Linking territorial foresight and urban planning

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Abstract

Purpose – *This article aims to show the opportunity and benefits of linking territorial foresight tools to urban planning procedures. Additionally, it suggests ways to reinforce the scenario design method with more in-depth analysis, without losing its qualitative nature and communication advantages.*

Design/methodology/approach – *These assumptions are tested in a scenario design exercise that explores the future evolution of the sustainable development paradigm and its implications in the Spanish urban development model.*

Findings – *Major findings are obtained on the feasibility of a systematic approach that provides anticipatory intelligence about future disruptive events that may affect the natural environment and the socioeconomic fabric of a given territory. In addition, the study confirms that foresight offers interesting opportunities for urban planners, such as anticipating changes, fostering participation and building networks, in contrast to its perception as a mere story-telling technique that generates oversimplified visions without the backing of rigorous analysis.*

Research limitations/implications – *In order to boost the perception of scenario design as an added value instrument for urban planners, three sets of implications – functional, parametric and spatial – are displayed to provide substantial information for policy makers.*

Originality/value – *The value of the present work lies in the synergy that can be generated between territorial foresight and urban planning, offering a great opportunity for policy makers to use futurists' output as input for urban planners' work.*

Keywords *Territorial foresight, Scenario design, Urban planning, Sustainable development, Strategic planning, Forecasting*

Paper type *Research paper*

1. The oblivion of future studies in urban planning

Since its origins in the nineteenth century and its full development during the twentieth century, one of the key concerns of urban planning has been to foresee the future and limit uncertainty. In fact, one of the core objectives of a city plan is to take decisions in the present time in order to correctly guide urban activities in the future for the benefit of its citizens. In the dawn of urbanism, visionaries such as Daniel H. Burnham, Lewis Mumford and Le Corbusier made an effort to depict the future of cities in drawings and words. Nevertheless, nowadays long-range forecasts and visions do not seem to attract the attention of contemporary urban planners.

The oblivion of future studies in the urban planning field was denounced several years ago by practitioners and researchers (Isserman, 1985; Wachs, 2001). Why do urban planners no longer think in visionary terms? Recent research in Spain (Fernández Güell *et al.*, 2009-2011) has shown that most public agencies in charge of urban and regional planning, as well as private consultants conducting professional work in that field, are very reluctant to use future studies in their plans and projects. This withdrawal from future studies can be explained by historical reasons.

In the second half of the twentieth century, urban planning abandoned its visionary origins and became more technocratic, favouring the use of quantitative forecasts, based on sophisticated algorithms and mathematical models (Hall, 1996; de Terán, 1996). However, the profound socio-economic changes experienced by most cities in the 1960's and 1970's produced gross mistakes in urban predictions. Continuous failures in the use of forecasting methods damaged the reputation of urban planners and seemed to show the impossibility of predicting urban phenomena based on scientific rules and regular patterns. The aftermath of quantitative models left the urban planning field with a profound scepticism of any kind of future-oriented analysis.

By the end of the twentieth century, this situation had aggravated. Socio-demographic, economic and technological changes were taking place at a fast speed with nonlinear patterns, making it difficult for analysts to anticipate and citizens to assimilate. In this context, urban planners had a hard time undertaking forecasts, since structural changes were making traditional paradigms obsolete. Confronted with this situation, most urban planners recognised their impotence for drawing reliable predictions, and turned toward short-term and contingency planning as a way to navigate in a very uncertain context.

In recent years, the pre-eminence of collaborative planning has added to the detriment of futures studies. Nowadays, citizen participation and collaboration amongst public and private stakeholders have become milestones in the planning realm. In this context, urban planning has become more of an action-oriented process with short and medium-term horizons. The formulation of visions and the display of technocratic predictions has been rendered obsolete by the need for consensus and compromise.

There is a final reason, which is particularly cogent to the Spanish case. When urban planning operates in a context with a rigid legal framework, excessive public intervention and public and private decision-makers acting in opaque and arbitrary ways, it is obviously very hard to generate future visions with the support of a broad array of local stakeholders.

These reasons explain to some extent the scant attention paid by urban planners in the last few decades to the revision and reinvention of futures studies as a field of practical knowledge. Under these circumstances, it is timely to ask whether it is convenient and feasible to recover these tools for the sake of our cities.

2. The standard urban planning process

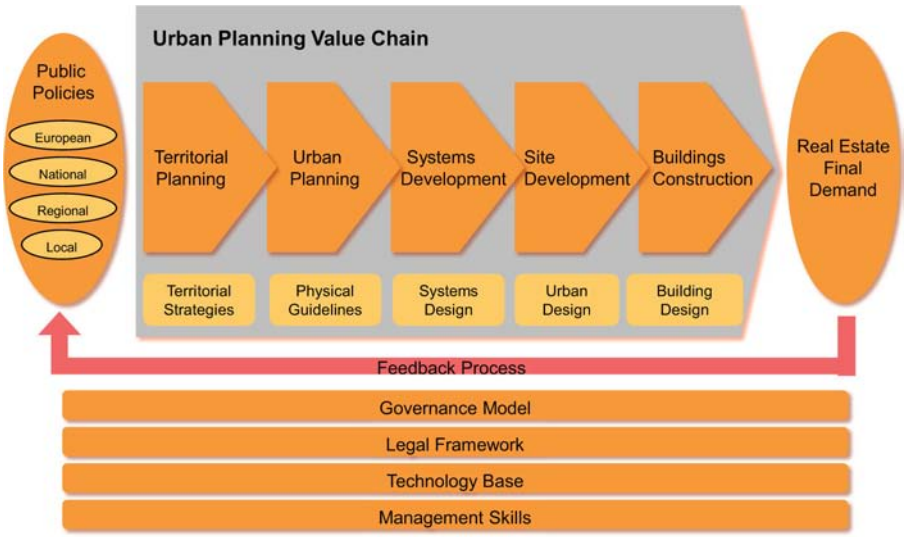
Although urban planning takes different forms in diverse political, cultural and socioeconomic contexts, there is a standard process which exemplifies the procedures followed in most countries when rural land is rezoned as urban. Thus, urban planning can be conceptualised by two major sets of elements (see Figure 1).

The first set is articulated by the urban planning value chain, which displays in a sequential and hierarchical way how urban development proceeds from territorial planning to urban planning, systems development, site development and building construction. Each of the five steps has its own geographical scope, objectives, operational methods, norms and administrative procedures. The value chain is initiated and guided by a set of public policies, formulated at various administrative levels, and it is geared to satisfy the real estate demands of citizens, business and institutions. The value chain is kept under surveillance by a continuous feedback process.

The second set is composed of horizontal elements that provide integral support for all the operational procedures of the planning value chain. The most outstanding support elements of the urban planning process are the governance model, the legal framework, the technology base and the management skills.

This conceptual model may vary a lot from one country to other. For example, some steps of the value chain may be mandatory in certain places, while they may represent simple indications to the policy maker in others. Just as well, some horizontal elements may be deeply entrenched in the local urban culture, while others may be weakly implemented.

Figure 1 Conceptual framework for urban planning



Source: Authors' elaboration (2011)

3. The new concept of territorial foresight

Three arguments are given to support the use of futures studies. The first one is related to the high level of complexity and turbulence that will characterise our cities in the twenty-first Century. In this context, many traditional analytical tools will be of no help to urban planners, so they will be forced to develop new methods and tools to meet the coming challenges.

Second, the social debate inherent to urban planning and the need for stakeholder collaboration can be facilitated through a mutually beneficial symbiosis between futures studies and urban planning (Cole, 2001). In fact, futures studies have a long-term focus and tend to be holistic, while city plans zoom in on social and spatial realities.

Third, there is a tight relationship between futures studies and strategic planning (Fernández Güell, 2011). The need to think about the future and formulate long-term development visions makes strategic planning a perfect client for futures studies.

Since there are solid arguments for raising futures studies to a relevant position within the urban planning process, the next question is whether they can respond to the requirements of contemporary urbanism. The answer could be called ''territorial foresight''.

