INTERREG IIC · METROPOLISATION · PÔLE "RHÔNE - ALPES - SUISSE"

Les espaces naturels périurbains dans les politiques urbaines et métropolitaines.

Periurban natural spaces in urban and metropolitan planning policies.

Approche sur les Espaces Naturels Périurbains coordonée par Fedenatur

Periurban Natural Spaces Approach co-ordinated by Fedenatur

Bilan de la réunion technique de Barcelone (Catalogne, Espagne)

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MISE EN PLACE D'UN RESEAU DE POLE DE COMPETENCE TRANSNATIONAL SUR LA METROPOLISATION
Pôle Rhône-Alpes-Suisse

Fédération Européenne des Espaces Naturels et Ruraux Métropolitains et Périurbains

Introductory Words

Ramón López Lozano- President of Fedenatur

This document, which contains the proceedings of the Barcelona seminar, represents the culmination of all the work carried out within the framework of the Interreg II-C (UE) program in the 2000-2001 period.

I consider the development of this meeting as particularly relevant due to the fact that it tackled as important a theme as the defence and conservation of the natural and rural patrimony of our cities which, in the last decades, have been submitted to expansive urbanisation and a rapacious occupation of the land. In this process, these natural and rural environments have not played a role accordant to the importance they deserve within the framework of sustainable development and of the city's compromise with the defence of it's biodiversity.

We do not agree with the restiction of the concept of nature protection in the metropolitan areas to the preservation of a collection of residual, isolated and disconnected spaces. In fact, we believe the opposite, that there is a serious need to create a network of free and open areas that guarantee the true connectivity of the land and that allow for the prevalence of animal and vegetable life forms, as well as agricultural and cattle-raising activities. This would articulate the urban, industrial and infrastructure sections into an harmonious mosaic, what is the real challenge in turning European cities into liveable spaces.

It is for this very reason that, on a European level, it becomes necessary to develop and define the criteria and characteristics that make up the Natural Spaces on the Urban Peripheries. This would help to establish a standard definition which, in turn would allow for the creation of an internationally accepted level of protection, added to the traditional natural protection labels such as natural park, regional park, national park, etc. These last are very useful tools, but cannot resolve our problem in terms of the metropolitan area. This is a petition that Fedenatur handed to the Directorate General Environment of the European Commission and which has been favourably considered.

Throughout the development of this Interreg II-C programme, we have dealt with different aspects of the complicated dialectic between the cities and natural areas on the peripheries, on a small to large scale. In October last year, in the city of Mataró here in Catalonia, we had a discussion on facilities for public use in the Natural Spaces on the Urban Peripheries. Last April, in Milan, we tackled the problems, perspectives and solutions to the border areas between the city and the countryside. Furthermore, in this last seminar we studied town and city planning policies in depth, taking into account the important role of nature surrounding and penetrating our cities.

The examples presented in this meeting by the diverse European cities, show that it is a subject that concerns us all, and that it is already in the process of development with more or less emphasis. They are also a major exponent to urge other European cities to face the challenge.

One of the objectives of our Federation is to enable an exchange of experiences within the framework of the protection of natural and rural areas on the urban peripheries, which become the recipients of a strong urban pressure, due to the growth and expansion of our cities. However, it is necessary to highlight that another of the Fedenatur objectives, equally important, is to urge European cities which have not yet taken part in these dynamics, to include the protection of these residual and neighbouring natural areas into their town planning and environmental policies. This constitutes an aim for the quality of life of their inhabitants and a necessary condition for sustainable development.

We understand that, within the European Union, this line of argument can constitute a good aim to implement in our cities through land policies concerned with environmental high quality and the preservation of natural resources.

I would like to express my gratitude to the Consorci de la Serralada Litoral for its implication in the celebration of the Mataró seminar, to the Parco Agricolo Sud Milano for its intensive work towards making the Milan seminar possible and to the team from the Consorci del Parc de Collserola for its effort in celebrating the seminar here presented.

Finally, I would specially like to thank the Rhône-Alpes Region, the Urbanism Institute of Grenoble (UPMF), the Parc-Nature des îles de Miribel-Jonage (Lyon) and the Urban Community of Lyon, for their particular political, intellectual and economic implication in the development and attainment of the aims laid out in this program.

The ecological matrix, part of the land plan for the Metropolitan Region of Barcelona

Carles Llop, Daniel Calatayud, Enric Batlle - Escola Tècnica Superior d'Arquitectura del Vallès (UPC).(Catalonia, Spain)

1. Processes in the Metropolitan Region of Barcelona

1.1. Economic change

Mediterranean cities have gone through a series of different phases. A first phase was the pre-industrial one before 1760. The first industrial revolution took place during a second stage between 1760 and 1870, associated with coal, the steam engine, electricity and the railway. The third phase, the second industrial revolution from 1870 to 1970 is associated with petrol, the internal combustion engine, the automobile and the aeroplane. This phase culminated in a work, social security and consumer society guaranteed by the states, the welfare state. The cities are now immersed in a fourth phase, the third industrial revolution or the information society. The technological revolution has given way to global financial intergration, the reduction of transport costs, the globalisation of commerce and a change in production models to flexible models (de-located, just-in-time and outsourcing). This post-industrial society has favoured the weight of transnational companies, (20% of global GNP), strengthening the logic of the sectors and weakening the states. These in turn become forced to de-regulate so that ¨their¨ companies can compete on the global market. The metropolises are re-organising in a self-organised process.

