incentive schemes does not result in a greater efficiency, effectiveness and equity of public strategies and actions.

In the cases in which a fully developed reward-based mechanism has been elaborated, Chapter 8 found a low interest in the new practice, as it is evident by the small amount of additional development rights recognized and in the large competition between institutional levels about incentive schemes. On the other hand, the uncertainty of regional and provincial bodies has significantly interfered with the development of coherent municipal regulations, causing situations in which local progresses are weak and mainly referred to fiscal and economic incentives. Considering the economic efficiency, the attractiveness of an investment project can vary considerably in relation to the locational quality of property and its status, but the influence of government intervention by introducing stimulating market tools does not succeed in making the actions of private investors sufficiently feasible. The density bonus provided by local authorities is too weak to obtain economic benefits or, at least, completely cover the costs, with controversial effects on the distribution equity of additional land development rights.

Furthermore, as discussed in Chapter 8, the assignment of additional development rights has not been determined in relation to the building age and obsolescence and does not consider urban or district scale regeneration interventions. In other words, despite the large inefficient existing building stock, the energy performance requirements associated with the density bonus are not well balanced and better support interventions of building demolition with replacement and

building refurbishment with greater density bonuses are assigned than for refurbishment practices. In addition to these considerations, the allocation criteria of bonus density does not consider, both in the provisions of the municipalities and in the Provincial ones, urban features such as building density, urban compactness, the availability of sunlight and the presence of renewable sources of energy. The effects in terms of urban reorganization and densification are not yet measurable and in any case do not seem to have been assumed as important ones.

What Part 3 illustrates is that no attention has been held on the real significance and implication of planning through additional land development rights. This follows that the findings indicated in Chapter 8 raise some questions about what preconditions would be necessary to create in order to make the market work. They are four main preconditions with a number of subsequent ones, as follows.

1. *Transparent and complete information in the market:*

- a. Local administration should enhance on-going information exchange, in particular between citizens, owners, developers and stakeholders, that have to be necessarily involved into the process of creating a market;
- b. With the goal of transparency in the process of treating the different properties involved, it should be determined useful to distinguish the land designated for conversion in terms of its economic, physical and legal characteristics;
- c. Transparency and local accountability with respect to contracts, procurements and liability.

2. *Large number of buyers and sellers trading identical products:*

- a. The reference scale and situation of the market scheme: actions on existing buildings considered as self-defined entities or on reconstruction areas? The choice of limited areas subjected to the incentive mechanism into a more coherent and comprehensive public action could result in an increase of demand, limiting the supply.
- b. The definition of criteria for the assignment of extra land development rights. Webster and Lai provide an answer to the question of how any particular assignment of property rights may be judged as being less or more efficient: *“the technical answer to the question is founded on common sense: rights to a resource should be assigned to those in the strongest position to influence the resource’s contribution to the desired outcome”* (Webster & Wai-chung Lai, 2003, p. 8). For, *“assigning property rights over a resource makes the resource owner a residual claimant of benefit (use and income) generated by that resource and encourages efficiency – increased efficiency means private gains”* (Webster & Wai-chung Lai, 2003, p. 9). This statement supports both arguments about economic efficiency and environmental (energy) effectiveness, while concerning distributional equity, the assignment, basically, in accordance with Micelli (2002 and 2011) and Camagni (1999 and 2011), should treat different situations in different ways, not by applying a unique building index on the whole municipal territory.

3. *Complete property rights regime: resources have to be privately owned, rights tradable and enforced.* As a matter of fact, Webster and Lai (2003, p.173) point out *“if information is not perfectly distributed and transaction costs are not zero, then the outcome for any externality problem depends on the distribution of property rights”*. The limitation about the use of the property rights here assigned in addition in order to stimulate the private activation probably need to be revised.

4. *Low transaction costs (with an effect on the profitability of any actions):*

- a. Creation of informal institutions to overcome the fragmented landownership and building ownership structures and the high transaction costs correlated;
- b. Evolution of existing institutions and their organizational structures in order to minimize the transaction costs associated with the exchange of land development rights or property rights;
- c. Elaboration of locally tailored land development rights and property rights arrangements.

The limitations of the current planning practice through the assignment of additional land development rights and the barriers to the implementation of existing mix of energy-sensitive urban planning and policy highlighted in Parts 2 and 3 show that the attention should be directed towards co-evolution of the state and markets, as they put it:

“Our position in this respect is that state and markets co-evolve, complementing each other and, by trial and error, discovering better ways of distributing responsibilities between private and public sector and between private and collective action”. It is necessary and possible to make a stronger market by avoiding the polarization between ‘market’ and ‘state’ and considering the real potentialities of designing a fully developed mix of them.

Question (b.2) How can the design of new practices, which replace the traditional command-and-control planning mechanism, affect the effectiveness and the efficiency of the energy planning process?

Improving energy efficiency in existing buildings is largely considered to be one of the most cost-effective ways of cutting carbon emissions. This requires investments in envelope insulation and new up-to-date appliances. It is also reported that the majority of environmental policy instruments, which are currently introduced in OECD countries target the new building sector, and that policy instruments for the existing building sector are relatively underdeveloped.

Changing existing situations and existing rights is difficult and could cost a lot of money. As a matter of fact, the person or organisation that owns properties are entitled to determine how they are used and redeveloped within the limits that are set by land-use regulations and within a number of other limits, determining lock-in situations (Hartmann & Needham, 2012).

In accordance with the approach applied in this research, one solution highlighted in the literature (Needham, 2012 following Thompson, 1997) is the reduction of inflexibility of planning by creating property rights which are adaptable to changed conditions. The assignment, therefore, can be crucial in this process and can support the achievement of greater environmental relevance and efficiency of the energy planning process.

This is what has been applied (or, better, has been sought to apply) in the Italian case when the use of additional land development rights has come into force. Thus, although the limitations discussed in Chapters 8 and 9, the introduction of a reward-based mechanism into the Italian legislation and the implementations into the following regional and local implementations are oriented to take actions in regard to the large existing building stock and to increase awareness of the necessity to focus public and private strategies on this.

In the light of this, some questions can be reconsidered, such actions.

Firstly, landowners or building owners rarely take the initiative to (re)develop a site or building that have become obsolete. One of the main reasons is the lack of financial capacity of landlords to activate redevelopment actions that could be overcome by the assignment of additional land development rights. These, in theory, should correspond to a building value similar or greater than the costs of private initiative.

Two side effects result in such an incentive scheme. In addition to the financial capacities and building and land-use regulations, the insufficient willingness to improve the building's quality by owners is also related to the market value of the building. Since the market value of a building does not depend only on the characteristics of the building itself, but also on the quality of the surrounding buildings and the neighbourhood, less well-maintained surrounding properties define a smaller return on maintenance and renovation expenditures. This becomes an incentive to spend less for improving building quality (Vickerman, 1984). Some authors refer to the "prisoner's dilemma game" originally formulated by Merrill Flood and Melvin Dresher in 1950. In the prisoner's dilemma game there is the paradox that individually rational strategies lead to collectively irrational outcomes. It is a game, in which two players may each "cooperate" with or "defect" the other player. No matter what the other player does, one player will always gain a greater payoff by playing defect. Since in any situation, playing defect is more beneficial than cooperating, all rational players will play defect. In the logic of collective action (Olson 1965) - individuals in any group attempting collective action will have incentives to "free ride" on the efforts of others if the group is working to provide public goods. This is also evident in the case of many owners and fragmented ownership structure in the same building or land where there is a collective action problem. It follows that an increase in the cost of transactions is likely.