According to several authors (Fernández Güell, 2006; Gavigan and Scapolo, 2001), territorial foresight can be defined as a systematic, participatory, future intelligence gathering and vision-building process aimed at present-day decision making and mobilising joint initiatives in the urban and territorial realm.

Territorial foresight involves the implementation of five essential elements at a small geographic scale, in which proximity factors are decisive:

1. *Anticipation*. Foresight is a structured way to anticipate and project long-term social, economic and technological developments and needs.
2. *Vision*. Foresight elaborates a guiding strategic vision, which shares a sense of social commitment about a certain issue.
3. *Action*. Foresight develops and implements strategic visions through detailed action plans, which enable current actions to tackle the future successfully.

4. *Participation*. Foresight intensively incorporates interactive, participatory methods that foster debate and analysis with a wide variety of stakeholders.
5. *Networking*. Foresight forges new social networks for the exchange of ideas, experiences and specific knowledge.

Territorial foresight offers noteworthy tangible benefits. First, it systematises the debate about future prospects for socio-economic development amongst a wide variety of agents by building up plausible and coherent future visions. Second, it helps to formulate viable, innovative territorial strategies that can reconcile the viewpoints of a wide range of stakeholders. Third, it forms expert networks to exchange and disseminate knowledge deriving from the foresight exercises amongst stakeholders and political decision-makers.

In spite of the above-mentioned advantages, territorial foresight has clear limitations. In the first place, foresight cannot tackle or resolve all the social, economic, environmental and political problems in a territory. Second, foresight cannot impose consensus when there are deep disagreements between territorial stakeholders. Third, foresight is not a quick remedy for urgent problems because it requires long analyses that do not produce immediate results. Finally, foresight requires certain policies that may be difficult to implement in emerging territorial institutions with little real power.

In contrast to traditional planning processes, which tend to have a limited sectoral scope, territorial foresight gradually builds up an integrated vision of the possible future through participation methods. Foresight is thus complementary to the established planning processes, feeding new elements and values into them, empowering local agents and providing legitimacy to territorial strategies.

Foresight methods are spreading progressively and are becoming a decisive element in many planning exercises. As a matter of fact, in the last few years territorial foresight has gathered increasing attention from various European public bodies. The European Commission's Foresight for Regional Development Network (2001) published *A Practical Guide to Regional Foresight*, which documented nine regional foresight exercises. Likewise, several articles by the Institute for Prospective Technological Studies have drawn attention to the potential of territorial foresight for decision making at the regional level (IPTS, 2001). The European Spatial Planning Observation Network (2007) has also published the findings of its project ''Scenarios on the territorial future of Europe'', in which three spatial scenarios were set out for the horizon 2030 (European Foresight Platform, 20115). Finally, the European Foresight Platform, another European Commission funded body, has made an intense effort to compile several regional foresight exercises within its *Knowledge Sharing Platform* (European Foresight Platform, 2011).

Despite the well-deserved interest and merit of the previous references, specialized literature still shows a substantial divorce between the scope and content of foresight exercises and the specific needs of urban planning. On the one hand, most foresight exercises by social scientists are usually based on general narratives that are intellectually stimulating but rarely of much help to the physical planner for making decisions in the urban realm. On the other hand, when looking at the future, urban planners tend to focus on forecasting tools, disregarding most foresight methods as frivolous exercises. In fact, our literature review has not detected specific, innovative research efforts geared to bridging the gap between these two fields of knowledge.

4. How to reconcile territorial foresight and urban planning

Despite its apparent benefits, territorial foresight is either simply ignored or just perceived as a trivial set of tools that do not provide much added value to the urban decision making processes. In order to reconcile foresight techniques with urban planners, new contributions are needed to reinforce qualitative instruments with quality, detailed outputs (visions or scenarios) that can be used as inputs for quantitative tools.

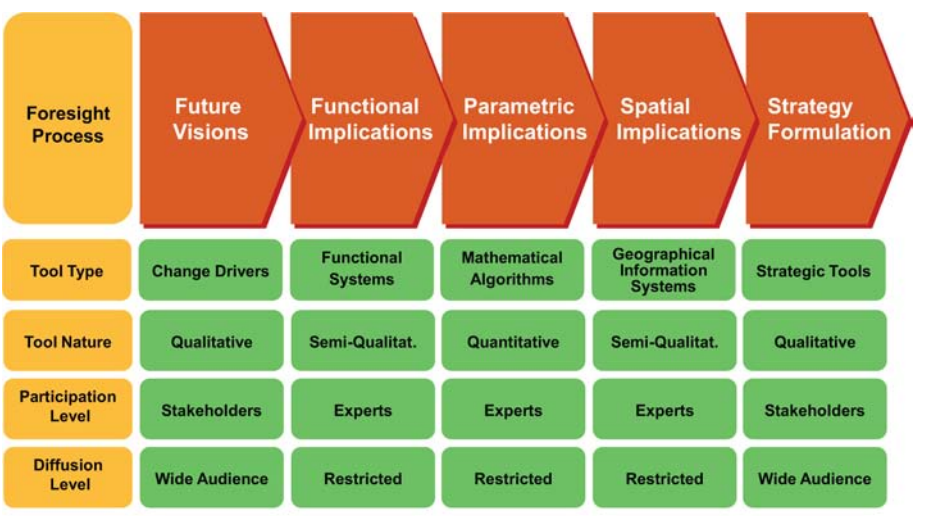
With this aim in mind, an approach is presented hereby to link foresight tools and the urban planning process. The proposed approach shows the way that a future urban vision can be

translated into practical, measurable strategies to guide territorial development in the long term. This approach consists of five sequential steps (see Figure 2):

1. *Formulation of future visions*. Traditional foresight tools such as vision or scenario design are used to create a future vision of the territory and its broader socio-economic context in a narrative format. This first step should normally use qualitative tools that facilitate participation by stakeholders.
2. *Determination of functional implications*. Once the visions are formulated, the functional implications for the territorial system are determined, which may display territorial elements, socio-economic flows and local stakeholders. This step should be undertaken with semi-qualitative analytical tools and should be mostly restricted to urban experts.
3. *Determination of parametric implications*. Functional implications should provide plenty of clues for the establishment of a set of parametric indicators that will measure urban development impacts. Widely used parameters amongst urban planners, such as population growth, job location, urban land consumption, urban density, urban sprawl and mobility ratio, can foster land-use and transport simulation models. Therefore, the third step should be based on quantitative tools and be restricted to urban experts.
4. *Determination of spatial implications*. Once the parametric implications are fixed, they can be downloaded to a geographical information system (GIS) to observe future urban implications from the spatial perspective. Nowadays, GIS technology provides a wide array of functionalities to display alphanumeric data on a digital map. A GIS tool will show graphic information about urban growth, urban sprawl and infrastructure networks. This step requires sophisticated quantitative and graphic tools, which should be operated by experts. Nevertheless, the final product will be easily understood by stakeholders as well as the general public.
5. *Strategy formulation*. After determining all kinds of implications across the territorial system, the analyst should be able to perceive the gap between the proposed future vision and the present situation of the territory, synthesizing the findings in a SWOT analysis. Departing from a SWOT analysis, it should be feasible to formulate strategies for guiding future development. Once again, this step requires involvement by stakeholders.

Although this approach is not new in the strict sense, since most of the proposed steps have been used implicitly or explicitly in the urban planning field, its uniqueness emerges

Figure 2 Linking foresight and urban planning



Source: Authors' elaboration (2011)

because all the elements are used in an articulated and coherent way, with a foresight exercise as a solid starting point. These five steps are developed in the following sections.

4.1 Step 1: formulating a future vision for sustainable development

Once the proposed approach to link foresight tools to the urban planning process has been established, a practical application is presented to assess its utility and feasibility. The chosen example is based on a scenario design exercise, in which social attitudes towards sustainable development were explored in the Spanish context for the horizon 2025 (Fundación OPTI, 2007). The issue of sustainable development (SD) has been chosen because it is a key challenge for contemporary societies, and also because it may induce disruptive transformations in the urban planning value chain.

