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SOCIAL ATTITUDE TOWARD SUSTAINABLE DEVELOPMENT IN 2025: A CASE FOR REINFORCING SCENARIO DESIGN

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Summary

This paper shows the role that some foresight tools, such as scenario design, may play in exploring the future impacts of global challenges in our contemporary Society. Additionally, it provides some clues about how to reinforce scenario design so that it displays more in-depth analysis without losing its qualitative nature and communication advantages.

Since its inception in the early seventies, scenario design has become one of the most popular foresight tools used in several fields of knowledge. Nevertheless, its wide acceptance has not been seconded by the urban planning academic and professional realm. In some instances, scenario design is just perceived as a story telling technique that generates oversimplified future visions without the support of rigorous and sound analysis. As a matter of fact, the potential of scenario design for providing more in-depth analysis and for connecting with quantitative methods has been generally missed, giving arguments away to its critics.

Based on these premises, this document tries to prove the capability of scenario design to anticipate the impacts of complex global challenges and to do it in a more analytical way. These assumptions are tested through a scenario design exercise which explores the future evolution of the sustainable development paradigm (SD) and its implications in the Spanish urban development model. In order to reinforce the perception of scenario design as a useful and added value instrument to urban planners, three sets of implications –functional, parametric and spatial— are displayed to provide substantial and in-depth information for policy makers.

This study shows some major findings. First, it is feasible to set up a systematic approach that provides anticipatory intelligence about future disruptive events that may affect the natural environment and socioeconomic fabric of a given territory. Second, there are opportunities for innovating in the Spanish urban planning processes and city governance models. Third, as a foresight tool, scenario design can be substantially reinforced if proper efforts are made to display functional, parametric and spatial implications generated by the scenarios. Fourth, the study confirms that foresight offers interesting opportunities for urban planners, such as anticipating changes, formulating visions, fostering participation and building networks.

1 The oblivion of future studies in urban planning

Since its origins in the 19th Century and its full development during the 20th Century, one of the key concerns of urban planning has been to foresee the future and to limit uncertainty. In fact, one of the core objectives of a city plan is to take decisions in the present time in order to guide properly urban activities in the future. Nevertheless, nowadays long-range forecasts and visions do not seem to conceal 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). The question is why urban planners do not think anymore in visionary terms. Recent research has showed that most public agencies in charge of urban and regional planning in Spain as well as private consultants carrying professional work in that field were very reluctant to use future studies in their plans and projects (*Fernández Güell et al*., 2010). This withdrawal from future studies can be explained by historical reasons.

In the second half of the 20th Century, urban planning abandoned its visionary origins and became more technocratic, favouring the use of quantitative forecasts, based on sophisticated algorithms and mathematical models. However, the profound socioeconomic changes experienced by most cities in the sixties and seventies produced gross mistakes in urban predictions. Continuous failures in making forecasts damaged the reputation of urban planners and stated the impossibility to predict urban phenomena based on scientific laws and regular patterns. The aftermath of quantitative models left the urban planning field with a profound disbelief toward any kind of futures oriented analysis.

By the end of the 20th century, socio-demographic, economic and technological changes were taking place at a fast speed with nonlinear patterns, being difficult for citizens to assimilate them. Just as well, urban planners had a hard time for undertaking forecasts, since structural changes were making traditional paradigms obsolete. Confronted with this situation, most urban planners recognized their impotence for drawing reliable predictions, so they turned toward short-term and contingency planning as a way to navigate in a very uncertain context.

The pre-eminence of collaborative planning adds in detriment of futures studies. Nowadays, citizen participation and collaboration among public and private stakeholders have become the milestones in the planning realm. Under this context, urban planning has turned more into an action-oriented process with short and medium-term horizons. The need for consensus and compromise has rendered the formulation of visions and the display of technocratic predictions obsolete.

These reasons explain somehow the scarce attention paid by urban planners in the last few decades to revise and reinvent 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 Convenience for undertaking territorial foresight

The metropolis of the 21st Century will have to evolve among high doses of complexity, uncertainty and turbulence. In this context, many traditional analytical tools will be of no help to urban planners; in fact, the sophistication of many statistical and mathematical models is more apparent than real when they come to face contemporary cities demands. It is obvious that the planning profession will have to develop new methods and analytical tools to meet the coming challenges. Three arguments are given to support the use of futures studies.

The first argument is precisely related to the high level of complexity and turbulence that will characterise our cities. When these issues dominate the urban scene, it is advisable to foresee the future in order to manage the level of uncertainty.

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

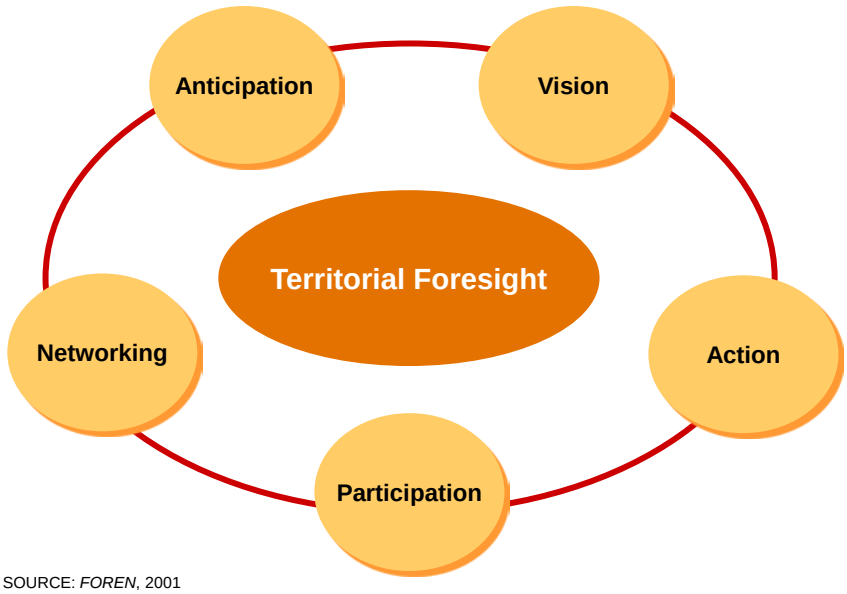
Thirdly, there is a tight relationship between futures studies and strategic planning (*Fernández Güell*, 2011). The need for thinking about the future and for formulating long-term development visions makes strategic planning a perfect client for futures studies.