Secondly, despite in a slowly way and with the limitation illustrated in Chapters 8 and 9, the role of public administration in achieving public goals is shifting from regulator to enabler. It is obvious that the novelty of this planning practice cannot already have strongly influenced it, but the process has begun, also in consideration of equalisation and compensation practices, more experienced and more widely spread across the peninsula. However, as the results of the interviews with civil servants in the case studies presented in Chapter 7, the deep mistrust between "market" and "state" or, better, between "market" and "planning" is still there, but the preliminary outcomes (sometimes incomplete) could boost the awareness about market stimulation tools in local governments.

9.5 An alternative approach: the spatial planning through property rights

From a property rights perspective the answer to those market failures (energy inefficiency) might be found in the re-delineation and re-assignment of property rights. The question here is about changing/managing existing property rights and, probably, creating new ones. It is necessary to change the market structure, creating saleable property rights which could be exchanged between areas and between owners and developers. This form of market structuring has already taken place in the United States, in the form of transfer of development rights (TDR), and also in Italy with the equalisation planning practice (perequazione). The creation of appropriate property rights for dealing with energy efficiency goals in existing building stock has not taken into account yet. As previously discussed, the reward-based mechanism assign land development rights that can partially work, having significant limitation in their definition and in

the delineation of their market. Firstly, it is necessary to define the meaning of property rights in the property rights theory and, more specifically, in the Italian legislative system and in view of energy efficiency renovation actions, then, the way in which it is possible to create a market of them have to be approached.

This section will discuss the following question and sub-questions, posed in the Introduction to this research:

(c) Considering the unsuccessful attempts in achieving desired goals, how is possible manage existing lock-in situations by applying a property rights approach in terms of policy tool, and where and when the application of the rights system makes sense, using the renovation of existing building stock as example?

c.1 What are the conditions under which the assignment of extra land development rights can delineate an efficient and effective market, besides political will?

c.2 What should be the mix between planning, regulation and market in saleable property rights and how and by whom the market should be structured and managed?

9.5.1 Property Rights in Land

Legal language: property rights in land as tools

Using a legal language, property rights in land can be defined as a relationship between people – the person holding the right and all others - in the land market. Basically, two different concepts of property are originated by as many law traditions. The legal systems are originated by Roman law, from which main variants of Anglo-Saxon law, in particular North American law.

In the Continental legal tradition it is the thing itself which is the property and which can be owned, traditionally based on the indivisibility and absolute nature of land ownership. On the other hand, in the Anglo-Saxon tradition, it is not the resource that is owned but the rights in that resource: those rights are property. This considers land ownership as a ‘bundle’ of rights, some components of which can be treated separately, e.g. land development rights, air rights or mineral rights.

The evolution of legal systems based on Roman Law recognises many different property rights attached to one piece of land or one building and it is the bundle of rights that society recognises as ownership (Jacobs, 1997). The bundle of rights consists of the right to use (*usus*), the right to income (*usus fructus*) and the right to transfer (*abusus*) (De Alessi, 1990) and, according to Alchian and Demsetz (1973) it is a portion of rights that is owned or transacted. Consequently, the various legal systems generally recognise the concept of divisibility (“*a bundle of autonomous and separable rights*” (Renard, 2008)), implying that the use of each one of those rights can be defined or controlled by specific public decisions and/or planning tools.

After having clarified what from a legal language mean property rights in land, it is helpful to discuss it further considering in particular the right to develop land. With a focus on the Italian context, the property rights system is defined at the national level, namely the use of land and identifies those entitled to these rights. Even if you have full ownership of land you could still be restricted in your exercise of that right as a result of the interaction between the public-law rules (land-use planning) – in general defined by the Constitution of a country - and the private-law rules (nuisance law, easement, covenants, co-ownership and legal vehicles): both restrict the ‘dominium’ of the absolute owner.

In this perspective, the right to develop land is a faculty depending on a decision of the public administration through land-use planning system and legislative system and it is not influenced by the status of land-owner. It can be documented, freely transferred and can circulate among private individuals by acts of private autonomy. Concerning the land development rights assigned extra, Graziosi (2010) argues that they have most significant problem of configurability of land development rights, reward or not, is that they are divided, from the beginning, from any connection with a building area, a property and an owner. They have the power to create from nothing, but in favour only of the public administration, which could then dispose of them.

Maintaining an instrumental approach and considering the right to develop land as an instrumental variable, in the last two-three decades, contemporarily with experimentations in planning practice in continental Europe, the traditional notion of land development rights has been associated with two different assignment situations and to four planning mechanisms in Italy.

According to the mainstream approach, in the Italian context public and private laws define the entitlement that cannot change whereas the means of use can. As a result, differences arise in the land use potentialities depending on the planning instrument activated. Equalisation, compensation and incentive planning practices, despite similar, develop property markets or property submarkets differently, creating market opportunities in different partial rights.

(1) Right holder = Land owner

The difference in the conceptualisation of property rights between Western Europe and the UK and U.S. should be beard in mind here. In Western Europe the right holder is associated with the landowner, whereas in Anglo-Saxon countries there is the user. In continental Europe, this situation is generally associated with:

- zoning mechanism: the land development right is identified in detail by a zoning document. The land-use plan itself does not automatically establish a transformation, but it affirms the possibility and, as such, represents a development chance for those who have the owner of that piece of land;
- compensation mechanism: as a result of a limitation in the land use rights, the planning authority recognises a non-financial compensation to land owners in terms of land development rights;
- based-reward mechanism: density bonuses to land or building owners for the achievement of certain planning goals.

(2) Right holder ≠ Land owner

Both in the case in which equalisation tools are only applied to a portion of the areas undergoing change and when the institution of land development rights market is applied to all the urban areas designated for urban transformation the land owner can not coincide with the right holder. Elaborating further the situation in which the right holder does not coincide with the land-owner, when the equalisation tool is only applied to a portion of the areas undergoing change, in the Italian legislative system this can be interpreted (Richter, 2005) in accordance with the article 23 of planning law 10/1942. It identifies homogeneous areas called “comparto edificatorio” subject to urban transformation. On the other hand, doubts arise when the institution of land development rights market is applied to all the urban areas designated for urban transformation (“*a pervasive tool in regulating the use of city land*”, Micelli, 2002). The introduction of such a mechanism affects both the contents of property rights and the private-law rules. Stella Richter (2005) asserts that it should be necessary not only to define the use of land and their development chance, thus affecting the land use rights, but to innovate the rights of property in the abstract, creating a power that originates in the ownership of an area, but that can be sold to another owner and still can not be used on the same area. He concludes that such an instrument is not attributable to any known to our law school. Within this context, the traditional function of land-use plan to attribute the land use and to shape the *jus aedificandi* may be less.