Since the Brundtland Commission defined sustainable development as ''the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs'' (World Commission on Environment and Development, 1987), this concept has gained universal acceptance by the general public, socio-economic agents and politicians (United Nations, 1992; World Summit for Social Development, 1995; Organisation for Economic Co-operation and Development, 2001). However, the reciprocal relations that may develop between the sustainable development paradigm and the general behaviour of society have not been rigorously assessed. The lack of studies about this issue is primarily due to two major difficulties: its complexity and its uncertainty.

Scenario design was chosen from among all the foresight tools because it provided an adequate management of the topic's complexity and uncertainty while at the same time unfolding alternative futures. Scenario design is a foresight technique that has been widely used and documented (Godet, 1993; van der Heijden, 1996; Schwartz, 1991). It is eminently qualitative, it combines intuition and rational analysis, and it requires the collaboration of a group of experts. For most foresight practitioners, scenario development is the archetypal product of future studies because it is profoundly creative and capable of handling uncertainty.

The stated foresight exercise followed the conventional scenario design methodology made up of three sequential stages:

1. characterise the sustainable development concept;
2. identify and assess change trends that may affect sustainable development; and
3. design future scenarios for the evolution of sustainable development.

This exercise relied on a systematic, ongoing participation process with experts in SD issues.

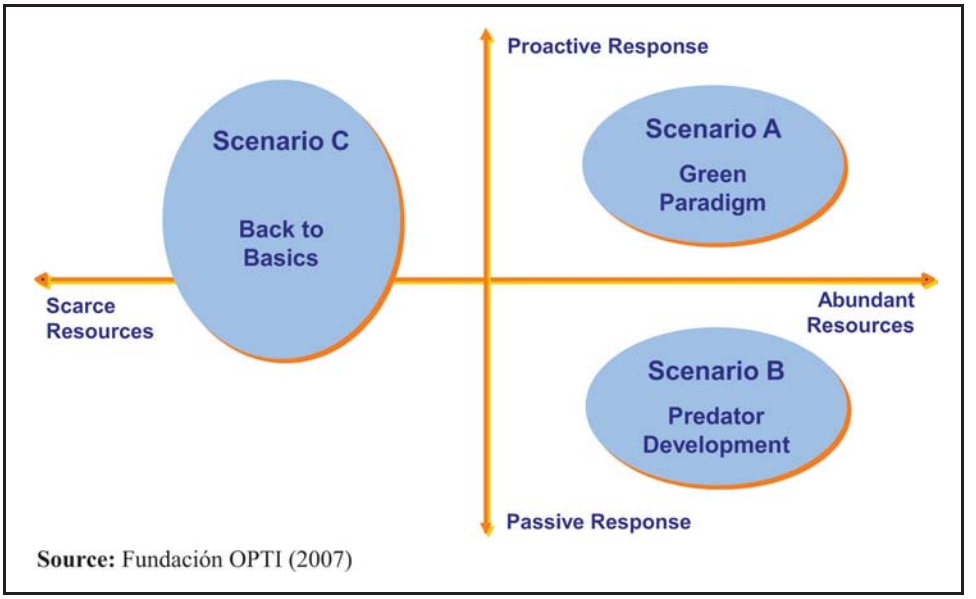
Change drivers affecting social attitude toward SD were grouped into two axes:

1. *Vertical axis*. Represented the potential alternative responses by society in the future to the SD concept. This axis encompassed all future uncertainties related to social behaviour, economic models and public policies towards SD.
2. *Horizontal axis*. Showed the availability of resources needed to achieve the sustainable development goals in the future. This axis included all critical uncertainties regarding the abundance or scarcity of technological, economic, human, institutional, and natural resources.

These axes gave rise to three distinct scenarios (see Figure 3), a consistent, plausible representation of the alternative futures into which the SD concept may evolve by the year 2025. A brief explanation is provided below about the socio-economic context in which each future scenario may develop.

Scenario A: green paradigm (circa 2025). This scenario takes place when there is both a proactive and a favourable response by public and private agents to SD and also an abundance of all types of resources required to achieve sustainable development. The

Figure 3 Future scenarios for sustainable development



Source: Fundación OPTI (2007)

''green paradigm'' is the manifestation of an environmentally aware society, in which most citizens participate in public decision-making.

In this scenario, Spanish society gives priority to human and social requirements over purely consumption-oriented needs. In this pattern, there is a reorganisation of spare economic resources towards non-profit and Third Sector activities. This context clearly benefits the Spanish productive system because it incorporates a sustainable, integrated economy into the global markets. The Spanish economy is more balanced and diversified than 20 years ago when it was dominated by the construction and tourism sectors.

Scenario B: predator development (circa 2025). This scenario occurs when resources of all types are abundant, but at the same time public and private agents have either a slow or a passive reaction to sustainability challenges. ''Predator Development'' represents a society that regards environmental issues as non-critical, compared to its economic and consumption requirements. The successive emergence of new technological innovations seems to conjure up environmental threats and tends to relax a society which indulges itself in exuberant consumerism.

In this scenario, Spanish society is mainly driven by egocentric values. At the national level, solidarity amongst regions has significantly deteriorated due to resistance by the wealthiest territories to share their profits with their least developed counterparts. Despite the economic cycle's ups and downs, the Spanish economy keeps growing at an acceptable rate. Nevertheless, economic achievements have been at the expense of high environmental costs, social inequities and territorial imbalances.

Scenario C: back to basics (circa 2025). In this scenario, there is a significant shortage of all resource types due to a prolonged recession, but at the same time, Spanish society as a whole is inclined to support sustainable development models. ''Back to basics'' is marked by the failure of the previous development model, which has led to social tension and frustration. Public and private agents are fully aware of the need for sustainable development due to a lack of response by the economic and technological realm.

In this scenario, Spanish society suffers a deep disenchantment with the socio-economic model that prevailed at the end of the twentieth century. In this scenario, economic growth is very low or even null, and commercial flows are very weak. The stagnation experienced by the Spanish economy is similar to the one suffered by most European countries. For several

years, unemployment rates have been above 15 per cent. Access to the labour market is very difficult for the new generations and most new jobs are precarious.

A perusal of the various websites specifically devoted to foresight studies (European Foresight Platform, Forlearn Online Guide (n.d.) and Millennium Project (n.d.)) shows that most scenarios exercises conclude with a description of the geopolitical, economic, societal and technological contexts. Despite their ingenuity and descriptive details, this kind of output is generally perceived as insufficient and trivial by most urban planners. In order to reinforce the perception of scenario design as a useful and added value instrument for urban planning, the provision of a more profound analysis is necessary. This goal may be achieved by analysing the in-depth implications of each future scenario for functional systems, parametric indicators and spatial patterns.

4.2 Step 2: determining functional implications

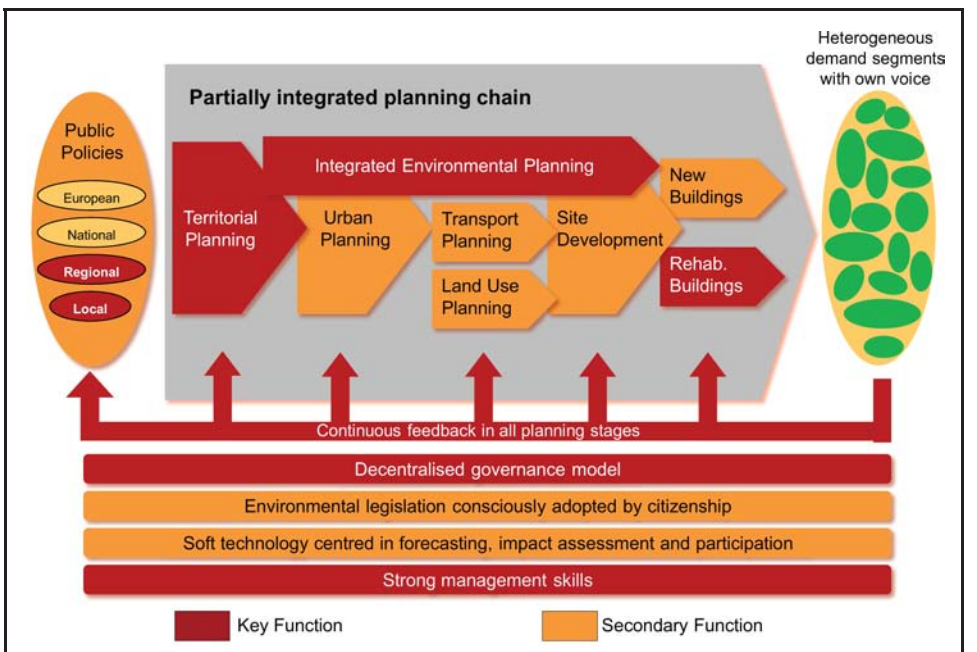
After designing the three scenarios, the proposed methodology establishes a set of functional implications that each future scenario poses for the urban planning process. For this purpose, the conceptual framework displaying the standard urban planning process, shown in Figure 1, is used to guide the implications analysis.