1.2. Social change

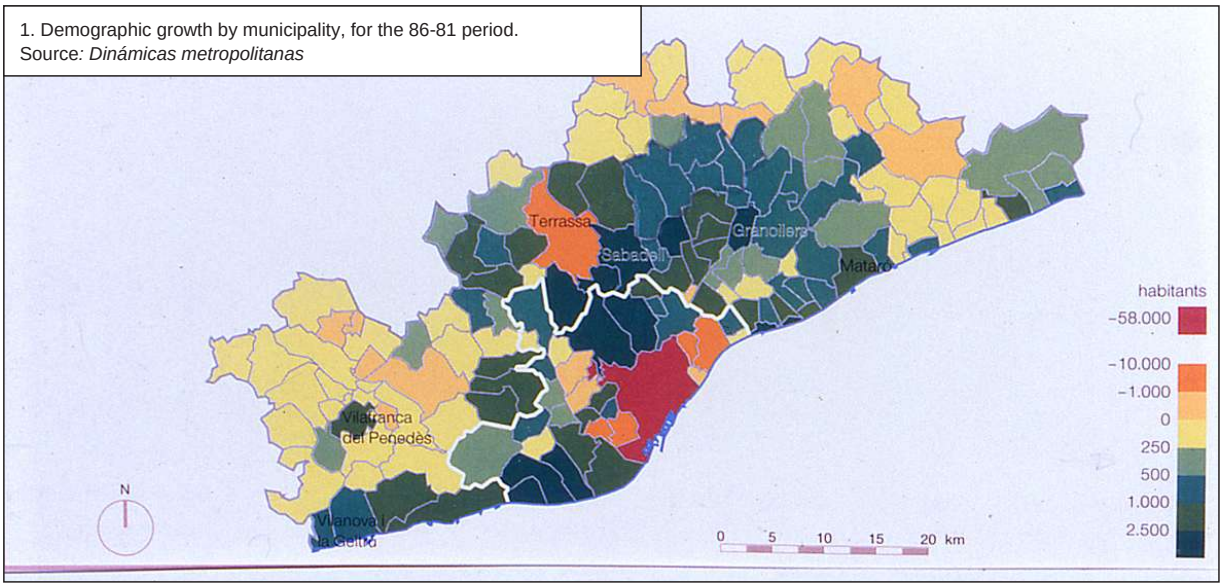
De-regulation culminates in a society of flexible, non-guaranteed work, less social security and/or more unemployment (UE) o lower incomes-rents (USA), but above all more inequality. Therefore we also witness a change in the forms of social organisation from the collective/compacted to the individual/dispersed, from the multifunctional society to the specialised and from the diverse to the segregated society.

1.3. Changes in the occupation patterns of the Metropolitan Region of Barcelona (RMB)

This new reality is transforming the RMB. It is evolving, from the agglomeration model to the network production model. This is characterised by a more elongated use of the land, more mobility, a revaluation of the peripheries, a preference for dispersed residential models and competition between municipalities in order to attract a population which is increasingly more segregated by its income. Lastly, there is a growing terciaration of the ¨core¨ focused on promoting the great urban attractions, businesses, urban tourism and commerce of high mark up prices (figure 1).

1.4. The study of morfogenesis in the Metropolitan Region of Barcelona (RMB)

1. Demographic growth by municipality, for the 86-81 period.
Source*: Dinámicas metropolitanas*



The town-planning department of the Valles Higher Technical College of Architecture has studied and mapped the morfogenesis of the RMB in three phases: 56-72, 73-86, 87-96. If at all times all the different forms of growth are apparent then each one of these phases is defined by the prevalence of one of these growth models. The cartography of these changes reveals the economic model or the predominant growth model.

- *If in the 56-72 phase, extension growth predominated by way of new suburbs and estates...*

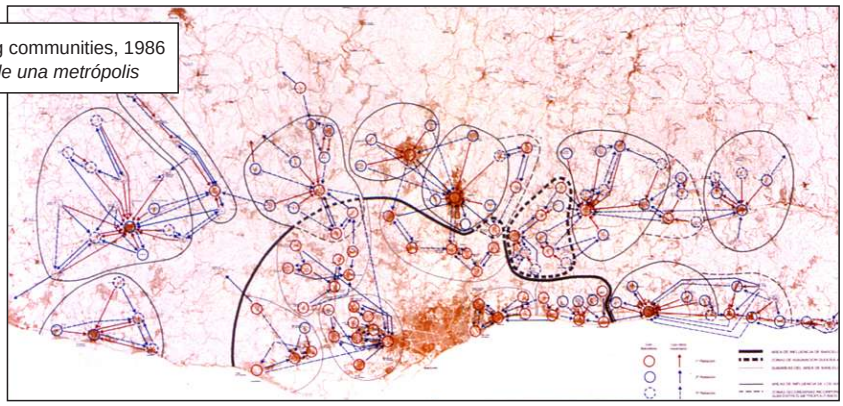
In light of the problems provoked by the accelerated growth of Spanish cities, the 1963 regional plans opted for industrial decentralisation, with the creation of industrial estates, directional centres and residential estates (Acturs). This decentralisation gave way to the construction of an arterial network at the start of the 70s (figures 2, 3 and 4).

