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MONITORING AND EVALUATION OF POLICIES – THE ROLE OF SUPPORT TOOLS FOR SPATIAL DECISION SUPPORT SYSTEM APPLIED TO PORTUGUESE CASE

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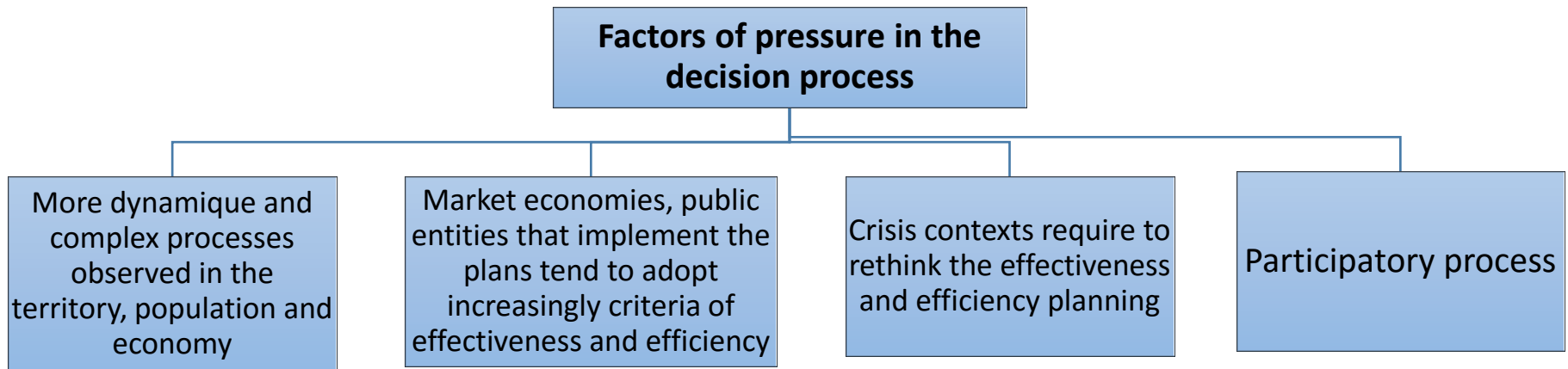
Structure:

1. Spatial Decision Support Systems (SDSS) in urban planning

2. SPOTIA project – an application

    2.0. Presentation of SPOTIA project

    2.1. Consultation Platforms for diagnosis, planning and evaluation phases

    2.2. WEBGIS as dynamic and user-friendly monitoring system

    2.3. Geographical modelling as a tool to reinforce the decision-making *process*

3. Final remarks

1. SPATIAL DECISION SUPPORT SYSTEMS (SDSS) IN URBAN PLANNING

The need for a deeper knowledge associated with the planning and evaluation

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                    ┌─────────────────────────────┐
                    │  Factors of pressure in the │
                    │       decision process      │
                    └─────────────────────────────┘
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| More dynamique and complex processes observed in the territory, population and economy | Market economies, public entities that implement the plans tend to adopt increasingly criteria of effectiveness and efficiency | Crisis contexts require to rethink the effectiveness and efficiency planning | Participatory process |

In this regard , the decision making has been enhanced :
- Improvement of information technology and analytical methods of information;
- Considerable increase in the quantity and quality of information available;
- More friendly-use for stakeholders and community, among others . Greater participation of stakeholders and the community at different stages of planning;
- Strengthening monitoring and evaluation systems planning;
- Including the value " transparency " in the decision- making process

1. SPATIAL DECISION SUPPORT SYSTEMS (SDSS) IN URBAN PLANNING

- Origins and objectives:
  - The Decision Support Systems (DSS) appear at the end of the 1960s
  - But Space Systems Decision Support (SSDS) come in the late 1980s
  - come in to solving complex problems where there are conflicts between sectors and options as well as the difficulty of interaction between decision-makers and solution processes

(Budie, 1994).

- A SEAD has three basic components:
  - a database;
  - an information analysis tools and establishment of models, including those that enable the development of scenarios;
  - and web mapping viewer which incorporates the above components

(Magagnin, R .; Roberts, D .; Ramos, R .; Silva, A., 2005)

Connection of the SDSS with stages of the planning proccess

Planning Phases	Technologies and their relevance in Planning
1. Problem and objectives definition	• Collection of information, sources of spatial information and it`s changes
2. Data collection	• Collection of information, sources of spatial information and it`s changes
3. Data analysis	• Store, manipulate and analyse physical, social and economic data • Mapping function to analyse the actual situation • Identify conflict areas through the overlay of data
4. Modelling and Projection	• Projection of future (ex. population, economic growth) • Estimate the impact of possible trends (ex. future demand of land resources) • Model different scenarios and formulate different planning options
5. Development of Planning Options	• The spatial optimization models with GIS – maximize or minimize some functions • Simulation of different scenarios, integration of cellular automata, location-allocation models find optimal locations of public facilities, multi-criteria decision analysis could consider multiple criteria in deriving different planning options
6. Selection of Planning Options	• Majorly a political process, where planners could provide technical inputs to reinforce the decision-making
7. Plan Implementation and Monitoring	• Evaluate and minimize environmental impact, for programming and monitoring land development, automate the planning office, enable more consistent decision making in development control
8. Plan Evaluation, and Feedback	• Monitor and evaluate changes and dynamics as in land use and if that dynamic correspond to the planned • It could help to develop adjustments to the plan