Since there are solid arguments to place futures studies in a relevant position within the urban planning process, the subsequent question is whether they can respond to the needs of contemporary urbanism. The answer may be named "territorial foresight".

According to several authors (*Fernández Güell*, 2006, *FOREN*, 2001; *Gavigan y Scapolo*, 2001), **territorial foresight** can be defined as a systematic, participatory, future intelligence gathering and vision-building process aimed at taking present-day decisions and mobilising joint actions in the urban and territorial realm. Foresight brings together key agents of change and sources of knowledge in order to develop strategic visions and anticipatory intelligence.

Therefore, territorial foresight involves the implementation of five essential elements at a small geographic scale, in which proximity factors are decisive (see **Figure 1**):

Figure 1: Elements of territorial foresight



SOURCE: *FOREN*, 2001

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 present actions to face the future successfully.

4) ***Participation***. Foresight intensively incorporates interactive and participatory methods that support 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 through 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 where there are deep disagreements between territorial stakeholders. Third, foresight is not a quick remedy for urgent problems because it requires long analyses and the establishment of expert networks that do not produce immediate results. Finally, foresight demands 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 into them new elements and values, empowering local agents and providing legitimacy to territorial strategies.

Foresight methods are spreading progressively and are becoming a decisive element in many planning exercises. This trend is determined by fast and unpredictable changes experienced by society, markets, technology and science. A dynamic and sometimes turbulent environment puts enormous pressure on rational planning systems, which have been frequently 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.

3 How to reconcile territorial foresight and urban planning

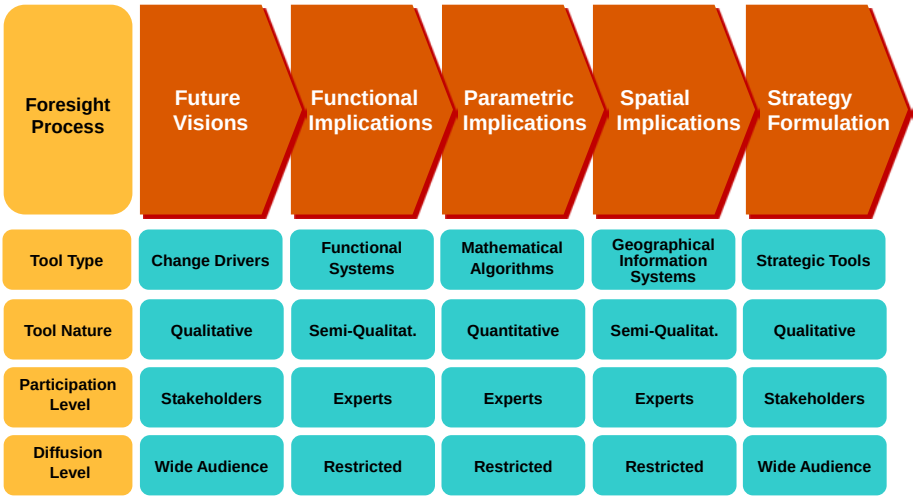
Despite its apparent benefits, territorial foresight is either simply ignored or just perceived as a trivial set of tools that do not provide much added value to the urban decision making processes. In order to reconcile foresight techniques with urban planners, new contributions are needed to reinforce qualitative instruments so that the quality and detail of their outputs (visions or scenarios) will enable them to 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 displays how to translate a future urban vision into practical and measurable strategies to guide territorial development in the middle and long-term. This approach is made up of five sequential steps (see **Figure 2**):

> **Step 1: Formulation of future visions**. Traditional foresight tools, such as vision or scenario design, are used to create a future vision of the territory. An important prerequisite is to characterise a functional system which displays territorial elements, socioeconomic flows and local stakeholders. This first step should be mostly performed with qualitative tools that facilitate participation of stakeholders.

Step 2: Determination of functional implications. Once the visions are formulated, functional implications are determined on the territorial system. Implications may refer either to specific elements of the territory or to transversal issues such as planning chain, participatory process, governance model, legal framework, planning technology or management skills. This step should be undertaken with semi-qualitative analytical tools and would be mostly restricted to urban experts.

Figure 2: Linking foresight and urban planning



Step 3: Determination of parametric implications. Functional implications should provide plenty of clues so as to establish a set of parametric indicators that will measure urban development impacts. Wide-used parameters among urban planners, such as population growth, job location, urban land consumption, urban density, urban sprawl or mobility ratio, can nurture standard mathematical models, such as the well-known land-use and transport simulation models. Therefore, the third step should be based on quantitative tools and would be restricted to urban experts.

Step 4: Determination of spatial implications. Once parametric implications are fixed, they can be downloaded into a geographical information system (GIS) so as to observe future urban implications from the spatial perspective. Nowadays, GIS technology provides a wide array of functionalities to display alphanumeric data in a digital map. A GIS tool will show graphic information about urban growth, urban sprawl or 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.

Step 5: Strategy formulation. After determining all kind of implications over 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 his 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's operation requires the involvement of stakeholders.

It may be said that this approach is not new in a strict sense, since most of the proposed steps have been implicitly or explicitly used in the urban planning field. Nevertheless, the innovative point made here is that they are used in an articulated and coherent way, having a foresight exercise as a starting point.

4 A practical application of future studies

Once the proposed approach to link foresight tools with the urban planning process has been established, a practical application is displayed in order to assess its utility and feasibility. The chosen example is partially based on a scenario design exercise, in which the social attitude toward sustainable development was explored for the Spanish context in 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 because it may induce disruptive transformations in the urban planning value chain.

4.1 Complexity and uncertainty regarding sustainable development

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” (*WCED*, 1987), this concept has gained universal acceptance among the general public, socioeconomic agents and politicians. 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 unmanageable complexity and its high uncertainty.