Functional implications of Scenario A (2025). The ''green paradigm'' scenario reflects a proactive social response to SD while urban societies enjoy abundant resources (see Figure 4).

In this scenario, public policies regarding urban development are very much decentralised at the regional and local level. Regional governments play a clear role in setting territorial strategies, which take into consideration local interests insofar as they do not conflict with sustainability principles. In this context, the planning value chain is partially integrated by the need to incorporate environmental planning into every step of the development process. Other key elements are territorial planning and building rehabilitation.

Real estate demand is very heterogeneous and segmented into multiple small groups, which are deeply concerned about environmental issues and wish to have a voice of their

Figure 4 Scenario A ''green paradigm''



Source: Authors' elaboration (2011)

own in the planning process. Citizens and non-governmental organisations exercise intensive vigilance over real estate projects. The big challenge is to satisfy multiple and diverse social demands without putting the sustainability principles at risk.

In Scenario A, there are significant improvements in the governance model at the local level. Progress is reflected by transparent decision-making, effective public participation, public-private co-operation and better coordination among different levels of administration. The existence of strong social capital permits a decentralised democratic system. This model requires a strong set of management skills in all public organisations to guide participation and coordination actions. Public management should be able to internalise environmental costs through sophisticated environmental evaluation tools.

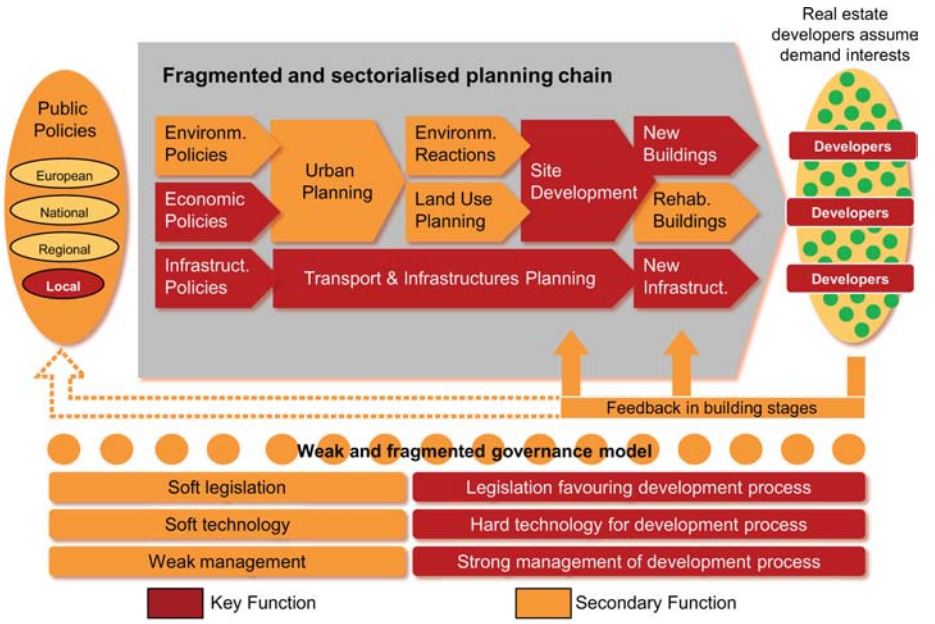
Functional implications of Scenario B (2025). The ''predator development'' scenario evolves when resources are abundant, but at the same time public and private agents have a passive attitude toward sustainability challenges. This scenario generates strong environmental and social impacts due to a model based on strong economic growth and intense consumption (see Figure 5).

Public policies related to urban development are not effectively implemented because of social and economic pressures. They mostly provide general guidelines about sustainable development that may or may not be followed by local governments. Municipal policies are strictly implemented through norms and regulations.

In this context, the planning value chain is very much fragmented and sectorialised because stakeholders' interests prevail over the basic sustainability criteria. The development process is dominated by hardcore elements such as transport and basic infrastructures. In fact, economic policies and growing social requirements dictate the need for new infrastructure and buildings.

Citizens' needs are assumed and represented by the offerings of real estate developers. In this scenario, most people live in a consumption spree that makes them reject the sacrifices needed to achieve more sustainable development. Developers are thus the most active agents in providing feedback to the planning process, mainly in its last stages.

Figure 5 Scenario B ''predator development''



Source: Authors' elaboration (2011)

Conditions inherent to Scenario B favour a local governance model that is opaque and discourages participation. In this context, frequent disputes between political, social and economic stakeholders hinder consensus. Horizontal elements such as legislation, technology and management are weak in the first stages of the planning stages, but they are intensely used when it comes to developing infrastructures, sites and buildings.

Functional implications of Scenario C (2025). The ''back to basics'' scenario takes place when economic and environmental crises are recurrent, resources are scarce and social attitudes are very favourable towards the implementation of strict SD models (see Figure 6).

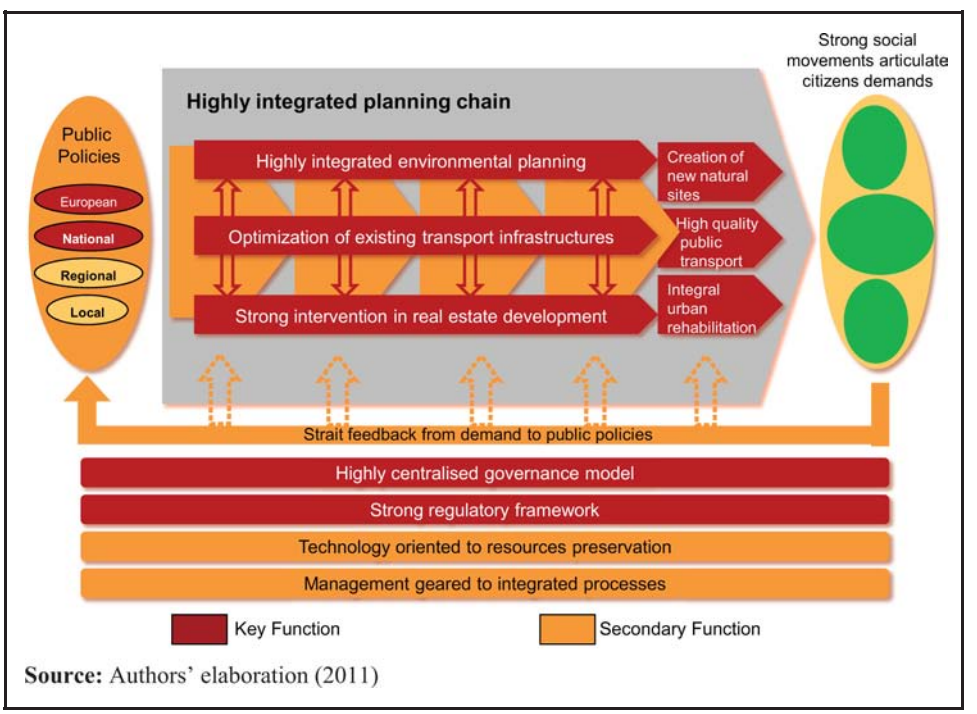
Due to difficulties in enacting and implementing urban sustainable policies at the regional and local level, European and national public agents have taken over policy making. A strong government, backed by a wide spectrum of the electorate, is formed to implement effective policies against the economic and environmental crisis. Regional and local governments can dictate territorial strategies and urban guidelines, but they are under strict control and surveillance by the authorities in Brussels and Madrid.