- *… The 73-86 phase was characterised by growth in low-density landscapes.*

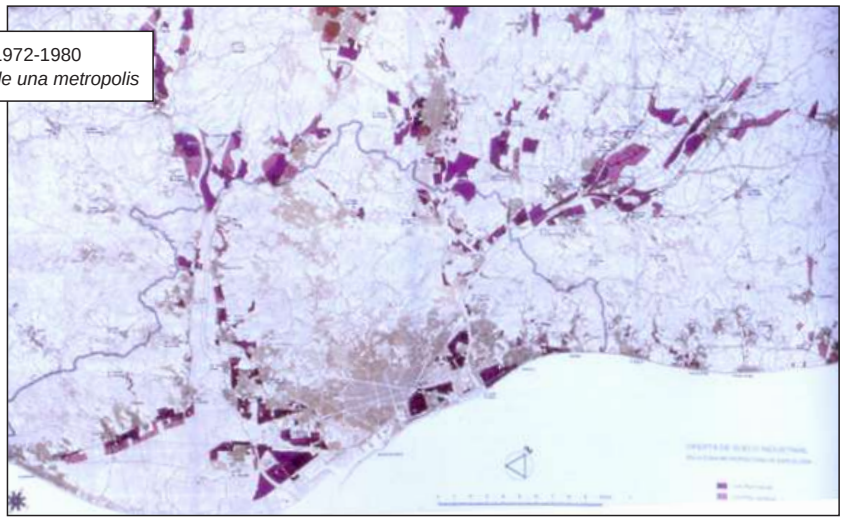
In the midst of economic crisis, urban policies were reoriented towards contention and urban requalification. However, it also

allowed industry to reorganise, thus extending along the river valleys of the Besòs and the Llobregat, near the arterial network

2.Main relationships among communities, 1986
Source : *La construccion de una metrópolis*

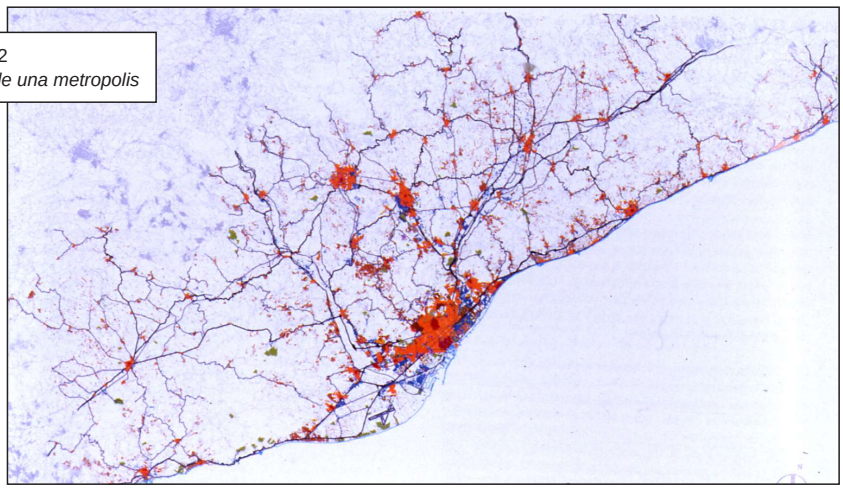


3.Available industrial land 1972-1980
Source : *La construccion de una metropolis*



and occupying 6000 hectares.

4.Extension growth 1956-72
Source : *La construccion de una metropolis*

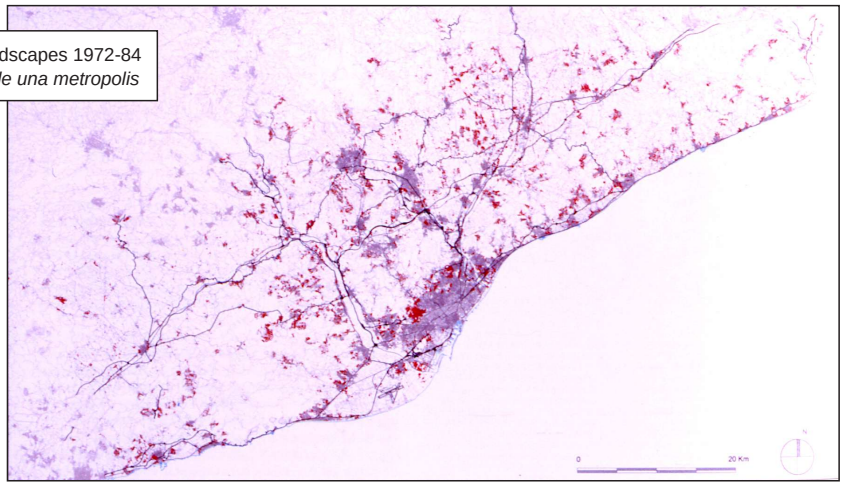


The generalised automobile access, the technological trigger of production re-organisation, promoted access to a second residence in the second and third belts and in so doing took up a further 7,000 hectares (figure 5).

- *The 86-2000 phase is characterised by a network growth model.*

This period is characterised by growing polarisation, along the motorways (east west, A7, A16, A19 and north south A2, A18) and nodes dedicated to the ¨banal¨ service industry (production services, distribution services, social and personal services). The

5.Growth in low density landscapes 1972-84
Source : *La construccion de una metropolis*