The first difficulty arises from the diverse and complex behaviour of social groups towards sustainable development in their daily or sporadic vital activities, becoming therefore very difficult to discern all of the potential demands that may be imposed on the citizen in regard to SD. This level of complexity is aggravated by the fact that the sustainability paradigm also influences and transforms social behavioural patterns, acting as a circular scheme.

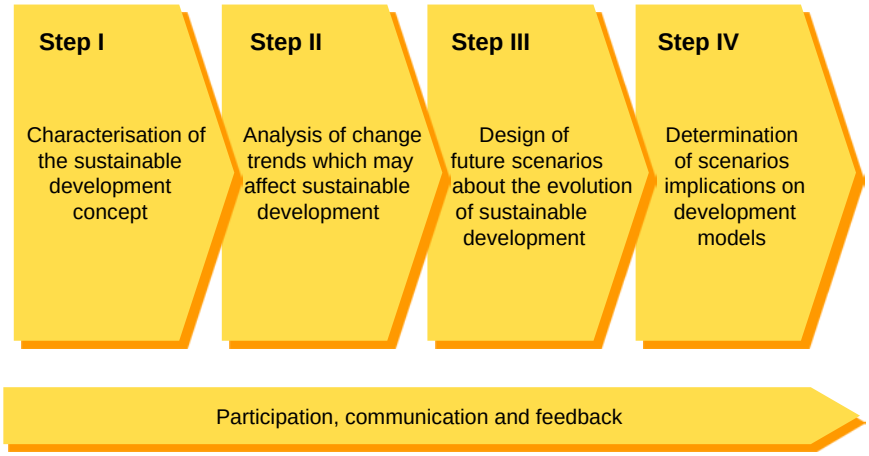
The second difficulty refers to the existing high level of uncertainty whenever the future evolution of social behaviour in regard to sustainable development in advanced and prosperous societies is foreseen. Even if we know the principles and values that presently guide the vital functions of social groups, these can easily change in a short period of time, quickly breaking away from historical patterns. In addition, we ignore the future evolution of environmental factors, such as climate change and the availability of energy resources, which will influence social behaviour.

Having understood the intrinsic difficulties of the exercise, among all foresight tools **scenario design** was chosen because it could manage adequately the topic’s complexity and uncertainty as well as it could unfold alternative futures. Scenario design is a technique that has been widely used and documented (*Godet*, 2001; *Heijden*, 1996; *Schwartz*, 1991). This foresight technique 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 deeply creative and capable of handling uncertainty.

4.2 Design of future scenarios

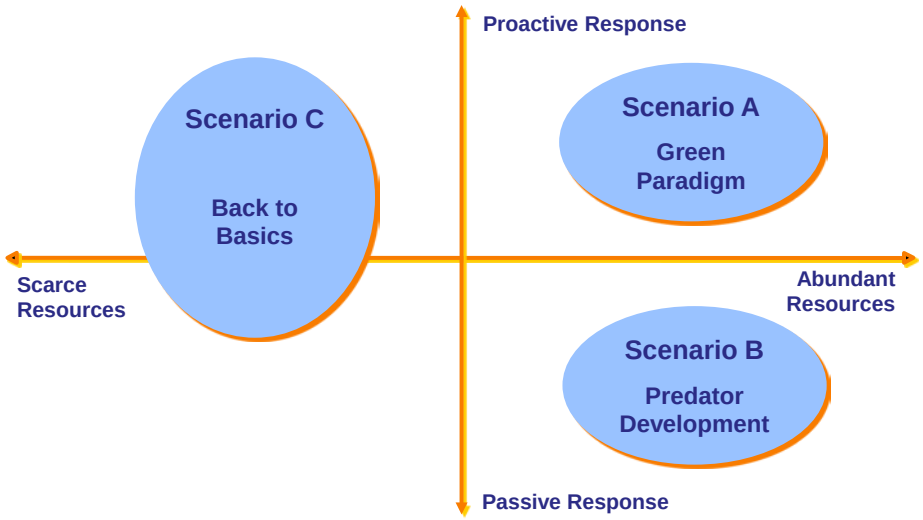
The stated foresight exercise followed the conventional scenario design methodology made up of four sequential steps (see **Figure 3**).

Figure 3: Scenario design methodology



Once the SD concept was conveniently characterised (Step I) and major trends were identified and analysed (Step II), the exercise proceeded to design alternative scenarios (Step III). Thus, change drivers affecting SD were grouped into two axes (see **Figure 4**):

Figure 4: Future scenarios for sustainable development



- ***Vertical axis***: Represented the alternative responses that society might give in the future to the SD concept. This axis encompassed all future uncertainties related to social behaviour, economic models and public policies towards SD.
- ***Horizontal axis***: Showed the availability of resources needed to achieve the goals of sustainable development 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 distinctive scenarios, which represent in a consistent and plausible form alternative futures into which the SD concept may evolve by the year 2025. A brief explanation is provided below about the socioeconomic context in which each future scenario may evolve.

Scenario A: Green Paradigm (circa 2025). This scenario takes place when there is both a proactive and a favourable response from public and private agents toward SD and also abundance in all types of resources required to achieve sustainable development. "Green Paradigm" stages an environmentally conscious society, in which most citizens participate in public decision-making.

In this scenario, Spanish society gives priority to human and social needs over those purely oriented to consumption. According to 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 an integrated and sustainable 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 disregards environmental issues as noncritical, compared to its economic and consumption needs. The successive appearance of technological innovations seems to conjure environmental threats and tends to relax a society which indulges itself in exuberant consumerism.

In this scenario, the Spanish society is mainly guided by egocentric values. At the State level, solidarity among regions has significantly deteriorated due to resistance of the wealthiest territories to share their profits with the least developed. Despite the economic cycle's ups and downs, the Spanish economy keeps growing at good rates. Nevertheless, economic achievements have been made by incurring in high environmental costs, social inequities and territorial unbalances.

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, the 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 leads to social tension and frustration. Public and private agents are fully conscious of the need for sustainable development due to a lack in response from the economic and technological realm.