In this context, the planning value chain is highly integrated, linking the different lines of sectoral planning under a comprehensive approach. Environmental, transport and land-use planning are thus tightly intertwined and guided by a common long-range strategy. Major outputs of the planning process are the creation of new natural sites, the provision of a high quality public transport system and the rehabilitation of integral parts of a city.

Due to a long economic recession and the scarcity of resources, social movements of all types and conditions have gained momentum to the point that they can counterbalance the power of political parties and the influence of economic agents. Consequently, social movements are frequently summoned and consulted by public bodies.

In this scenario, the governance model is managed by a strong centralised power base (probably the State) that makes major decisions regarding the pattern of urban development to be implemented by regional and local authorities. This scheme is complemented by a highly articulated participatory movement headed by major social groups. This governance model allows for direct feedback by citizens' groups to public authorities, its major drawback

Figure 6 Scenario C ''back to basics''



Source: Authors' elaboration (2011)

being the threat of majorities imposing decisions on minority groups. Citizen participation and coordination among public administrations is imposed by law and social demand.

There is a strong regulatory framework to restrict new urban development to a minimum, in favour of rehabilitation processes. Clear and strict regulations are established to force companies and public bodies to internalise their environmental costs.

4.3 Step 3: determining parametric implications

Once functional implications have been determined, a set of parametric indicators related to standard sustainability issues (Kates *et al.*, 2005; Meadows, 1998) is established to assess the potential impact of each future scenario on urban development patterns (see Table I). A base-line scenario (2010) is estimated, using current statistics provided by various public sources. Projections for the year 2025 are displayed using diverse tools and analysis methods. The ultimate purpose of these parameters is to translate functional implications into quantitative values, so that their systematic tracking can lead to corrective measures.

4.4 Step 4: determining spatial implications

After parameterizing and projecting a set of sustainability indicators, the spatial implications of each scenario can be displayed with graphic tools. Future spatial patterns are visualized through the location and extension of urban areas, transport infrastructures and open spaces in a small territory located in the north-western periphery of the Madrid metropolitan area. Figure 7 shows the current physical status (2010) of the study area, composed of four municipalities – Cercedilla, Becerril de la Sierra, El Boalo and Navacerrada – with 21,500 inhabitants in 150 km^2.

The study area reflects a fragile environment whose ecosystem could be irreversibly disturbed by the increasing impact of human pressure. The medium-low density communities and their traditional lifestyle and production systems have not posed any threat to its sustainability in the past. Nevertheless, it is bound to have an uncertain future due to its proximity to the overcrowded Madrid metropolitan area.

Each of the following spatial scenarios represents a planning concept taken to an extreme. The final shape adopted by the localities will be a meld of several issues whose major assumptions and deterministic results are summarised as follows.

Spatial implications of Scenario A (2025). The predominant philosophy of the ''green paradigm'' scenario will be to thrive in economic and social terms with lower consumption of energy, water and natural resources. Under these circumstances, the study area will develop as follows (see Figure 8). There will be a lower consumption of urban land per capita and greater protection of rural land. City plans will concentrate residential and non-residential uses into well-defined urban areas and they will preserve rural surroundings to enhance ecological, landscape and agricultural values. A compact, complex and energy-efficient model will be developed for the urban areas. This model will alternate compact buildings with abundant public spaces, which will facilitate social relationships and provide basic services. Urban design will incorporate criteria to achieve a more energy efficient development pattern. Regarding the transport system, new road development will kept to a minimum, while the railway network will be substantially augmented and improved. Within the study area, travel by motorized vehicles will be minimized in favor of non-motorized means (pedestrians, bicycles and electric vehicles).

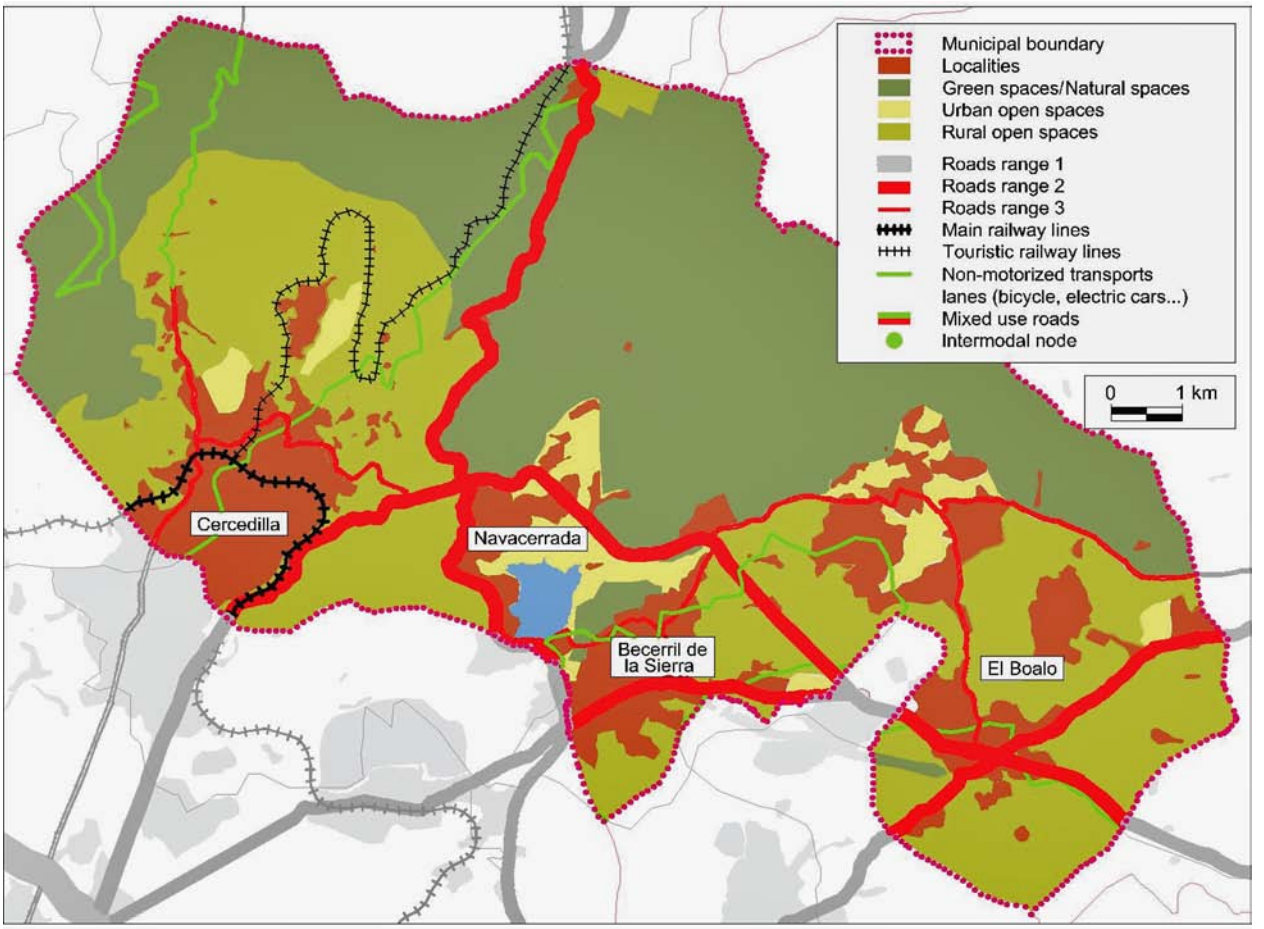
Spatial implications of Scenario B (2025). In the ''predator development'' scenario, population growth coupled with strong economic development and rising energy consumption will cause a significant increase in the ecological footprint. Spatial development in the study area will take place as follows (see Figure 9). Territorial management strategies will not incorporate the principles of sustainable development extensively, unshackling the forces of urban sprawl. Towns will become larger, with an ever-expanding peripheral area. Per capita urban land consumption will increase, making it