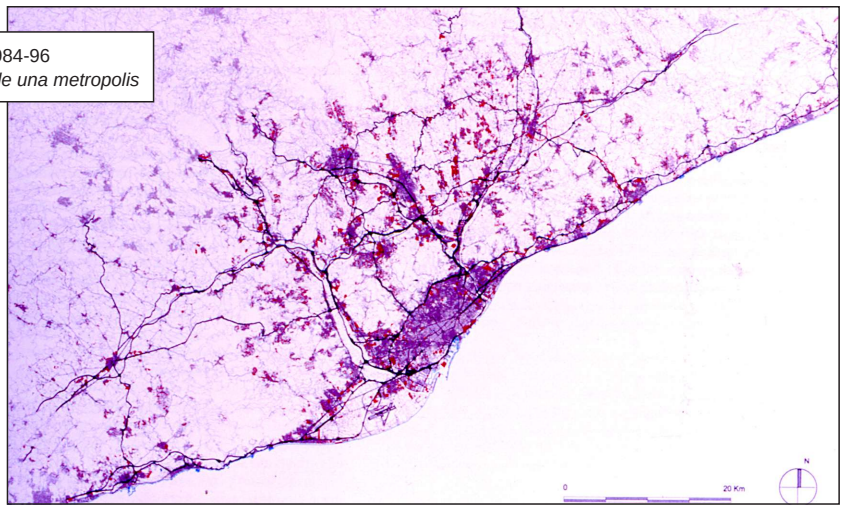


growing polarisation was taken up by the ¨strategic¨ tertiary sector on the arterial elements of the core constructed with the impetus of the 1992 Olympic Games. Examples of this are the Diagonal east sector (Glòries, Diagonal Mar, 22@ and Forum 2004), the Diagonal west sector (North Campus) and the Gran Via east sector (Plaça F. Maciá, Airport city) and finally that of the Ronda Litoral-Ronda Dalt (Port Olympic, Port vell, Maremagnum). This all carries the price of public expulsion or abandonment from a core that is increasingly expensive and of a dense and fairly unstructured first and second belts. And thus in searching for low-density areas in the second and third belts the second residence becomes the first (figure 6).

1.5. Metropolitan indicators for the 72-96 period.

Without population growth, soil consumption has risen from 23,000 hectares to 47,000 hectares (+ 100 %). This rise is distributed amongst infrastructures from 1,500 to 3,860 hectares (+ 157%), industrial land from 3,500 to 10,600 hectares (+ 202%) and in

6.Network growth model 1984-96
Source : *La construccion de una metropolis*



low-density areas from 5,000 to 15,000 hectares (+ 300 %). There has also been a geometric change expressed in the change in demographic weight of the urban belts. The core (1,5 M inhabitants) has lost from 44% to 37,5% (-1% per year). The first belt of 12 districts (0,75M inhabitants) has fallen from 23% to 16,5% (-0,75% per year). The second belt of 19 districts (0,65 M inhabitants) has remained at 14,5% (+ 0,12% per year), and the great winner is the third belt comprising of 132 districts (1,35 M inhabitants) which has increased their relative weight from 19% to 33% (+ 0,7% per year).

This change of geometry leads to a density reduction, a rise in motorization rates from 174/1000 vehicles to the 620/1000 current vehicles and a strong increase in mobility kilometres associated to transport (plus 87%) between 86 and 96 (plus 300% from 72 to 01). There is therefore also a rise in energy consumption (figures7 and 8).

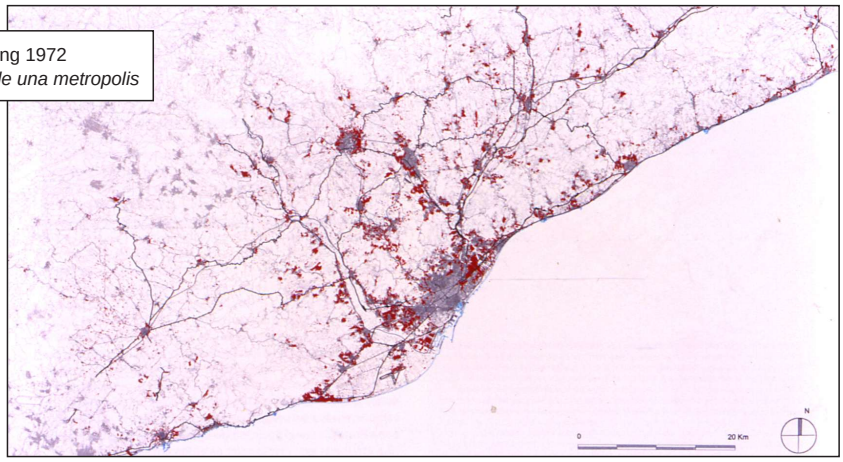
2. The land model for the Metropolitan Region of Barcelona

2.1. The Metropolitan Sector Land Plan

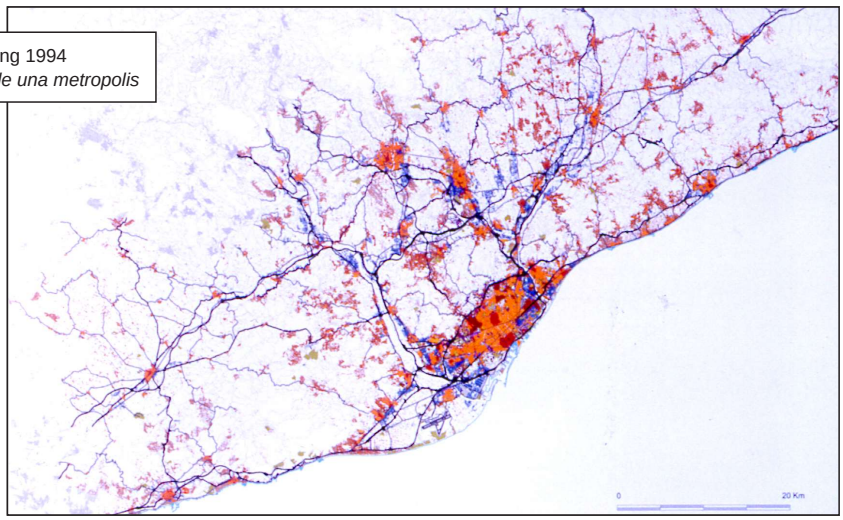
This plan structures the metropolis into a less concentric and more isotropic mesh, structuring railway and road networks and strengthening eight large urban islands. It admits generous occupation increases (1M inhabitants) based on optimistic data of vegetative demographic growth and immigration, and adds a further 12,000 hectares to the 27,000 hectares already programmed and allocated to construction, and which will in turn insulate the open spaces (figure 9).