In this scenario, the 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%. Access to the labour market is very difficult for the new generations and most new jobs are precarious.

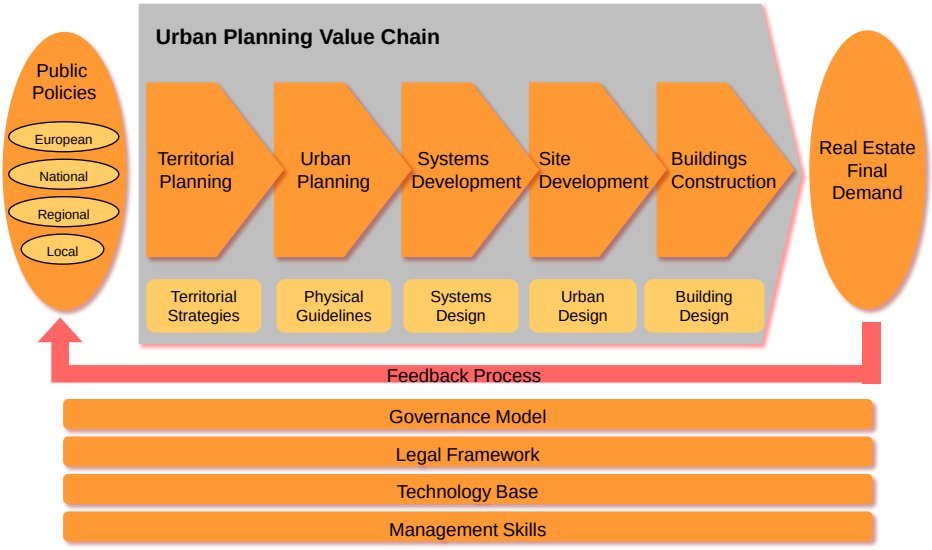
5 Reinforcing scenario design

Most scenarios exercises are finished with the description of geopolitical, economic, societal and technological contexts. Regardless of 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, it should be necessary to offer a more profound analysis. This goal may be achieved by analysing in-depth implications of each future scenario on functional systems, parametric indicators and spatial patterns. These possibilities are explored in a small territory located in the north-western periphery of Madrid metropolitan area.

5.1 Determining functional implications of scenarios

After having designed the three scenarios, the proposed methodology establishes a set of functional implications that each future scenario poses on the urban planning process. For that purpose, a conceptual framework displaying the standard logic of urban planning processes has been developed to guide the implications analysis (see **Figure 5**).

Figure 5: Urban planning conceptual framework



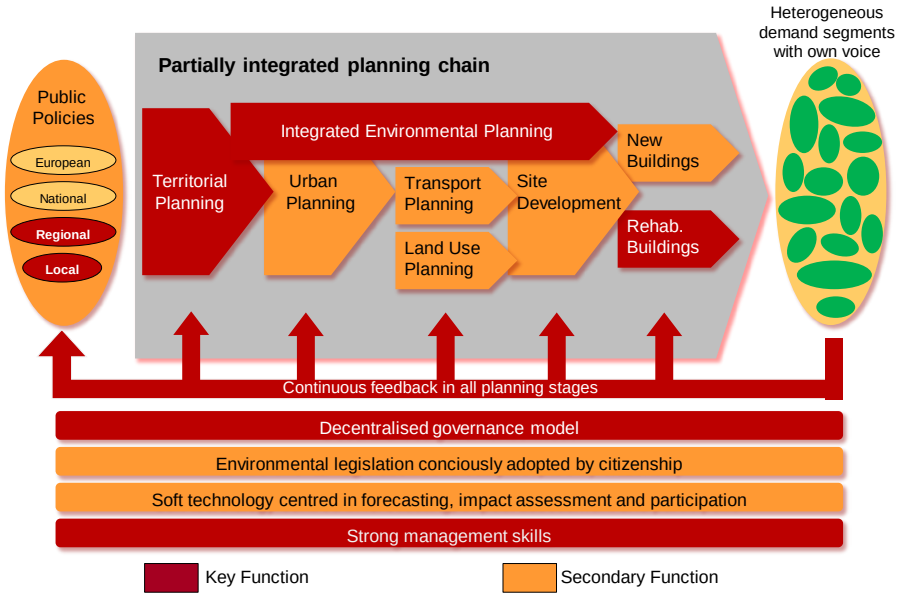
Standard urban planning procedures can be conceptualised by two major sets of elements. The first set is articulated by the urban planning value chain, which displays in a sequential and hierarchical way how urban development proceeds from territorial planning to urban planning, systems development, site development and construction of buildings. 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, which are formulated by various administrative levels, and it is geared to satisfy 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 by horizontal elements that provide integral support to 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.

Scenario A functional implications (2025)

The "Green Paradigm" scenario reflects a social proactive response to SD while urban societies enjoy abundant resources (see **Figure 6**).

Figure 6: Scenario A "Green Paradigm"



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 as far as they do not conflict with sustainability principles. In this context, the planning value chain is partially integrated by the need of incorporating environmental planning in every step of the development process. Other key elements are territorial planning and the rehabilitation of buildings.