Table I Main scenarios indicators

Indicators	*Measurement unit*	*2010*	*2025* *Scenario A*		*Scenario B*		*Scenario C*		*Analytical methods and tools used for estimating indicators*
Society									
Population growth	△ hab (% annual)	0.98	Medium-low	0.6	High-medium	1.6	Negative	−0.5	Population projections
Urban density	inhab/km^2	135	Medium	147	Medium-low	125	High	168	Simple mathematical algorithm
Migration rate	migrants/1,000hab (annual)	17	Medium	32	High	54	Negative	−14	Population projections
Dependency ratio	ratio	0.41	Medium	0.69	Low	0.47	Very low	0.26	Simple mathematical algorithm
Replacement fertility rate	ratio	1.12	Appropriate	2.1	Medium-low	1.30	Low	0.62	Simple mathematical algorithm
Economy									
Unemployment rate	hab (%)	14.2	Very low	5.1	Low	7.3	Very high	16.4	Simple mathematical algorithm
Predominant economic sectors	%	Basic services 70%	Recreational activities and ecological tourism	46	Basic services (construction/real state)	72	Farm and forestry activities	37	Economic trend analysis
Electric energy consumption	MWh/pc (annual)	3.98	Medium	4	Medium-high	4.9	Low	3.1	Simple mathematical algorithm
Economic growth	△ GDP (%) (annual)	−4.3	Sustained	2.1	Strong	3.7	Negative	−4.4	Econometric model
Environment									
Selective collection of solid waste	%	39	High	68	Low	37	Middle	51	Simple mathematical algorithm
Modal split	Public transport/total trips (% annual)	31	Medium	43	Low	23	High	64	Transport models
Mobility with private vehicles	km/vehicle (annual)	16.000	Decreasing	13.500	Increasing	18.300	Strongly decreasing	11.700	Simple mathematical algorithm
Proximity to bycycle network	meters	380	Close	200	Far	500	Midway	300	Normative policies
Water consumption	m^3/pc	106	Medium	112	High	136	Low	75	Simple mathematical algorithm
Urban land footprint	m^{2}inhab	626	Decreasing	575	Strong increase	700	Strong decrease	535	Land-use models

Society
Population growth. Variation in population over a year, expressed as a percentage of the difference of the number of individuals in the total population at the beginning of that period
Urban density. Number of people inhabiting a km^2 of urbanized area
Migration rate. Difference of immigrants and emigrants of an area in a year divided per 1,000 inhabitants (considered on midterm population)
Dependency ratio. Age-population ratio of those typically not in the labour face (the dependent part, <15 and >65) and those typically in the labor force (the productive part)
Replacement fertility rate. Level of fertility at which a population exactly replaces itself from one generation to the next, stated in 2.1
Economy
Unemployment rate. The percentage of the total labour force that is unemployed but actively seeking employment and willing to work
Predominant economic sectors. Percentage of predominant activity in relation to the total number of existing jobs
Electric energy consumption. Megawatts hour of electricity per inhabitant consumed in a year
Economic growth. Increase of per capita gross domestic product (GDP) or other measures of aggregate income, typically reported as the annual rate of change in real GDP
Environment
Selective collection of solid waste. Percentage of recyclable waste selectively separated by the community individuals
Modal split. Percentage of public transport modes in relation to total trips
Mobility with private vehicles. Distance travelled annually by motor vehicles for personal mobility (in vehicle kilometers)
Proximity to bicycle network. Meters of distance that an individual has to walk from his home to get to a bicycle lane (appropriate distance: 300 meters)
Water consumption. Use of water in m^3 per inhabitant, including its consumption in all kinds of ways
Urban land footprint. Area of primary-production land needed to support the resource use of the dwellers on urban land

Figure 7 Current spatial scenario (2010)

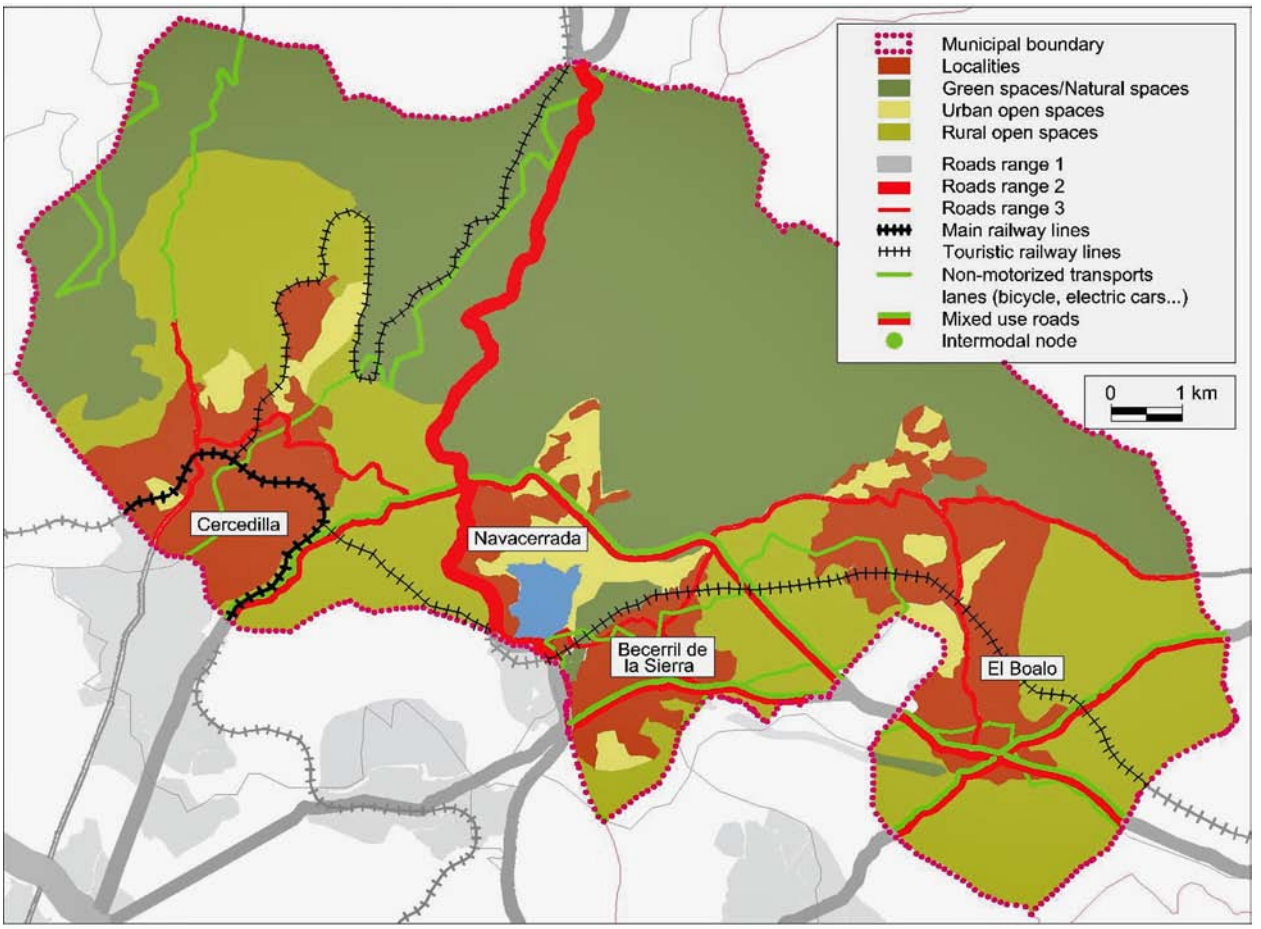


Source: Authors' elaboration (2011)

difficult to decouple the increasing environmental impact. The protection of the natural environment will be virtually confined to areas declared as having natural importance, while the rest of the territory will be exposed to real estate development. Priority will be given to the construction of road infrastructure in detriment of the railway system. The implementation of the public transport system will not be feasible due to the excessive dispersal of land uses and the low density population.