Equalisation, compensation and incentive are based on the idea that the markets in rights can be created and structured purposefully in such a way that the outcome can be influenced. With their peculiarities they have spread differently in Italy. Whereas equalisation and compensation mechanisms have been often combined and have received the attention both by academics and administrators, the reward-based mechanism has assumed the distinctive feature of an experimental tool on a residual basis.

The role of property rights in land in the urban economics language

Welfare economics, in seeking a good use of scarce resources has produced the idea of allocative efficiency (the welfare optimum). The application of this approach to land-use planning starts from price as the coordinating mechanisms working within the structure of a market. The classic treatment of market and public failures, zoning and regulation plus taxes, incentives and subsidies, is by Pigou, in his *Economics of Welfare*, as previously discussed in Part 3, Chapter 6. The first serious alternative to Pigou’s analysis came from Coase, who refused the justifications for the government intervention and discussed how economic behaviour would be affected if transaction costs were not zero and about what would be the role of property rights within economic reality. “*When rights are well defined and the cost of transacting is zero, resource allocation is efficient and independent of the pattern of ownership*” (Coase, 1960) is considered the foundation of the property rights theory.

Accordingly, in the neo-institutional economic literature the role of property rights is identified in that of guiding incentives to achieve a greater internalisation of externalities (Demsteez, 1967), and creating incentives to use resources efficiently. This should be achieved by reducing transaction costs and, if those cannot be reduced to zero, reassigning and re-delineating property rights over land. Buitelaar and Needham (2007a) state that property rights are social constructions that are shaped (within limits) by the state, in accordance with the property rights theory that defines property rights as institutions to make the market work (Webster & Wai-chung Lai, 2003).

In terms of property rights theory, Buitelaar (2003, p.316) affirms that: “*land use planning can be seen as a way of coordinating decisions about changing user rights on land in order to change land use. The right to use is central to land use planning. Other parts of the bundle of property rights, such as the right to income or the right to transfer, are less important for land use planning, although they are very much related to the right to use*”. He (2003, p.322-323), then, argues that: “*the delineation of user rights (by the Constitution, civil law or common law) is part of the property rights*

regime. This regime can be seen as a set of (juridical) rules, principles, norms, regulations and procedures which frame the actions of agents towards property. [...] These form the connection between property rights and spatial planning”.

Following Alexander (2007, p.113) and these considerations by Buitelaar, the most widespread rights related to land use are the land development rights identified in the context of land-use planning and law in rights that a statutory plan allocates to land owners to develop their property in certain ways. Public law rules (zoning plan and regulations) and private law rules (among others: nuisance law, easement, covenants, co-ownership and legal vehicles) create, enforce and structure rights in land and in that way influences land use. These define a boundary in the fundamental rights of property.

The delineation and allocation of property rights have an influence on the development outcomes and are considered by neo-institutional economics scholars the main reasons for efficiency problems. As previously discussed, the assignment and delineation of rights and duties in land development processes should be finalised to improve market efficiency, reducing externalities. According to Havel (2009, p. 80), the appropriateness of such an approach should be the result of country context, locally specific to considered efficiency problems. The choice cannot be determined in general and the follow discussion has to be considered only in strict technical sense.

Webster and Lai (2003, p. 9) state *“if the action is directed at reducing [negative] externalities to some socially acceptable level, the rights over the various resource attributes involved should be assigned to those who have the greatest ability to influence the way those resources attributes contribute to externality reduction”*. In other words, *“the externalities should be internalised by all major parties to the problem, in proportion to their ability to influence the outcome”* (2003, p. 151).

Buitelaar and Segeren, (2011, p. 663) provide a distinction between the assignment and delineation of property rights: *“the assignment of property rights often regards the whole bundle of property rights or, particularly in the case of land, a large part thereof. This bundle or the single attributes can be alienated or re-assigned to others. Delineation refers to the way the boundaries of the bundle or an attribute from that bundle have been drawn, that is, the conditions under which the right can be exercised. In many advanced economies, land-use planning plays an important role in the delineation of this right “.*

9.5.2 Regulating and structuring the market

The question here is the way in which the suggested solutions, the good use of scarce resources, could be implemented. The state provides two manners for influencing how land can be used and these two possible types of intervention have been distinguished by Needham (2006). They can have different effects in the area of this research: structuring the market, by creating property rights and enabling them to be enforced, and regulating the market, basically by land-use planning. Needham (2006 and 2012) investigates whether a public authority could achieve the goals of land-use planning by creating market in property rights rather than by regulating the use of those rights.

Regulating can be considered a traditional approach to intervene. Needham (2006, p.12-13 and p. 20) states that regulation *“can influence actions in market in rights in land so that the outcome of people acting in that market is a desired one”*. This influences how people may operate within the market rules and can restrict people in the exercise of their rights. In this approach, lawmaker imposes rules on all, whether they choose to play or not, and, as a result, he can change the way in which people act inside markets. Public power is intended to influence the way in which people exercise their users rights in land through *“locationally generic actions and locationally specific ones”* (Needham, 2006, p. 20). Locationally generic refers to the application of building ordinances, regulations and requirements and environmental regulations. Normally, but this depends on local context, they are not measures being part of land-use planning but they constantly interact with it. The main significant example is the building code that can impose that measures on distances between buildings, height of buildings, thermal insulation of external envelope, etc., are respected to grant a planning permit and activate the idea of land-use planning. On the other hand, when the locationally generic actions are implemented on the ground they become locationally specific and can create difficulties in the management and implementation of regulation and statutory land-use planning. Moreover, Needham identifies two means by which state agency can change the way in which land is used: by passive regulation or by active involvement in projects. *“Passive regulation contain two ways: by prohibition (essence of statutory planning and ordinance) and by incentives. [...] An example of active involvement in bringing about the desired change is building an estate of affordable housing or road or a bridge, etc”*. State powers can also authorize public agents to take action, such as forbidding certain land uses in certain locations, assigning subsidies or soft loans or education campaigns to influence and persuade people. In addition, *“state agency might be able to bypass the market by compulsory purchase or pre-emption”*.

On the other hand, Needham (2006, p. 13) argues that an appropriate property rights market can be created and structured “*in such a way that the desired land use is achieved by people working freely*”. This is a more indirect way of planning than land-use planning. Public goals try to be achieved by letting people use their property rights, recognizing the possibilities of changing existing property rights and creating new ones and by withdrawing some of the public controls on land use. Basically, the law maker has the role to create property rights in land and the rules about their use and trade and this let the market “*does its work*” (ibidem, 2006, 13). In this approach, similarly to game rules, a widely used metaphor, the state creates a good framework (Havel, 2009, p. 72), whereas the exercise of a right is naturally restricted by the market rules. The parties involved have the freedom to decide whether or not to enter into a transaction in the market. Structuring sets the rules of the game for those who want to play it. The land use that comes about has been determined by “the market”, by the relationships between private actors inside that framework of laws decided previously. Hence, following Geuting and Needham (2012), a framework of private law rules influences land use configuration by a set of legal instruments that create and structure rights in land i.e. covenants, co-ownership, legal vehicle, and easement constraints.