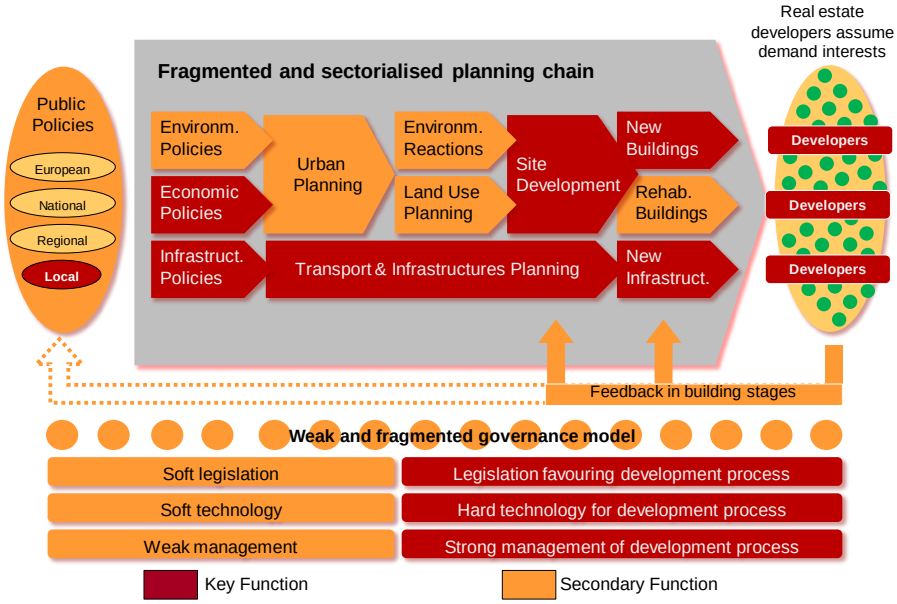
Real estate demand is very heterogeneous and segmented in multiple small groups, who are very concerned about environmental issues and who wish to have their own voice in the planning process. Citizens and non-governmental organisations exercise intensive vigilance over real estate projects. The big challenge is to give satisfaction to multiple and diverse social demands, but without risking sustainability principles.

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 enables a decentralised democratic system. This model requires a strong set of management skills in all public organizations to guide participation and coordination actions. Public management should be able to internalise environmental costs through sophisticated environmental evaluation tools.

Scenario B functional implications (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 7**).

Figure 7: Scenario B "Predator Development"



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 needs dictate the need for developing new infrastructures and buildings.

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

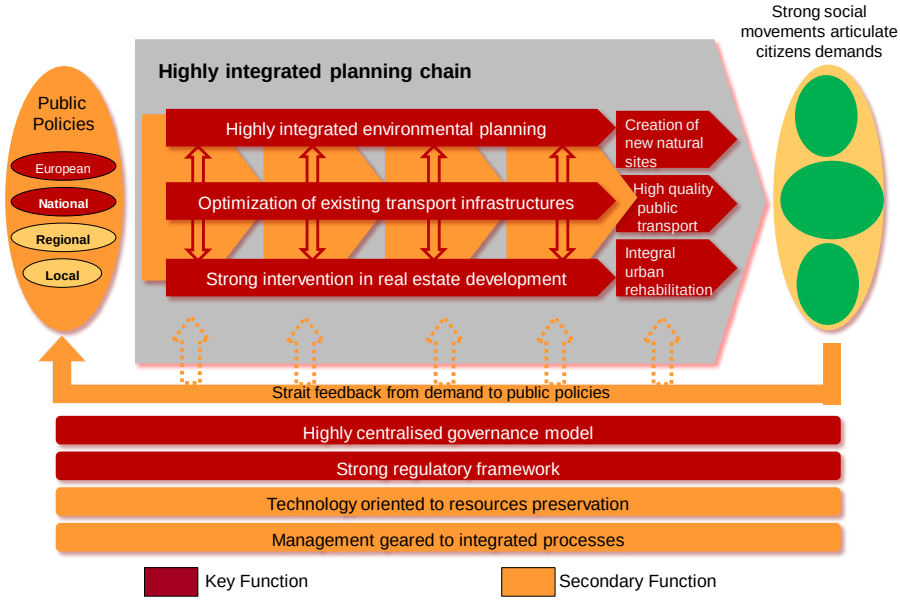
Conditions inherent to Scenario B favour a local governance model that is opaque and discourages participation. In this context, there are frequent disputes among political, social and economic stakeholders which hinder consensus. Horizontal elements, such as legislation, technology and management are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

Scenario C functional implications (2025)

The "Back to Basics" scenario takes place when economic and environmental crisis are recurrent, resources are scarce and social attitude is very favourable toward the implementation of strict SD models (see **Figure 8**).

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 a strict control and surveillance from Brussels and Madrid authorities.

Figure 8: Scenario C "Back to Basics"



In this context, the planning value chain is highly integrated, linking the different lines of sectorial planning under a comprehensive approach. Therefore, environmental, transport and land-use planning are 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 type and condition 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 heard by public bodies.

In this scenario, the governance model is managed by a strong centralised power (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 leaded by major social groups. This governance model allows for direct feedback from citizens groups to public authorities, being its major drawback the threat of majorities imposing decisions to 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.

5.2 Determining parametric implications of scenarios

Once functional implications have been determined, a set of parametric indicators related to standard sustainability issues (*Meadows*, 1998) is established to assess the potential impact of each future scenario on urban development patterns (see **Table 1**). A base-line scenario (2010) is estimated, based on current statistical data provided by various public sources. Projections for the year 2025 have been 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.