2.2. Neoliberal or sustainable

7.Forms and uses of building 1972
Source : *La construccion de una metropolis*



8.Forms and uses of building 1994
Source : *La construccion de una metropolis*

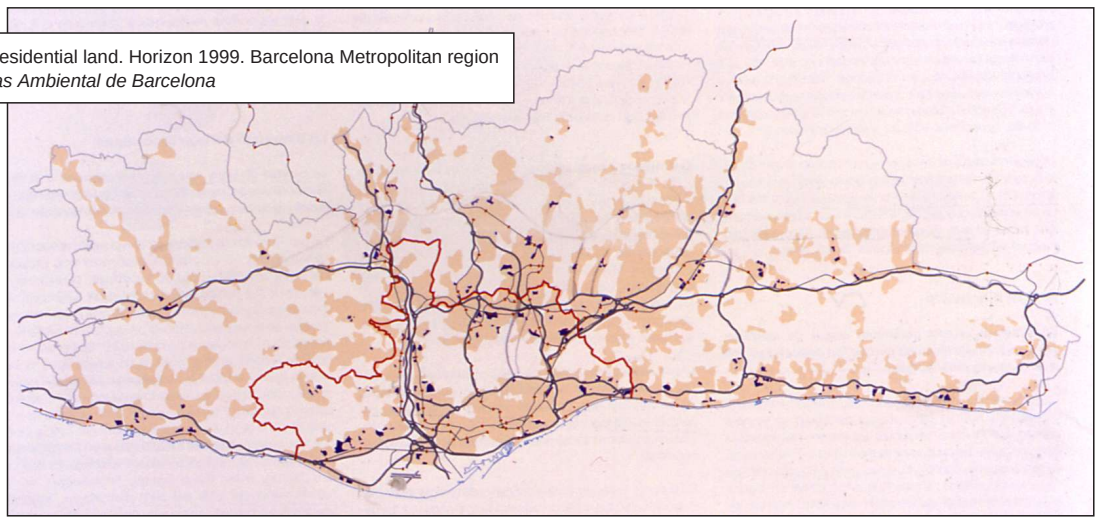


This neoliberal styled model bids for flexibility and competition between nodes of the system of cities as a survival mechanism in a situation in which there will only be winners and losers. This is achieved by betting blindly on emerging sectors of the new economy and considering that the state should only influence the system at the time when its pathologies come to light.

A second stand states that this is not defendable as a territorial paradigm. It opposes a paradigm or land ordination with its origin in Geddes and in Lewis Mumford´s Regional Planning, made a science through the Landscape ecology of Forman. This stand of ecological-landscaping arguments defends the need to incorporate the system of open spaces in land ordination.

3. An ecological matrix as a base for "a different" land model of the RMB.

9.Available residential land. Horizon 1999. Barcelona Metropolitan region
Source : *Atlas Ambiental de Barcelona*



3.1. The Green Belt

The Barcelona Deputation manages 65,000 hectares in 11 progressively insulated natural spaces. In the first phase it promoted the idea of a great green belt, similar to that of the Great London Plan of Sir Patrick Abercrombie, a green belt that would avoid dispersion of the RMB into the rest of Catalunya. Today, the Anella Verda takes up 100,000 hectares and 100 municipalities. We believe that this landscape policy which, should be continued, is no other than the subsidiary project of a subjacent project, that of establishing a metropolitan ecological matrix (figure 10).

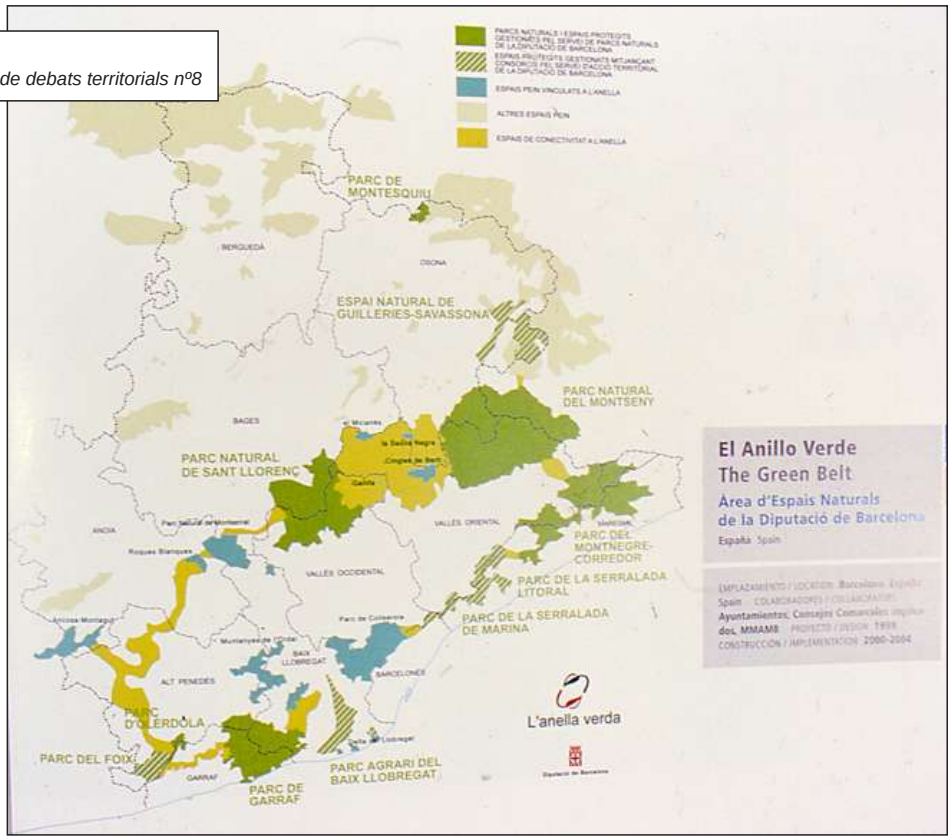
3.2. The metropolitan ecological matrix

This would be a system of interconnected open spaces that respond to the landscape ecology laws and whose role is to maintain biodiversity. This system would be composed of the natural spaces included in the PEIN (patches), the water system, wooded corridors and agricultural spaces (buffers).