Spatial implications of Scenario C (2025). In the ''back to basics'' scenario, sustainable development will be imperative due to the lack of energy resources and low economic activity. Under these limitations, spatial development in the study area will occur in the following terms (see Figure 10). There will be a strong public awareness of SD, but priority will be given to social and economic policies that create employment. People from the big metropolis will migrate to the countryside in search of job opportunities. Many second homes will be abandoned by their owners because of maintenance problems, and they will be either demolished or recycled for other urban uses. There will be no significant urban growth. Protected natural areas will cover most of the territory. Urban sprawl will be heavily taxed and the compact city model will be imposed. Proximity between residence and work will be encouraged to reduce commuting. Road networks will be reduced in favor of an extended railway system. Priority will be given to non-motorized transport modes, with the construction of new lanes.

Figure 8 Spatial implications of Scenario A (2025)



Source: Authors' elaboration (2011)

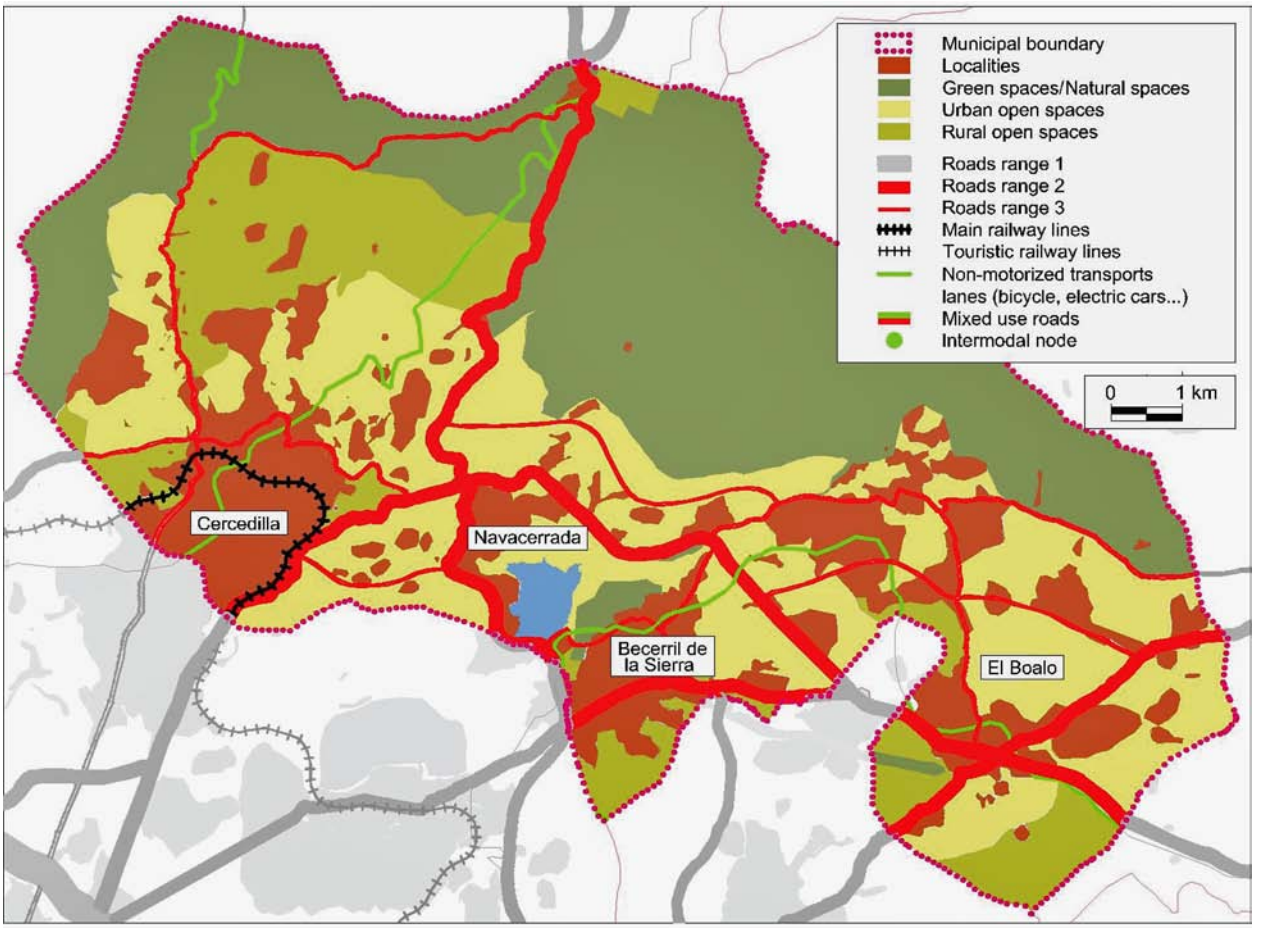
4.5 Step 5: formulating strategies

After determining functional, parametric and spatial implications, formulating strategies for future urban development appears to be a quite logical and deductive step in the proposed methodological approach. Findings from the implications analysis generate a SWOT matrix in which gaps between the future scenario and the present situation can be easily perceived. The identification of gaps therefore constitutes a logical basis for formulating strategies. A few sample strategies are suggested below for each scenario.

Suggested strategies for Scenario A. The green paradigm scenario offers a favourable context to successfully tackle the major challenges such as fighting climate change, undertaking territorial planning or improving energy efficiency. Nevertheless, prospering in Scenario A will mean a major transformation in the Spanish society, as the following strategic actions illustrate:

- Develop an open collective mentality so that society can adapt quickly to changes.
- Promote an educational system that transmits the values of sustainability, innovation, social commitment and solidarity.
- Satisfy new, heterogeneous social demands without endangering the principles of sustainable development.

Figure 9 Spatial implications of Scenario B (2025)



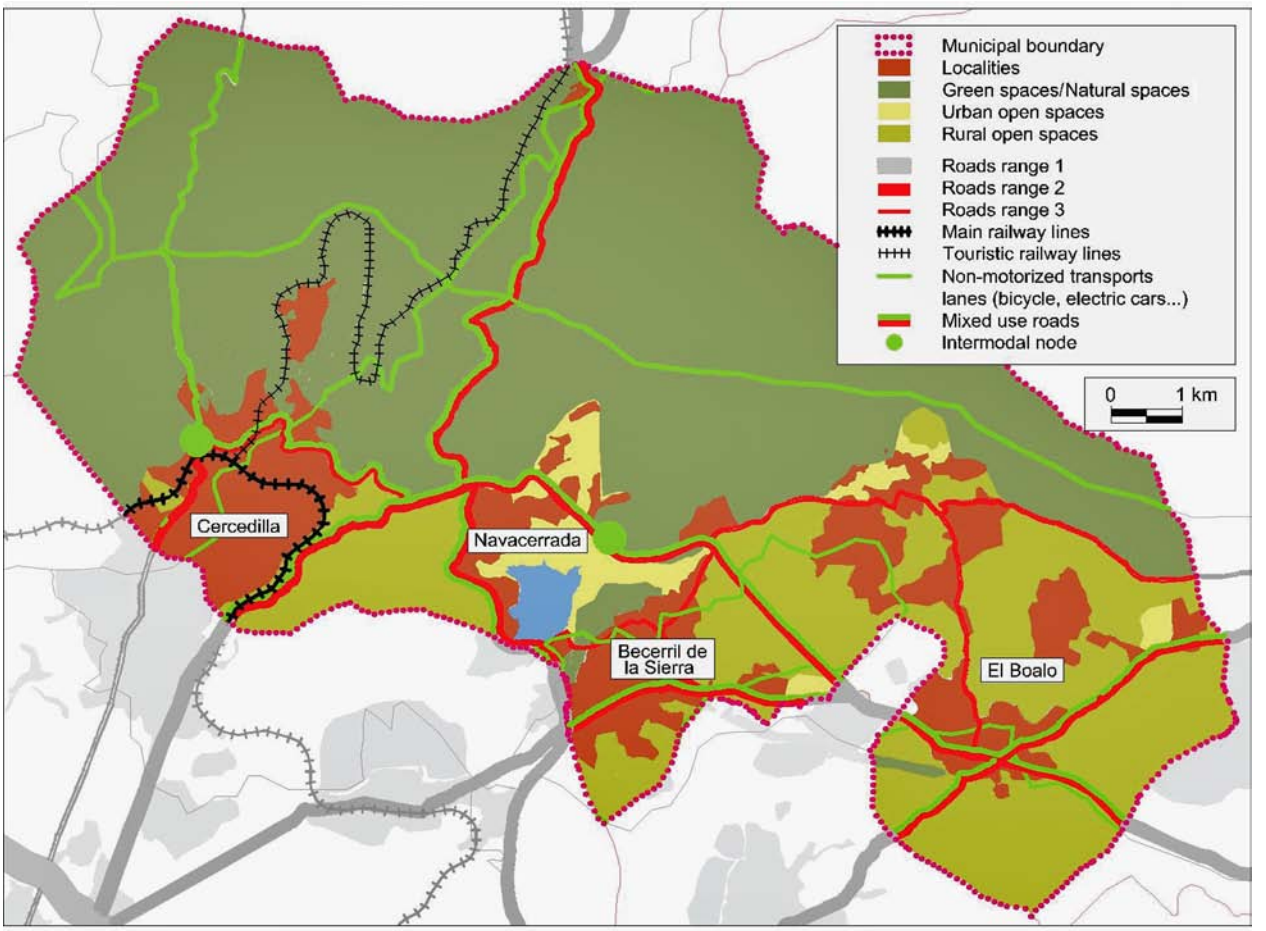
Source: Authors' elaboration (2011)