Within this perspective, a different reading of policy and planning approach to energy issues in urban areas, here analysed and evaluated, can be performed. Although society can structure and regulate property rights in land at the same time, in order that complement the other (Needham, 2006), in the research area here analysed the two ways to influence the land use to achieve better energy efficiency and production in urban areas remain unrelated.

The reward-based mechanism as well as the equalisation practice tries to make policy objectives more attractive for market agencies using land development rights as a policy instrument. Development can be stimulated by the delineation of the set of potential use of land development rights and their assignment and re-assignment. On the other hand, as the research evidences from Part 3 highlighted, the process of creation of property rights market is not fully developed.

According to property rights theory and concerning specifically the incentive system, the creation of a different market for unlocking lock-in situations (the existing buildings and the ownership structure) by changing the way in which the market for land development rights works should be fully structured, flexible and adaptable to different cases.

Within the regulative perspective, some of the means to regulate the market is by development control and, in the particular case of planning and policy instruments used in pursuit of energy goals, by building control. Public administrations make plans using public law about how a particular plot of land or building may or may not be used and constructed. The introduction of a performance approach in the building code in terms of energy efficiency of envelope and plants has positively influenced the mainstream tendency to affect individual decisions by public powers, but this is not enough. With the exception of new buildings, existing buildings and existing urban areas appear as un-locking situations do not affected by locally generic measures. Other ways which can be found in ‘energy area’ practice, and confirmed by the literature about planning by law and property rights, are: giving an economic or fiscal subsidy to land-use (or building characteristics) decision which is desired by public, or imposing a levy on an undesired land-use decision; persuasion and encouragement to take the right decision which the public authority desires by education campaigns, courses and so on; and providing infrastructure which make some uses more attractive than others. According to Needham (2012, p. 25), “*the decision remains free, but it is influenced or constrained*”.

9.6 Re-framing the problem: a mix between planning, regulation and market

What the case study analysis illustrates is that no attention has been given to the real significance and implication of planning through additional land development rights. Hence, although municipalities should heavily condition the elaboration and the real implementation of such policies by establishing the market rules, facilitating, supporting and encouraging private sector to act for public purposes, the existence of local incentive schemes does not results in a greater efficiency, effectiveness and equity of public strategies and actions. From the evidences of case studies it clearly emerges that the deep mistrust between “market” and “state” or, better, between “market” and “planning” is still there. This needs further discussions within a different approach, able to consider the potential role of property rights as policy tools without neglecting the needs for public interventions and regulations.

The discussion about market versus government dichotomy (Alexander, 2001) leads to the traditional debate between state control and market forces. The proponents of a welfare approach support the statement that the high degree of public intervention in the form of public control removes some of the imperfections (such as negative externalities and market failure) present in the land and property market. As illustrated in Part 3, when government replaces the market there are arguments that governments meet some failures (government failures).

On the other hand, in the new institutional economics approach to markets, the government does not interfere in the market of property development, but the government concentrates on creating good frameworks within which market can

operate. A common argument of these studies is the necessary of coordination between different actors and agencies participating in the process. The way the coordination between different actors arranged is called 'governance', which is a more overarching concept than the market versus government dichotomy (Alexander, 2001). In a slowly way and with the limitation illustrated, the role of public administration in achieving public goals is, therefore, shifting from that of regulator to the enabler with more emphasis on partnership between private and public decision makers, as Webster and Lai (2003, p. 2) put it: "governments became enablers rather than suppliers, and partners of, not opponents to, markets". In relation to urban planning and development and, especially, to the creation of a submarket of partial rights, the discussion about by whom the market should be structured results in questioning the role of the state in this process. The contemporary institutional analysis draws attention to the capacity of public administrations to orient and influence the equilibrium of the market, not intervening into it but framing it, because "market cannot function without rules introduced by government" (Lindblom, 2001, p.102) and because "when people exchange rights freely and voluntarily we say that they do this 'in the market'. Consequently, most changes in land use are done through the market" (Buitelaar & Needham, 2007a, p. 3). As a result, the market cannot be excluded from influencing land use through imposing or relaxing regulations because public authorities are, by constitutional laws, empowered to assign and change property rights. According to Needham (2012, pp. 220–221) public "has always options, between doing nothing and doing something. Even the libertarian perspective of reducing planning to a 'minimum' and let people themselves decide how to use their own land and property, requires a decision about planning, law, and property rights, namely [as previously debated] regarding the definition and the initial assignment of the rights".

Webster and Lai assume that "market needs the state" (Webster & Wai-chung Lai, 2003, p. 52) and therefore, that "spontaneous markets require responsive governments to create legal environments that support innovation, competition and private wealth accumulation" (ibidem, 2003, p. 6). Lindblom emphasizes this introducing the dance metaphor, as "if the market is the dance, then the State provides the orchestra and the dance floor" (Lindblom, 2001, p.102).

Needham and Buitelaar also argue that the existence and the efficiency of a market mainly depend on the rules created by the lawmaker and enforced by state agency. Buitelaar's idea is that "the market is structured by the government who makes the rules that facilitate the exchange. In addition, the government can and often is a market action." (Buitelaar 2007, p.5) and, in this perspective, Micelli (2002) offers an additional explanation. The author (2002, p. 141) argues that "markets for development rights have not proved to be automatic devices led by an invisible hand: the visible hands of the administrations take steps to establish market rules and to promote them, reducing transaction costs as much as possible".

Consequently, in accordance with Buitelaar (2003) "the only question which is interesting is about the mix of planning and the market" and how the market should be structured in respect to existing planning and policy instruments activated in the same spatial context and what could be the better mix in the policy area analysed and evaluated in this work.

The synergy between different typologies of policy instruments, which shape, regulate and stimulate the market as well as foster the capacity building of actors, significantly influences the implementation phase. Although the combination of different characters and different operational paths should allow public administrations to consider a number of possibilities in view of a pre-determined goal, the evidences from case studies reveal a marginal interest in this. The results of the case studies highlight a limited inclusion of climate change control and energy saving goals in planning implementation mechanisms. Moreover, financial strategies, developed mainly at national and regional level, are not appropriately connected to local urban policies and planning measures.

Despite the Italian reality previously analysed and evaluated, markets for development rights neither should replace the command-and-control tools traditionally used in planning nor should work isolated. In reality, their success seems to depend significantly on their capacity to work with other implementation instruments, alternative and complementary, at risk of affecting the real operationalisation of equalisation programs. Hence, integration is a significant condition due to the important role of local government in this process. Authors from the U.S. (Machemer & Kaplowitz, 2002; Kaplowitz, Machemer, & Pruetz, 2008; Pruetz & Standridge, 2009) emphasize the effective inclusion of stimulating market tools into a planning system in which other instruments are already activated. All the authors conclude that, in order to make a TDR successful, the land use regulatory process should be compatible with other implementation instruments such as purchase development right program. On the Italian side, equalisation and compensation practices have initially sought to replace the compulsory purchase order in perspective of more distributional equity and less public costs in the acquisition of areas for public purposes. Lately, Camagni (2011) has hypothesised the use of both of them in synergy and also Micelli (2011) has stressed the need for integration between policy tools and cooperation among public and private actors, more participative and collaborative schemes.