3.3. The role of the ecological matrix

If the networked city fragments and devalues the land base, the ecological matrix on a regional scale would give it value. Two levels can be discerned, the first – support restoration functions (preservation of the existing landscape, biodiversity preservation, guarantee of ecological services, building of the new sustainability services, requalification of the municipal network of open spaces and to give a reason to the new parks of supra municipal allocation).

10.The Green Belt
Source : *Area revista de debats territorials nº8*



The second deals with the role of entropy limitation (to act as a construction base for the Metropolitan Sector Land Plan. The idea is to establish a limit to RMB growth thus avoiding it's dispersion into Catalunya, to be compatible with a land model in polinuclear network of compact nodes and to establish a limit to nodal growth and in so doing avoid dispersion). On a regional scale the ecological matrix would attempt to limit the growing entropy of the RMB.

3.4. Precedents

The idea of an ecological matrix is not a new one. Olmsted developed it in his Boston System-Park in 1883, but there are also other precedents, on a city scale (Washington), or the Dutch National Ecological Network. The Finger Plan of Copenhagen is especially interesting with its ecological corridors integrating riverbanks, greenways and segregated routes.

3.5. Structure and Systems

The proposed structure is dual, vertebrating metropolitan strategic elements that guarantee interconnection, with others of municipal designs, that intergrate in a flexible and voluntary fashion.

- *The forests, 65,000 hectares protected by the PEIN and another 35,000 hectares protected by the Green Belt (Anella Verda).* These forests, of metropolitan allocation, are threatened by forest fires, and are protected by promoting the recovery of potential

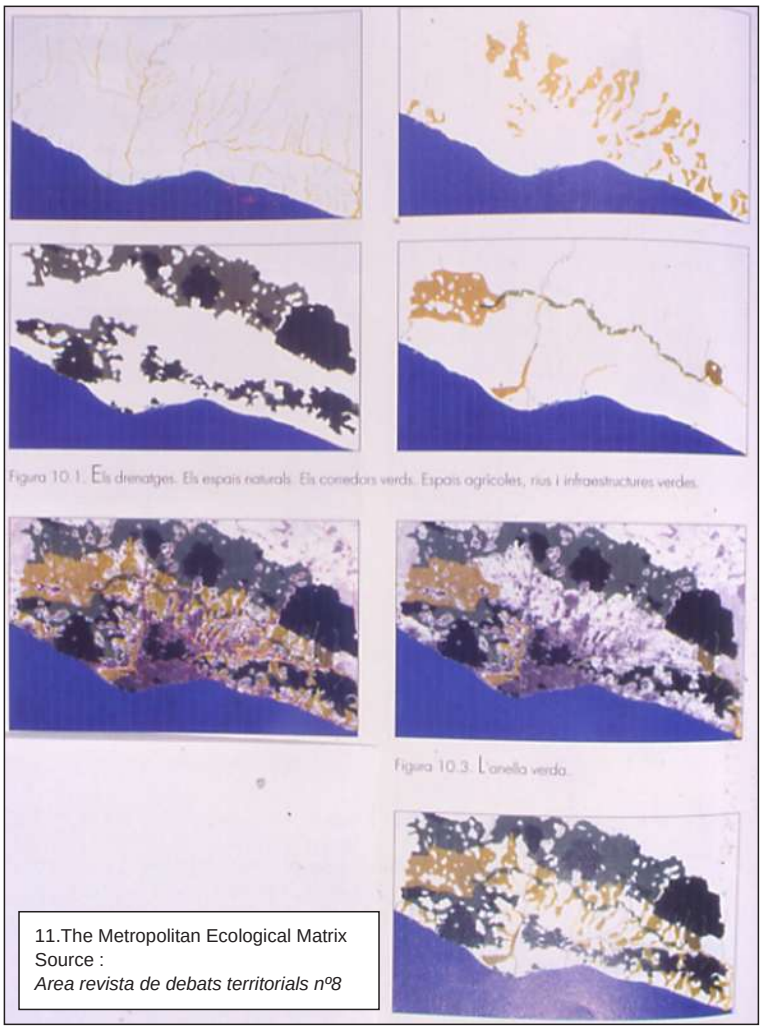
vegetation, via reforestation plans. The services supplied are erosion prevention, flood prevention and the absorption of the CO2 produced by the inhabitants of the metropolis. They are structured in internal areas (Patches) with a progressive rise in integral reserves and perimeter areas destined to absorb demographic pressure by way of parks – doorways assigned by the municioality, with ecological roles (leisure and educational buffers).

- *The water system (¨corridors¨), 10,000 hectares*

Spaces of metropolitan allocation. The services contributed are water retention, flood limitation, to diminish erosion, aquifer recharge, recover riverside forests and to recover the biodiversity.

- *The agricultural spaces, 160,000 hectares*

The criteria is that of building a network of spaces allocated by the municipalities, structured as an Eco landscape mosaic of patches, corridors and buffers. These will avoid obsolete or non-productive crops until town planning requalifications are made, whilst promoting the recovery of the cultural heritage, (Delta del Llobregat). Also fomenting regulated recreational agriculture (vegetable garden on the urban periphery) and developing a new and clean productive agriculture at agropoles (Penedes vineyards, tree nurseries and floral plantations in the Maresme greenhouses).