Table 1: Main scenarios indicators

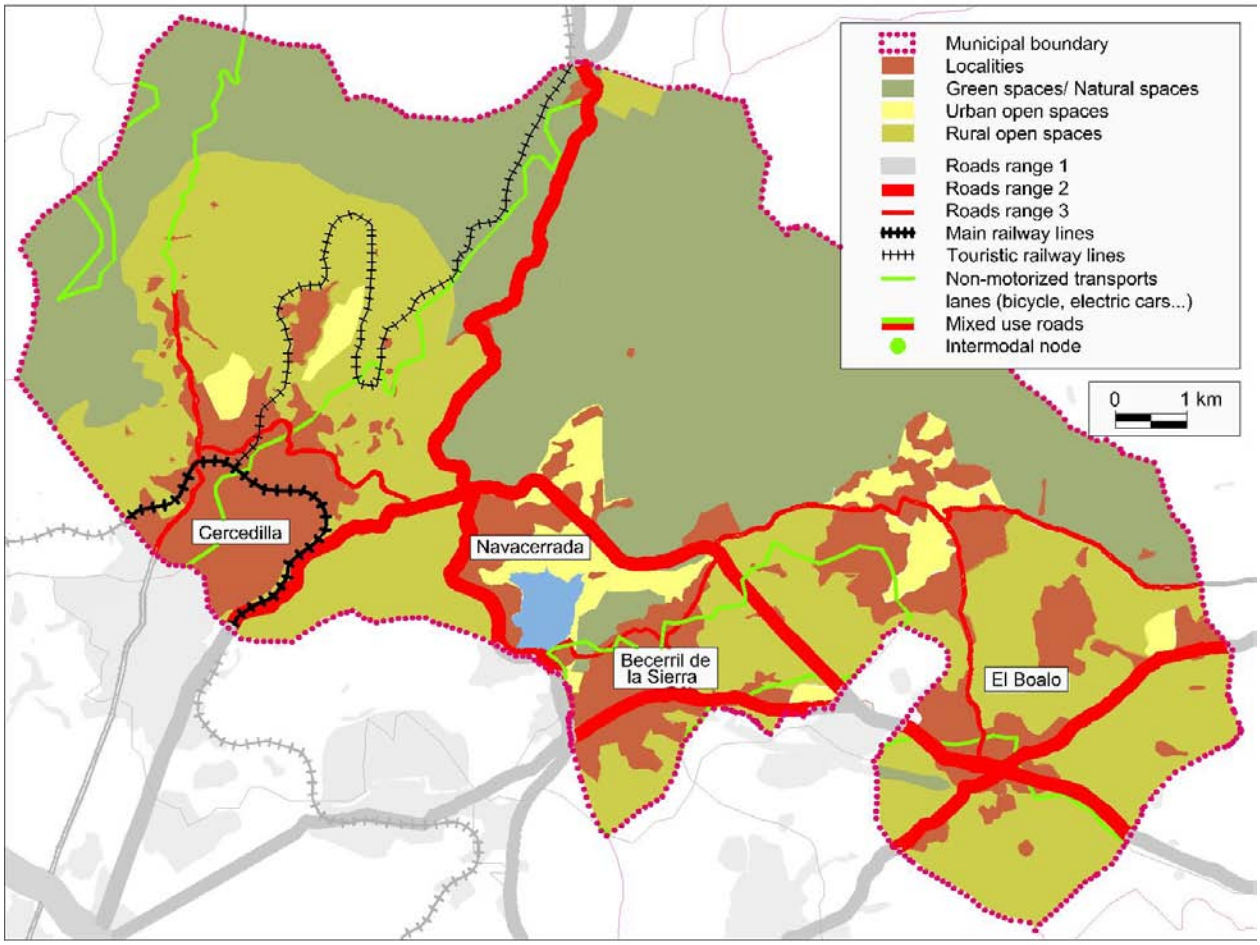
	Indicators	(measurement unit)	2010	2025						Analytical methods and tools used for estimating indicators
				Scenario A		Scenario B		Scenario C		
society	Population growth	Δ hab (% annual)	0.98	medium-low	0.6	high-medium	1.6	negative	- 0.5	population projections
	Urban density	inhab/km²	135	medium	147	medium-low	125	high	168	simple mathematical algorithm
	Migration rate	migrants/1000 hab (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	Δ 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 bicycle network	meters	380	close	200	far	500	midway	300	normative policies
	Water consumption	m³/pc	106	medium	112	high	136	low	75	simple mathematical algorithm
	Urban land footprint	m²/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 km² 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 labor force (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.
economy	**Unemployment rate.** The percentage of the total labor 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 m³ 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 dwellers on urban land.

5.3 Determining spatial implications of scenarios

After having parameterized and projected a set of sustainability indicators, 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. **Figure 9** shows the current physical status (2010) of the study area, made up by four municipalities -- Cercedilla, Becerril de la Sierra, El Boalo and Navacerrada--, which holds 21.500 inhabitants in 150 km².

Figure 9: Current spatial scenario (2010)