Concluding, after establishing the market rules, local governments, in close collaboration with upper institutional levels, have to delineate and elaborate interactions and relations between instruments in achieving the same goals of energy

efficiency and energy production in urban areas. How should building regulations, fiscal and economic instruments, land use plan, energy plan and this hypothetical submarket of partial property rights work together?

9.7 Making the system work: what are the conditions?

As mentioned in section 9.4.2, four main preconditions with a number of subsequent ones are necessary to make the system work. The reward-based mechanism, recently introduced in Italy, failed to consider information, buyers and sellers, property rights system as well as low transaction costs as essential elements to create appropriate submarkets of land development rights.

1. *Transparent and complete information in the market*

A central theorem of modern welfare economics asserts a correspondence between Pareto efficiency and market performance. On the other hand, the Pigouvian approach has either ignored or heavily discounted the information problem because transaction costs are assumed to be zero. From a neo-institutional economics perspective, Webster and Lai (2003, p.173) point out “*if information is not perfectly distributed and transaction costs are not zero, then the outcome for any externality problem depends on the distribution of property rights*”. Hence, transaction costs definitely include “*the cost of competition, information, measurement, contract formation and contract enforcement under a specific institutional arrangement*” (Wai-chung Lai, 2005).

Ideally, information on ‘products’ should be readily available, equally distributed and should be processed by partners in business with one others (symmetric information). Beyond the Pigouvian approach, asymmetric distribution of information among actors in property markets is the norm in most cases. This asymmetric and imperfect information approach influences the degree of uncertainty in market processes and in planning implementation actions. Following North (1990), the agent knows more than the principal and this, otherwise, has no or incomplete information about the agent’s characteristics, action, or possibilities of choice.

Camagni in 1999 discussed about the meaning of transparency problems both in competition and information in the case of equalisation practice in Italy and, similarly than here, the author reflected on some considerations that could support the delineation of a practicable and sound market. On these considerations and on, the literature from neo-institutional scholars and the evidences from Part 3, three subsequent preconditions are as follow.

a. *Local administration should enhance the exchange of information, in particular between citizens, owners, developers and stakeholders, which have to be necessarily involved into the process of creating a market.*

Buildings can exist in complex chains of ownership and governance. Different people may build, own, manage and occupy the building. This problem means that the person who pays for a retrofit and the person who benefits from it (e.g. by lower energy bills) can differ and, in addition, the gains from the additional building volume obtained by retrofitting and the value of this in terms of energy and CO₂ saved can significantly differ as well as it can significantly differ from the current building value. This makes it difficult to create land development rights incentives that cause each of these actors to take the decisions needed to reduce carbon emissions.

Within this context, establishing transparent and complete information can mean aggregating the demand bringing together building owners, associations of building managers and occupants to identify streets, blocks, or neighbourhoods who all want to retrofit their buildings. This can mean also defining and coordinating an evaluation programme of building, land and retrofit actions, involving stakeholders, organisations and public sectors that can provide an assessment. It implies mobilising the community and sharing the information about the characteristics of the public initiatives, features of retrofitting actions and details on future returns of residential real estate investment and property rights submarket. Sufficient market information must be available to investors, to reduce uncertainty and to improve transparency through public offices.

b. *With the goal of transparency and accountability in the process of treating the different properties involved, it should be useful to distinguish the land designated for conversion in terms of its economic, physical and legal characteristics.*

In terms of transparency, accountability and distributional equity, the instrumental approach to property rights theory requires the clear definition of the building and land characteristics that can significantly affect the efficiency, effectiveness and integration of such a market. The description of the process of treating the different properties involved,

setting out what economic, physical and legal features, has to be conducted at the start of the public action. All property owners participating in or interested by the energy urban rehabilitation scheme will receive this information and they will take part in the elaboration of this 'assessment scheme'.

c. Transparency and local accountability with respect to contracts, procurements, commitments and liability.

The accountability of local authorities to their citizens is a fundamental tenet of good governance. Transparency and accountability are essential to stakeholder understanding of local government and to who is benefiting from decisions and actions. Access to information is fundamental to this understanding and to good governance. Laws and public policies should be applied in a transparent and predictable manner and the public agency should be able to demonstrate his role in each public action. Citizen participation, again, is a key element in promoting transparency and local accountability.

2. Large number of buyers and sellers trading identical products

One of the necessary precondition for approaching property rights as a policy instruments and considering the market of property rights as a market of land development rights (or building volumes obtained after the realisation), is the attractiveness of the market for buyers and sellers and the size of this market. We can speak of a 'market' of land development rights, in which each owner (both those who have a receiving area, and the owners of tradable development rights) must be able to immediately identify a number of potential partners (indeed, precisely the narrowness and thinness of this 'market' would ultimately derail the model). Buyers and sellers have to find each other easily and the information available about transactions and prices. The public administration should make buyers and sellers aware to each other. Especially in the cases of thin markets, the exchange of information between buyers and sellers result fundamental to delineate the market actors. Furthermore, a market with a large number of transactions can be structured both in terms of reference scale and situation (i.e. identification of a growing urban development or particular urban areas, brownfields, infill and rundown ones) and in terms of target market (i.e. identification of a specific group of features in building sector or in building product). Irrespective of the choice, the market needs a degree of competition among buyers (Hodgson, 2002), between territories, between urban designs, among capitals and also between different market structures. Geuting (2007) affirms "*municipalities can be guaranteed that within a local housing market there is sufficient competition between developers within one relevant housing market [...]. With the existence of tradable building rights, new developers can be selected either by the municipality or the present owner of the land*" (2007, p. 31). This affects also the ratio between price and quality and, so, the price-mechanism. "*If there are a limited number of competitors in a region it is likely that developers will try to make deals among themselves about the quality they would offer at a certain price*" (Ibidem, 2007, p.32). The author points out also that "*the effect on achieving the policy goal of more competition within one local housing market depends very much on the way the rules to achieve this are designed and integrated within local policy objectives and on the methods to select property developers*" (Ibidem, 2007, p.33). These are two points that will be further developed in the following subsequent preconditions.

Considering the subject of this discussion, structuring such a market of property rights regarding energy efficiency and production means to be aware that buyers should be willing to pay more (but having lower risk), tenants should be willing to pay a higher rent to compensate owners for the additional costs but with lower holding costs. On the other hand, studies affirm that compared to dwellings EPC rated G, dwelling with better EPC ratings have sold at a significant price premium. In addition, dwellings with high EPC ratings (C or above) have achieved significantly higher price appreciation than lower-rated properties.

a. The reference scale and situation of the market scheme: actions on existing buildings considered as self-defined entities or on reconstruction areas?