11.The Metropolitan Ecological Matrix
Source :
Area revista de debats territorials nº8

- *Sustainability installations. ? Hectares*

These elements allocated by the metropolis are the end of pipe of the production system and treat the city outputs. These residues are undervalued resources separated from their life cycle by the Eco-inefficiency of the production system. Through the available technology these spaces reintroduce the resources into the life cycle by water treatment, water purification in third cycle installations and refuse treatment (municipal, inactive and industrial). These spaces will generate new landscapes, which must be compatible with leisure activities in order to communicate and educate in the new paradigm.

- *The network subsystem, 3860 hectares.*

The ecological matrix must integrate the subsystem of networks in its interior which, provide the inputs that feed the metropolis, its energy flows and materials. The mobility networks (roads and railways), energy networks (high tension and gas), telecommunications, but also the leisure networks (bikes).
Figures 11 and 12.

3.6 Obstacles

The matrix is indispensable in order to demonstrate that the other model is also possible. It must allow for the overcoming of the fragmented view of the sectors: political (short term options), economic (productivity and competition), romantic (patrimony) and natural (the integral protection of some areas whilst accepting the total destruction of others). Both systems are integrated, complementary and need a municipal and metropolitan agreement.

3.7. Elements

Although there is no agreed plan, there are supramunicipal or municipal initiatives in process which are creating this paradigm in a process of self-organisation. A first list allows for the identification of five categories and 22,500 hectares of the ecological matrix, under discussion, but with very uneven degrees of consolidation and unitary costs. The case of urban parks is very discouraging as it is often lacking a metropolitan strategic vision or not very interrelated with a possible regional ecological matrix.

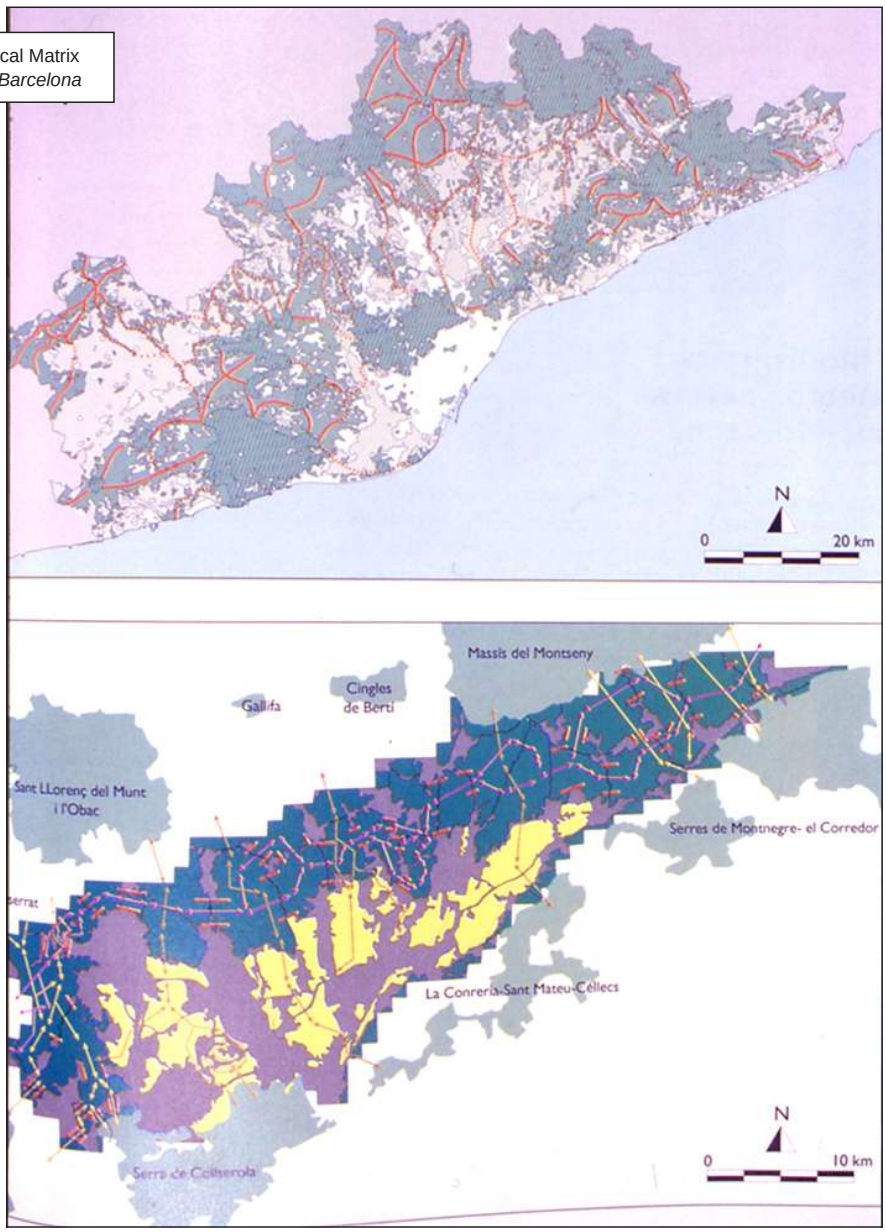
Agricultural parks	10 units	22000 Ha.	between 114 and 16700 Ha.
Fluvial parks	9 units	700 Ha.	between 5 and 450 Ha.
Coastal parks	6 units	200 Ha.	between 6 and 90 Ha.
Doorway parks	5 units	107 Ha.	between 4 and 20 Ha.
Urban parks	20units	150 Ha.	between 1 and 23 Ha.