- Build a new economic model that is environment-friendly and fosters responsible consumption.
- Modify mobility patterns by incorporating technological and energy innovations.
- Modernize public administration so that it can implement an advanced, transparent governance model.

Suggested strategies for Scenario B. In the predator development scenario, Spanish society is somewhat self-indulgent and very much oriented towards consumption because it feels confident that new technologies will solve most environmental threats. In this context, there is a need for strict policies and measures to prevent or minimize the generation of heavy environmental impact:

- Satisfy social needs in a context where individualism and intolerance prevails.
- Prevent spatial segmentation of ethnic groups into residential enclosures.
- Foster a dynamic economic system with energy renewable sources.
- Channel the growing demand for mobility by people and goods through the construction of new environment-friendly transport infrastructure.
- Strengthen the urban planning legislation to control real estate pressure.

Figure 10 Spatial implications of Scenario C (2025)



Source: Authors' elaboration (2011)

- Pursue a massive incorporation of new technologies into public administration to improve and streamline their operational processes.

Suggested strategies for Scenario C. The back to basics scenario is dominated by a high level of social frustration due to a long-standing economic recession and the lack of an adequate response by previous governments. Emerging from the crisis and implementing sustainable development policies requires radical proposals led by social movements:

- Build a social fortress based on family networks and Third Sector organizations to survive in a tough economic context.
- Prevent the outburst of social conflicts through the implementation of ambitious inclusive social policies.
- Set up an educational system aligned with new social and environmental values.
- Establish mandatory measures to diminish energy consumption and promote the use of public transport.
- Internalize the cost of urban sprawl and discourage new urban developments.
- Build a governance model that is capable of effectively integrating politicians, stakeholders, social movements and citizens on an equal footing.

5. Applied approach to territorial foresight

The proposed method to reconcile territorial foresight with urban planning was developed over a five-year period. Due to the scarcity of research resources and the complexity of the topic, progress had to be attained through a slow, piecemeal effort in different research projects and academic activities. An approximated work sequence can be set out as follows:

1. Evidence about the oblivion of territorial foresight among Spanish planners was gathered as part of doctoral academic activity (Fernández Güell *et al.*, 2009-2011). Nearly 20 personal interviews were made with planning practitioners and public officials in Spain. Interviewees were questioned systematically about their attitude toward future studies and their perceived barriers to the implementation of these studies.
2. Scenarios regarding social attitudes towards sustainable development were adopted from the foresight exercise carried out by Fundación OPTI in 2007. More than 30 experts from private companies and public organizations helped to assess trends and determine scenario implications for the sustainable development model. Experts were engaged via personal interviews and focus groups.
3. The determination of functional implications as a means to strengthen scenario design was tested for the first time as part of a foresight exercise undertaken in Burgos city (Asociación Plan Estratégico de Burgos, 2009). More than 40 local stakeholders participated in the study through eight thematic groups and determined the scenario implications for the city's future development. This exercise was used as an input to the Burgos Strategic Plan and the city planning process.
4. Partial evidence for determining parametric and spatial implications in the study area was gathered in a research project financed by the Universidad Politécnica de Madrid (Fernández Güell *et al.*, 2007). This project explored development trends in the metropolitan peripheries of Madrid, paying special attention to environmentally sensitive areas in the Guadarrama mountain range.

Although the collection of evidence in a fragmented way by diverse means over a long period of time may a seem a very inefficient and tortuous way of conducting research, this approach has allowed us to mature ideas and contrast instruments with parsimony in a little-explored field of knowledge.

6. Main findings and conclusions

Although the research findings are not conclusive since the methodological approach has to be tested further in a wide variety of urban contexts, some tentative conclusions can be drawn from the evidence and experience gathered over the last five years. These findings are grouped into two sets.

The first group of findings relate to the advisability of changing the Spanish urban development model so as to promote the SD concept amongst citizens, economic agents and public bodies. Whichever scenario materialises in the near future, the sustainability paradigm in Spain will be achieved, depending on the fulfilment of a number of prerequisites:

- The development model will have to be more integrated, more participatory, more coordinated, more technology-friendly, and more based on management principles.
- The urban planning processes will have to incorporate breakthrough innovations and subsequently, be totally reengineered.
- The transformation of the planning process will require reciprocal changes in the legal framework and the governance model.
- Broad territorial plans, which are strategically comprehensive and multi- sectoral, will have to be elaborated and effectively implemented in order to achieve sustainability.

- All public administrations – European, national, regional and local – will have to be responsible and feel deeply involved to implement sustainable development.
- Social intelligence regarding sustainability must significantly increase if lifestyles and consumption behaviour are to be changed in the desired direction.

In brief, Spain faces a major challenge to change social and cultural behaviour towards sustainable development. Overcoming this challenge will mean undertaking significant changes in day-to-day habits, as well as in governance and business models.

The second set of findings shows the advisability of reinforcing foresight tools to make them more attractive and reliable for urban planners. With respect to the assessment of the approach proposed in this paper, some findings are worth mentioning.

First, the foresight method appears to be user-friendly for regional and local decision makers and quite manageable for technicians. Although the approach is process-oriented, it generates a tangible product – future scenarios and their functional, parametric and spatial implications – which people can easily refer to and understand.

Second, this foresight approach may be welcomed by both strategic and physical planners. On the one hand, it offers a comprehensive future vision of a territorial issue and its functional implications, and on the other hand, it encompasses analytical and spatial tools with a view to developing quantitative projections for specific issues.

Third, quantitative analysis can lend coherence and credibility to scenario exercises. However, modelling tools should support the process and not drive it. In fact, the sophistication of many statistical and mathematical models is more apparent than real when it comes to tackling the demands of contemporary cities. Therefore, a foresight method like the one proposed here should not lose its eminent qualitative nature.

Fourth, this exercise elicits the potential for using foresight as a powerful tool for the dissemination of territorial knowledge and the establishment of expert networks, which altogether can help to improve a territory's governance.

In brief, the present research lays the foundations for the integration of foresight methods with urban planning processes in order to achieve a more sustainable development model. The complementary added value of both approaches can represent an innovative opportunity for policy makers and stakeholders searching to respond to future challenges. A dynamic and sometimes turbulent environment puts enormous pressure on rational planning systems, which in many cases have been designed to simulate highly stable and predictable functional systems. Therefore, foresight methods represent an emerging approach that works with few technical constraints and shows an increased adaptability to environmental changes. This research represents a starting point for interaction between urban planners and futurists. If this achieved, the chances are that foresight will elicit less technical scepticism in the urban planning realm.

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