Structuring a property market focused on existing buildings is firstly considered. In this case the result could be the creation of a submarket (green renovation) in an already existing green building market. The proliferation of green building standards is contributing to the growth of the industry by providing specific guidelines and support for constructing and retrofitting buildings. Notwithstanding, the recent credit crisis and economic downturn have had some serious implications for property market and real estate in Europe and especially in Italy in which data for 2012 (ISTAT, National Institute of Statistic and Research) indicate a serious drop in house prices. The Italian building market is facing a continued stagnation with transaction levels likely to remain low throughout 2012 (-23,9% in the first nine months of 2012, ANCE). Furthermore, despite lower holding costs and a likely higher building value, a green building could have higher price and higher rent than post-war/economic boom buildings, largely present in the Italian property market. From the effectiveness perspective, in addition to improve the energy efficiency of envelope and systems, this choice can

increase the on-site renewable energy generation by installing equipment that captures energy from sunlight, wind, water and geothermal system. Obviously, a preliminary evaluation of energy generation capacity is needed as well as considerations about a possible association with environmental labels in order to boost the change of supply and demand through the pricing mechanism.

On the other hand, the choice of creating a property rights market with a larger reference scale could present more advantages than a 'traditional' green building market. The choice of limited areas subjected to the incentive mechanism into a more coherent and comprehensive public action could result in an increase of demand, limiting the supply. Although structuring a market of property rights inside a well defined urban regeneration project could appear as a restriction of the number of buyers and sellers and a reduction of the number of transactions, actually this can increase information transparency and considerable certainty to both buyers and seller of the future benefits associated with their involvement, and therefore more willingness to participate. The certainty in the use of the partial rights activated can also support the adoption of the scheme by the community and maximize the effects of market opportunities for agents and make it more interesting to buy or sell certain partial rights. Getting into complex contracts, as an urban redevelopment plan can involve, has to be the only opportunity to obtain land development rights to be used in that area.

Considerations in terms of spatial dimension of energy performance of urban sectors can properly take into account how a correct interpretation of urban compactness, urban form and land use mix concepts can, on the one hand, facilitate the production of district heating, district cooling, electricity and biogas (by allowing service to a greater number of customers in a given area) and, on the other hand, influence travel behaviours. In this wider approach, the process to make cities more compact by an intensification process can support the reduction of dependence on travel by facilitating shorter journeys and inducing greater supply and use of public transport is to be supported by concentration of services, facilities and workplaces, as well as introducing district heating or combined heat and power systems, in addition to individual on-site energy generation. As previously discussed in Part 1, connections between energy consumption of building and physical organization of cities emerge from part of the planning literature. Site layout is the most important factor affecting solar gains, and it involves both urban and building factors. In particular, numerous studies have demonstrated the improvement in solar gains (and consequent energy savings in winter) if the facade is appropriately oriented in order to maximize sunlight availability and if there are no obstruction buildings and overshadowing. Furthermore, there are strong evidences on the influence of urban density on sun light availability and the consequent betterment of solar gains and chance to use active solar mechanisms as solar and photovoltaic techniques. In this concern, topography works as independent "external" variable and mainly affects the sunlight availability mechanism by the shadow due to the mountains and hills, and the consequent limited parts of the territory available for certain types of energy-sensitive policies and interventions.

b. The definition of criteria for the assignment of extra land development rights.

This section is not intended to debate how to create, structure or/and regulate a market of partial property rights as well as it does not provide preferences for one planning practice, in the particular Italian context, or for another (i.e. equalisation, compensation and reward-based mechanisms). This would like to present the preconditions that can allow a market to work properly. Bearing in mind this perspective, criteria mean rules that permit to quantitatively determine the influence of physical, economic and legal land features on additional land development rights assigned. Webster and Lai provide an answer to the question of how any particular assignment of property rights may be judged as being less or more efficient: "*the technical answer to the question is founded on common sense: rights to a resource should be assigned to those in the strongest position to influence the resource's contribution to the desired outcome*" (Webster & Wai-chung Lai, 2003, p. 8). For, "*assigning property rights over a resource makes the resource owner a residual claimant of benefit (use and income) generated by that resource and encourages efficiency – increased efficiency means private gains*" (Webster & Wai-chung Lai, 2003, p. 9). This statement supports both arguments about economic efficiency and environmental (energy) effectiveness, while concerning distributional equity, the assignment, basically, in accordance with Micelli (2002 and 2011) and Camagni (1999 and 2011), should treat different situations in different ways, not by applying a unique building index on the whole municipal territory.

It is necessary that a set of criteria is firstly elaborated and then applied to the land and building assessment, by sharing with citizens and stakeholders these phases, in order to increase the certainty of equal treatment of different land features. Obviously, this implies that these criteria should consider the complexity in relation to multiple variables in order to properly reflect the variation in land and building value due both to traditional factors and 'energy' ones and, therefore, to properly attract developers, individual owners or their associations. Furthermore, the definition of criteria for the assignment of extra land development rights can guarantee that the approach can be repeated and outputs evaluated in a process of local and public accountability.

3. *Complete property rights regime: resources have to be privately owned, rights tradable and enforced*

The property rights regime in accordance with property rights theory approach provides the legal delineation of property rights as a complex system of legal rules in relation to land, which can directly and indirectly influence the market performance. As a matter of fact, Webster and Lai (2003, p.173) point out “*if information is not perfectly distributed and transaction costs are not zero, then the outcome for any externality problem depends on the distribution [and delineation] of property rights*”. Hence, “*the legal delineation of rights defines the scope of market agents in the development process. It creates chances and also limits, by defining economic user rights connected to land*” (Geuting, 2007, p. 26).

Following Havel (2009, p.76), property rights regime, that includes, as previously stated, public and private law, “*defines land development structures, which could be more regulatory, cooperative or market like*”. From an instrumental perspective this appears clear because within the same property rights regime different coordination mechanisms are present in addition to the price one, such as regulation with land-use plan, zoning and building regulations as well private agreements between actors. The development process and the spatial characteristics of real estate are defined by property rights regime by market regime, regulative regime and cooperative regime, supplying limits and chances to agents.

Within this framework, it is not discussed how to change and re-delineate the property rights regime in Italy but how to be aware about it in case of creation, structuration of markets or submarkets in partial rights and in real estate. As discussed in section 9.5.1., with some planning practices it can be more profitable to use a certain partial right, new rights can be defined and existing rights can be used in new situations. Equalisation practice (similarly to TDR in U.S.), especially, in comparison with compensation and reward-based mechanisms, delineates the most comprehensive features of *ius aedificandi*. It essentially consists of the chance to enforce, market and transfer land development rights with a not so stringent correspondence between right holder and landowner. This is because land development rights assigned through equalization (and directly from the spatial plan) can be transferred and marketed from the time of plan approval and constitute a 'product' direct, whereas land development rights assigned with compensation and incentive schemes are (seldom) quantified by the plan but assigned to the landowner who is obliged to maintain the completion of the actual transfer of the fund or the exact fulfilment of the obligation to re-landscape and environment. The additional land development rights are exchangeable only after the assignment and after the addressing of the related duty, following particular implementation actions of the local land-use plan.