4. Some reflections on the sustainability of the metropolitan area

4.1 Entropy and Neguentropy

Physics, a statistical science, proves through the terrible second law of thermodynamics, that ordered systems tend to evolve towards more disordered configurations thus increasing the molecular disorder. This disorder is measured via the mathematical function of entropy. Life has learnt to avoid the dangerous rise of entropy. However, a city with 4,3 M inhabitants that makes random economic decisions seems to respond to statistics and therefore to the law of entropy. Does a deregulated economic system, a result of the information society, tend to increase its entropy? How should this rise of entropy be measured?

12.The Metropolitan Ecological Matrix
Source: *Atlas Ambiental de Barcelona*



4.2. The sustainability paradigm

Cities are dissipated systems that feed off inputs (material and energy flows), metabolised as goods and services by the businesses and inhabitants which are then consumed or exported thus generating value and externalising them as outputs (resources that cannot be valued, like waste). This new and inexorable economic phase is defined by an increase in commerce and flows, increasing the city inputs and outputs. This cannot be exported as a development model (by 2020, on a worldwide scale, 8,000 M inhabitants will live in cities). How much entropy does the RMB generate?

4.3. Sustainability indicators

The Dolbris European Environmental report sets down the first city environmental indicators. As an indication, for every million inhabitants/ year, the RMB should be close to the following: energy input 420,000 M tep, H2O input 1000 Hm3: material pack input 22,000 000 T, H2O output 130 Hm3: municipal waste output 580,000 T, direct CO2 output 9,000 000 T CO2 or 1,2 hectares/inhabitant.

4.4. Local sustainability?

In this first phase, sustainability has focused on measuring outputs that is, environmental impacts of consumer guidelines on the base carriying capacity. The environmental Atlas of the Barcelona area is starting this information search broken down into sectors. It is possible to map the local natural systems and to locally assess local insustainability, or outputs, introduced by the city network. These must be mapped by territories, to the source, in order to interrelate the processes and evaluate the entropy introduced on the support system. The problem lies in that each output has its own support system and it is possible that they do not coincide with the cartographic-administrative division. As an example:

- The evolution of soil consumption
- The evolution of fabric consumption
- The evolution of mobility consumption
- The contribution, consumption, physical-chemical and biological treatment of the water.
- The exploitation and salinisation of the aquifers
- The evolution of antropic occupation, the impact of fire and the natural capital of available forests
- The types, production, availability and recycling speed of waste
- The evolution of coastal inflexibility and how it affects the sedimentary dynamics

4.5. Global sustainability?

A good researcher cannot stop asking him/herself, - If the economic model is global and is characterised by the globalisation of the production model, how do you measure the reduction of the output charge capacity of a PC made in Taiwan? Since 1996 Rees and Wackernagel deduce the inputs associated to consumer guidelines independently of where charge capacity is reduced. This accounting, the Ecological Footprint, blessed by environmental economists, measures the entropy of cities by transforming these into energy consumption standards (Gj) or mortgaged Biosphere hectares (neguentropy) in order to produce this good or service. This indicator translated into T CO2 allows for local indicators to be added, in this global indicator (more demanding than the ratified Marraquesh agreements.

The first evaluations of the Ecological Footprint for the RMB CO2 give a trace of 3,77 ha/inhabitant hectares with an increase of +150% in the 72-96 period (7,3 times Catalunya), following the Randstadt footprint (15 times Holand) and far from the global1,7 ha/inhabitant.

4.6. Global insustainability

This global indicator is an insustainability indicator. The atmospheric concentration of CO2 (363 ppmv) which causes global warming is produced by the 65% of inhabitants who live in cities and specially us, the inhabitants of the OCDE cities (82% of GNP and consumption capacity). The EU has signed the Kyoto agreement and has ratified it in Marraquesh. It is a 92-2010 compromise to reduce direct TCO2 emissions by 8% in order to attempt to reduce the rise in CO2 concentration.

4.7. A “different” RMB land model.

How to make Kyoto (-8% TCO2 direct emissions) compatible with trace increases of +150 (+150 % TCO2 of global emissions)? Only such a powerful tool like the land model can propose itself this objective, and requires the ecological matrix. However, this will not be a sufficient condition (the absorbable footprint of the ecological matrix is equivalent to 60 000 inhabitants). The land plan must reduce the residential footprint, (compact nodes), the compulsory footprint (public transport network and rental policies), the non compulsory mobility footprint (leisure in the ecological matrix), and the consumer goods and services footprint (dematerialization, recycling and reuse in the ecological matrix). What is not sufficient is a pristine and clean ecological matrix and a production that takes place elsewhere and we consume... As part of a land plan, the ecological matrix accept the challenge of sustainable development. But who is in charge?

4.8. Methodology

Building a theoretically sustainable model must be audited by environmental economy and would require various phases. Firstly, the cartography of the ecological matrix, secondly, the quantifying of natural services supplied by it, and thirdly, an evaluation of inputs consumed by metropolitan consumer rates in ecological footprint, fourthly, balance and in fifth place, the design of possible strategies to limit insustainability. The sixth phase is the sharing of these in terms of municipal footprint charges, the seventh, is to formulate a general plan and lastly, to check the theoretical model. This check would take place (via GIS) permuting growth and the footprint associated to the economic period 72-96, by a limited footprint model. This process would permit to quantify avoidable entropy and in so doing evaluate if it is possible to comply with the Marraquesh agreements, the costs and evaluate the services supplied by the metropolitan ecological matrix in economic terms.