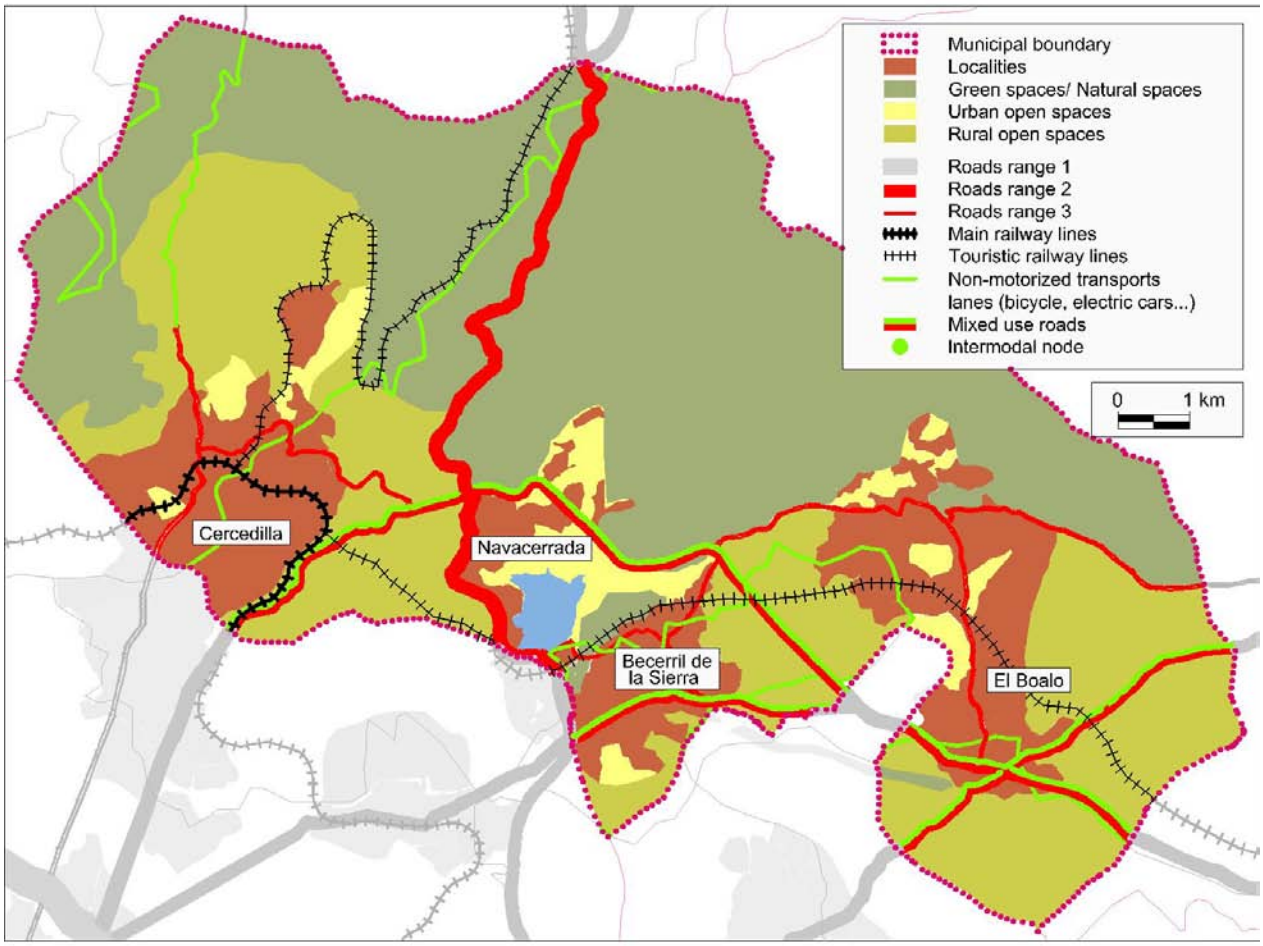


Each of the following future scenarios (2025) represents a planning concept taken to an extreme. The final shape that the localities will adopt will be a melding of several topics, whose major assumptions and deterministic results are summarized as follows.

Scenario A spatial implications (2025)

The dominant philosophy of the "Green Paradigm" scenario will be to thrive in economic and social terms with a lower consumption of energy, water and natural resources. Under these circumstances, the study area will develop as follows (see **Figure 10**). 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 in well delimited urban areas and 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 will 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).

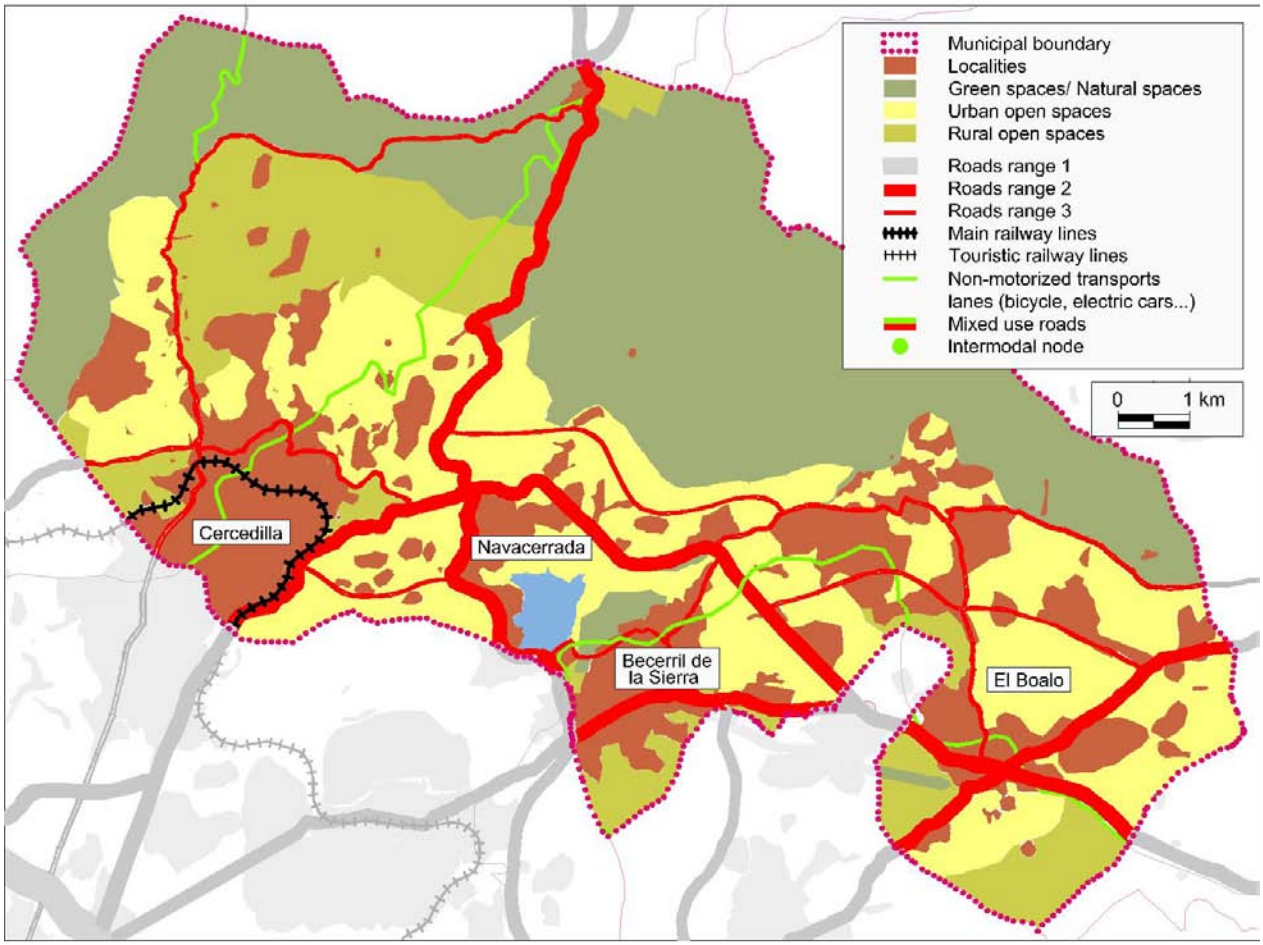
Figure 10: Scenario A spatial implications (2025)



Scenario B spatial implications (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 11**). Territorial management strategies will not incorporate the principles of sustainable development extensively, letting urban sprawl forces free. Towns will be larger with an ever-expanding peripheral area. Urban land consumption per capita will increase, becoming difficult to decouple increasing environmental impacts. The protection of the natural environment will be virtually confined to areas declared of natural interest, but the rest of the territory will be exposed to real estate developments. Priority will be given to the construction of road infrastructures in detriment of the railway system. Public transport system will be unfeasible to implement because of excessive land use dispersion and low density.