4. *Low transaction costs*

It is generally recognized by ne-institutional scholars that transaction costs include “*the cost of competition, information, measurement, contract formation and contract enforcement under a specific institutional arrangement*” (Wai-chung Lai, 2005) and have an effect on the profitability of any actions. Hence, “*different ways of setting up those markets – of 'structuring property rights' – will give different transaction costs. And that will affect the land use which people realize among themselves, irrespective of regulation (such as planning permissions) by a state agency*” (Needham, 2006, p. 60). But, how can the state affect transaction costs? Buitelaar (Buitelaar, 2004, p. 2540) defines “*transaction costs are the costs that are incurred to increase the information available to us and to reduced uncertainty*”. Following this, Needham (2006) considers two ways in which public administrations can be directed to reducing transaction costs. Firstly, according to Webster and Lai (2003, p. 95), it is necessary delineate property rights more or less clearly in order to avoid “*property rights ambiguities*”. Then, the author takes into account all these activities, which can affect the uncertainty surrounding a decision by “*providing land markets with subsidized strategic intelligence*” (Webster & Wai-chung Lai, 2003, p. 26). Buitelaar (2004, p. 2542) points out “*uncertainty can also be (and often is) reduced by using institutions. Landed property, for instance, means that there are rights and consequently duties with respect to a particular piece of land. These reduce uncertainty about what can and cannot be done with that land, and by whom*”.

Within this context, the question that arises is how efficiently we can produce the built environment, considering the transaction costs perspective, namely minimal transaction costs. Buitelaar in 2004 mainly focuses on the process efficiency elaborating a theoretical framework based on user right regime concept in order to identify some important points and some possible factors that affect transaction costs.

The first point deals with all the land transactions during the development process (land exchange). The second category that determines the height of the transaction costs is whether or not a land use/zoning plan is made. The third category is 'agreement' and the last category is planning permission. All these points can be described through some different and some similar factors. In the case studies here considered, and in this pre-condition, the number of parties involved, the stakeholder participation and the conflict of interest between actors and projects are matters that require particular

attention considering the high fragmentation of properties structure and complex ownership chain. Working on uncertainty and ambiguities, three possible subsequent preconditions are as follow:

a. *Creation of informal institutions to overcome the fragmented landownership and building ownership structures and the high transaction costs correlated;*

Informal institutions as personal networks would like to consider the difficulties in articulating formal organizational realities with the rules and norms currently existing, in particular with blocks of flats rules and regulations and building administrations. Hence, since the transaction costs of negotiating with every land-owner for trespassing his land/building/flat would be too high, group-owned pieces of land or blocks of flats are sometimes desired. Aggregating demand by the connection between those who need building retrofitting or urban regeneration projects can overcome the complexity of context and reduce the uncertainty related to process efficiency.

b. *Evolution of existing institutions and their organizational structures in order to minimize the transaction costs associated with the exchange of land development rights or property rights;*

In order to explain this concept North (1990, p.3) should be quoted here with the definition of institutions. For the author “institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction”. With respect to land market and referring to the North’s idea, Needham & Louw (2006) include: “...formal rules as the legal definitions of rights in landed property and how those are protected, requirements for registering property, taxes on property and on property transfers, restrictions on the use of land imposed by planning and other laws, rules for compulsory purchase and the compensation that has to be paid. There are also informal 40 institutions in the land market, such as the weight that is given to unwritten agreements, the expectations about the part played by public and private organisations, trust and how that affects the use of networks. The intangibility of that which is exchanged in land markets (namely property rights), the high monetary value of those rights, and the great significance of land for individuals and their society, mean that institutions are particularly important for land markets”. Within this perspective, this precondition intends considering the improvements to the different steps of development process, namely land exchange, making land use or zoning plan, agreement and planning permission. In particular the delineation and re-delineation of property rights (also into land registries), the plan and administrative-political structure and the structure of procedure and permission can be supposed as factors that more influence the amount of transaction costs.

c. *Elaboration of locally tailored land development rights and property rights arrangements.*

The structure of land and property ownership varies from urban areas to urban areas. Land or property assembly on a site with a high level of fragmentation leads to relatively high transaction costs, which have an effect on the profitability of a development and on the willingness of private actors to be involved. Transaction costs are, for example, the man-hours involved in land assembly (e.g. the negotiations), the costs of compulsory purchase, and the interest costs of the earlier acquired and undeveloped plots. As a result of this, the study of the current assignment of rights and the elaboration of locally tailored land development rights and property rights arrangements can support the minimisation of land assembly actions and, as a consequence, of transaction costs.

9.8 Conclusion

The research was aimed at describing and evaluating the policy response to energy issues and discussing why and how energy issues must be strongly interrelated with urban policy area by tracing relationships between energy, spatial planning and land use tools. If the first connection is the subject of a growing body of literature, the role of planning and policy system in the strategic coordination of strategies, markets and potential in land-use planning is still underestimated. As Owens (1992) points out, “*planning influence land-use patterns and therefore some aspects of energy demand [and production] in the longer term*”. The analysis of land management strategies and tools both from a public policy and a property rights approaches in order to operationalize planning themes become key elements to properly investigate how rhetoric commitments are translated into real changes. The research developed theoretical frameworks and analysed and evaluated the selected case studies by multi-disciplinary approach, combining planning and policy approach with urban economics and planning rights theory.

The first part set the basis of the research by introducing as key-concepts the interactions between the spatial organisation of society and energy demand and production, and the implications and constraints of energy concerns for policy and planning. The interactions are described in their different parts, dwelling on their efficiency and production in the light of

the current trends in energy/urban planning literature. The implications and constraints are then defined by specifying their peculiarities, the approaches proposed for attaining them, and the main shortcomings encountered also in current practice. This allows to place energy planning and policy in the broad context of urban policy area.

The second part presented the analysis and the evaluation of the energy planning instrument currently in force in Italy, the municipal energy plan (MEP), within its specific contexts. Part 2 aimed to investigate the capacity of public administration to deal with energy concerns and achieve results using the instruments at disposal and it seeks to understand the factors upon which the successful (or unsuccessful) outcomes seem to depend on. The role of this part is of great importance in the logic of the present work. In fact, Part 2 was intended to analyse and evaluate the whole (energy) planning process highlighting the weak and strength points affecting the implementation phase.

The third part analysed and evaluated the use of novel land-management tools, and the prospect of replacing public-led interventions with market tools in view of the inclusion of energy savings and climate change in plan implementation procedures in the Italian context. The recent introduction in the Italian national legislation of an implementation practice based on the assignment of extra land development rights, and the translation into regional systems and the first experimentations at local level allow to discuss about the shift from urbanism tradition to governance approaches and to test the application of a reward-based mechanism as non-financial implementation tools for energy planning goals. The part 3, after the development of a rich theoretical framework, presents the Italian (short) local experience in this respect using two case studies: Trento and Bolzano-Bozen. As in the previous Parts, the municipal level was preferred for they strong centres of local autonomy that retain jurisdiction over land-use plan and land-use regulation and potentially have a key role to govern energy as an urban issue.

The fourth part offers a critical analysis of the work done purposes, a new research agenda and draws the conclusions of the research. This was aimed at combining the analysis and the evaluation of the two 'steps': the municipal energy plan as example of energy planning instrument at the local level and the reward-based mechanism as innovative land-management tool in pursuit of energy saving. The analysis of data collected in the light of the theoretical framework and the conclusions are the subject of this Part. In addition, sections 9.5, 9.6 and 9.7 discussed possible futures for planning through property rights in view of greater energy efficiency and production in urban areas. The theory of case study analysis, as will be done in the following section. In accordance with the approaches proposed by Yin (1994, p.111-115) for data elaboration ("relying on theoretical propositions", "thinking about rival explanations", "developing a case description") the proposed methodology includes more strategies, with the aim of testing the validity of the parts of the research in producing or not the expected results since the work addresses a largely new issue in the planning discipline and it wants to be seen as a first approach that could be the basis for further reflections and refinements. Therefore, in Part 2 and Part 3, the results and the evidences of case study analysis (in particular in the chapters 5 and 8) were presented.

Concluding, the study has analysed whether it is possible to integrate energy planning with urban policies and spatial planning, and to replace public-led interventions with market tools with a view to including energy saving and climate change adaptation and mitigation goals in plan implementation procedures. The main thesis has been that public authorities need to make use of all the policy tools at their disposal, because energy efficiency and GHG emissions abatement can be attained only when the market incorporates some of the benefits (which are short-term for energy saving but long-term for climate change effects) and when the behaviours of consumers and citizens change so as to reduce consumption and to contain mobility (and this is mainly connected with residential well-being and urban space quality). These goals can be pursued only partially 'by regulation'. This is the approach characterizing most traditional public interventions, although recently many actions have been undertaken to 'develop capacity' by raising awareness and to disseminate know-how in combination with the 'self governing' approach aimed at improving the efficiency of local government buildings and operations. Also market-stimulation actions have been introduced, but much still has to be done to integrate them into a coherent system of public policies and actions, in particular ones targeting land-use plans and building codes more closely on energy saving issues. New opportunities are apparent, because the planning culture is progressively adopting performance assessment procedures instead of conformance control, and it is making use of incentives in order to orient the market towards public interest goals.

The challenge regards the provision of public goods of a new kind – consisting not of public spaces but of urban quality, energy saving and greenhouse gases reduction. Municipalities must intervene, within an appropriate framework of measures transferred from the national and regional levels, by means of additional actions reflecting local specificities. A better performing urban space means mobility reduction, a mix of activities, appropriate densities, and priority given to urban regeneration. A clear vision of the physical and social outcomes of the use of bonus-rights is needed, because these must be used coherently with the general goals of urban development.

In Italy, two main actions have been recently developed in the field of urban energy. The first concerns the development of Municipal Energy Plans, and the results of the case studies presented highlight the partial inefficiency and

ineffectiveness of the authoritative command-and-control instruments, as well as of the financial implementation strategies, while some results have been achieved by self-governing measures improving energy use by municipal buildings and plants. A second action was introduced in 2008 by the Annual Financial Act and in 2009 by the National Housing Plan. It consisted in a reward-based mechanism related to building refurbishment and to urban renewal, including energy efficiency improvement goals. The main aim was certainly to stimulate private initiatives in response to the effects of the economic downturn, but the innovation in terms of energy-saving objectives and in new implementation tools must be duly considered.

A first consideration concerns the need to connect spatial planning strategies and policies with urban energy efficiency actions, given the complexity of relations at stake. In general, urban factors have not yet been fully included in a general framework aimed at achieving the better energy efficiency of cities, with particular regard to the existing building stock in terms of 'urban potential'. It can be stated, in accordance with Dente (1996, p.13), that environmental policy design should not be considered an entirely separate field of research, opening it to cross-fertilization with other fields of research and practice, reducing the fragmentation of actions on urban areas, and connecting single legal provisions, policies and implementation tools within a common framework which considers both the influence of urban factors on energy performance and the availability of local resources, and how they affect land uses.

A second point regards the inclusion of climate change control and energy saving goals in planning implementation mechanisms. The findings of the empirical parts of the research highlight that there are weak connections between existing planning instruments, such as municipal energy plans, building codes, mandatory building energy efficiency certification, and land-use plans. The MEPs of Bologna and Modena consider the role of the built-up areas and of the existing housing stock, but the lack of detailed studies on the implementation and implication of measures proposed "has left part of the plan incomplete, in particular the measures to improve the energy efficiency of existing residential buildings" (interview with civil servants of the public administration of Bologna). The case of Venice is similar, and the Venetian city manager affirmed that the MEP's "actions and policy tools proposed do not significantly influence consumption trends" and that the plan has "limited real capacity to govern the conservation and transformation of urban space". The process of including energy goals in spatial planning and urban policies requires tailor-made solutions able to encompass the legal, economic, and social aspects of energy. By contrast, national and regional laws provide standardized procedures, and as a result, municipalities – which represent strong centres of local autonomy – operate with great difficulty. In addition, financial instruments, developed mainly at national and regional level, are not appropriately connected to local urban policies and planning measures. Despite the potential of the local level in appropriately responding to the climate-change and energy-saving challenges, the use of innovative land-use based mechanisms has yet to be fully implemented and further research is needed. The reward-based mechanisms introduced by the national legislation have proved ineffective in regard to their main goal, namely internal and external coherence, social acceptability, environmental relevance and market and economic efficiency.

The third and last point concerns the proposal of a new research agenda. The key issue here is the possibility to mobilize the market in view of greater energy efficiency and production in urban areas. According to Rydin (1992), property can play a passive role (application of mandatory energy efficiency standards) or an active role (making use of energy efficiency criteria concerning design and materials) in reducing the environmental impact. The idea of planning through property rights stems from new institutional economics and might be fully applied to energy building retrofit and urban regeneration in order to activate property. This was partially translated in the recent Italian introduction in a reward-based mechanism but this could more properly be translated in a sub-market of partial rights. Unavoidably, the concept generates many complex questions because the application of ideas of neo-institutional economics to planning literature is rather recent and generally discussed from economists who are not planners. In addition, this research stream is not developed from a theoretical side in Italy, where the planning practice is predominant but this also means huge research resources in terms of case studies and space for experimentation. Some questions were addressed in this research work but it is necessary to stress that many more thoughts and in-depth research should be given to it. However, considering the performance of existing planning and policy instruments and tools here analysed and evaluated, it appears useful shift from mainstream approach to a more innovative one. One major issue for the political agenda is the question about what advantages are of a submarket of land development rights as compared with the present thoughts about reward-based mechanism and implementation tools in general. Firstly, making the public energy objectives more attractive to, and rewarding for, private actors, individual owners, developers or real estate agencies, can mean no additional financial expenses for the community and less direct involvement of the public bodies. Then, the achievement of these planning goals by redelineating and reassigning property rights can significantly influence the real implementation of more rhetoric urban strategies, especially if its use is focused on specific urban areas. Lately, in case of an adequate elaboration of market rules able to consider, on the one hand, the spatial dimension of energy issues, and on the other hand, the

integration with other implementation tools, this approach can contribute to overcome the distance between energy policy and urban policy.

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