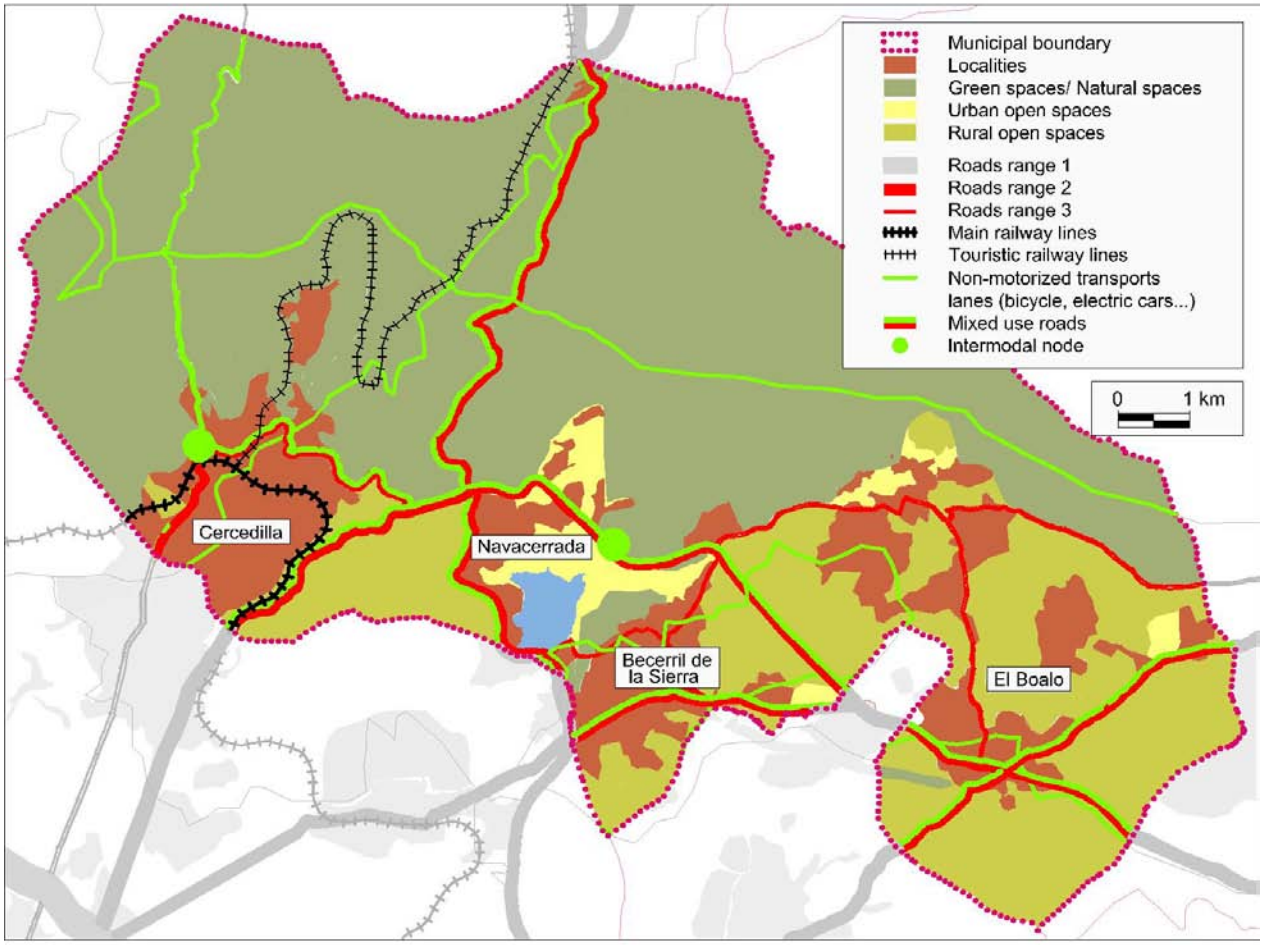
Figure 11: Scenario B spatial implications (2025)



Scenario C spatial implications (2025)

In the "Back to Basics" scenario, sustainable development will be an imperative because of 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 12**). There will be a strong public awareness towards 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 to other urban uses. There will be no significant urban growth. Natural protected 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 means of transport by means of the construction of new lanes.

Figure 12: Scenario C spatial implications (2025)



6 Main findings

Two sets of findings are discernible from this paper: those regarding the need for improving urban development policies and models, and those showing the opportunity and feasibility of reinforcing qualitative foresight tools as scenario design.

The first group of findings relate to the convenience of changing the Spanish urban development model so as to promote the SD concept among citizens, economic agents and public bodies. Whatever 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 multisectorial, 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 towards sustainability must significantly increase if life-styles and consumption behaviours are to be changed in the desired direction.

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

The second set of findings display the convenience of reinforcing foresight tools as to make them more attractive and reliable to urban planners. In respect to the assessment of the approach proposed in this paper, some findings are worth mentioning.

Firstly, 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-- to which people can easily refer to and understand.

Secondly, 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 so as to develop quantitative projections for specific issues.

Thirdly, quantitative analysis can lend coherence and credibility to scenario exercises, but modelling tools should support the process and not drive it. Despite its evident shortcomings, a foresight method like the one proposed here should not lose its eminent qualitative nature.

Fourthly, this exercise shows foresight as a powerful tool for territorial knowledge dissemination and for the establishment of expert networks, which all together can help improve a territory's governance.

In summary, this scenario exercise shows the potential of foresight to deal with territorial issues plagued with complexity and uncertainty, as well as its capability to bring down analysis from global challenges to local and technical implications. Obviously, the proposed approach needs additional development and refinement; but when this is achieved, chances are that foresight will elicit less technical scepticism.

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