Ex-ante

Mid-term

Ex-post

Adapted Yeh (2008)

2. SPOTIA PROJECT – AN APPLICATION

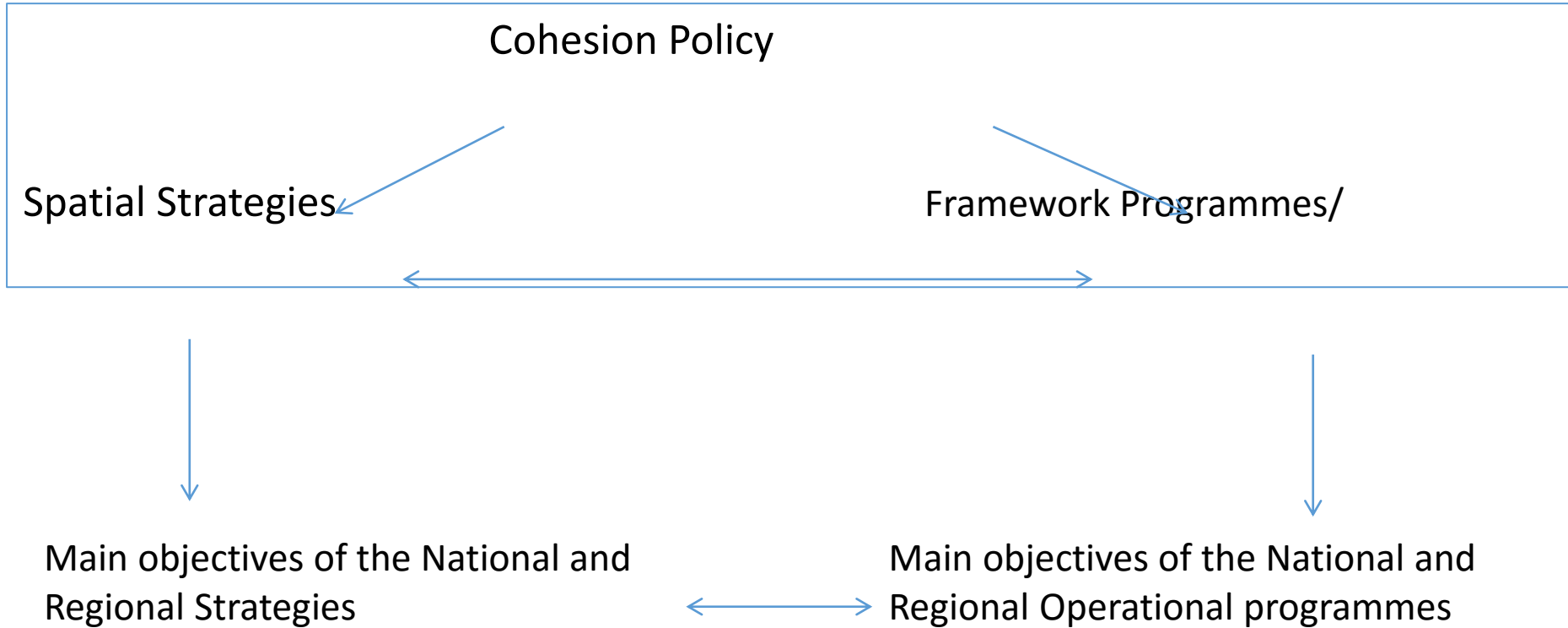## 2.0. PRESENTATION OF SPOTIA PROJECT

SPOTIA Project: Sustainable spatial policy orientations and territorial impact assessment – contribution to portuguese context (PTDC/CS-GEO/105452/2008). Coordenation: Professor Eduarda Marques da Costa, Centre of Geographical Studies, University of Lisboa
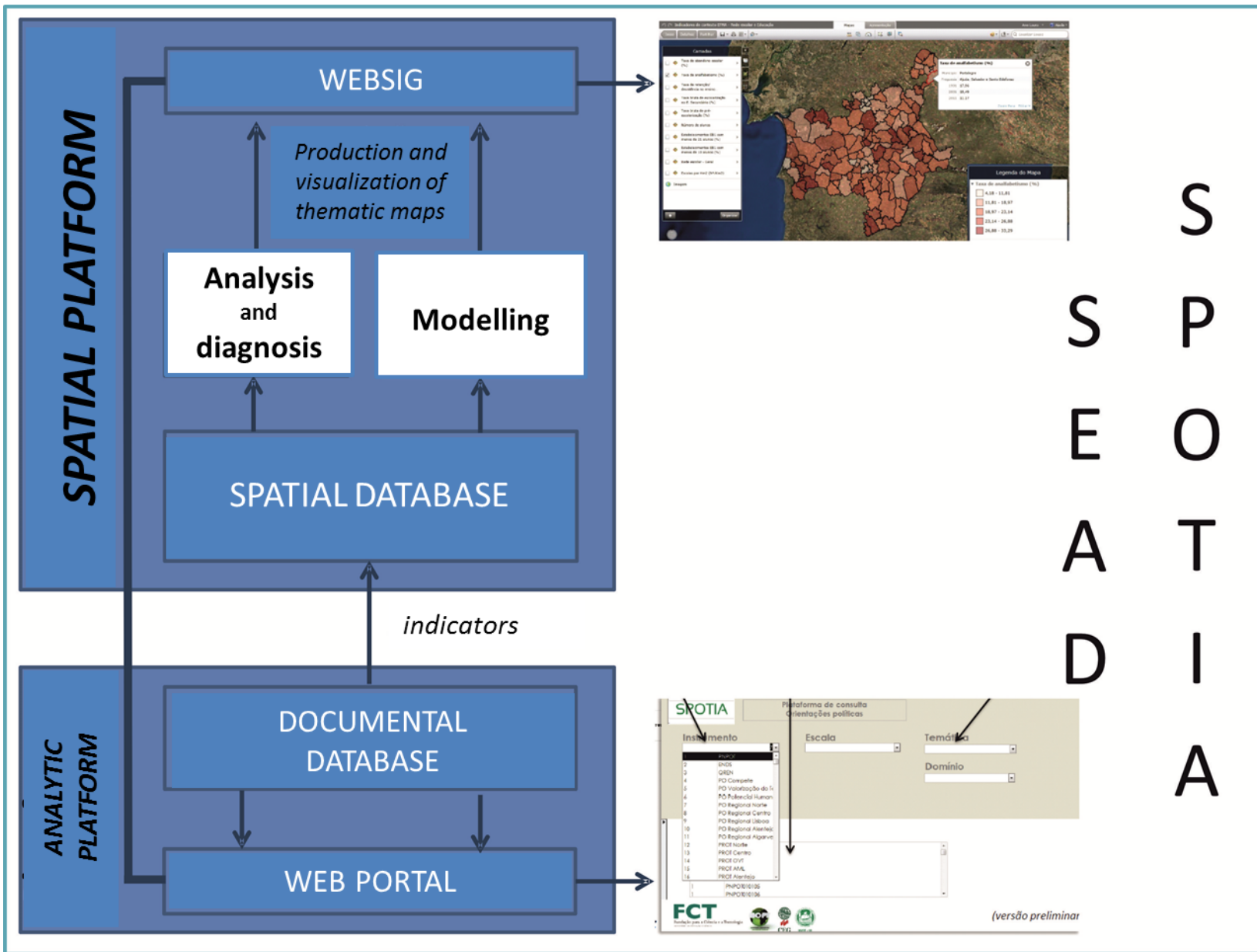
- Centro de Estudos Geográficos (CEG) – Lead Partner
- Centro de Estudos Sociais (CES – Coimbra U.)
- Universidade Técnica de Lisboa (IST-UL)

SPOTIA Project – main goals:

I.   to analyse the coherence between Portuguese territorial policies in a multiscale perspective;

II. to identify, collect and analyse the most relevant indicators for the policy areas at national and regional scale;

III. to analyse the impacts that mega-projects have or supposed to have on territory, population and economy – Ex. Multipurpose Alqueva Project

IV. to develop a Spatial Decision Support System (SDSS), through a collection of several tools, that support decision-making respecting to territorial problems.

The coherence between instruments

Cohesion Policy

Spatial Strategies   Framework Programmes/

Main objectives of the National and   Main objectives of the National and
Regional Strategies   Regional Operational programmes

2. SPOTIA PROJECT – AN APPLICATION

2.0. PRESENTATION OF SPOTIA PROJECT

SDSS, with the main goal to become it in a more coherent planning system, that are in course the following methodological experiences in SPOTIA Project:

- Consultation Platforms for diagnosis, planning and evaluation phases;

- WEBGIS as dynamic and user-friendly monitoring system, and;

- Geographical modelling as a tool to reinforce the decision-making process.

BUT BEFORE WE NEED THE INFORMATION TO SUPPORT a), b) and c)

Phases and functions of planning	Tasks	SPOTIA Project activities
1 Diagnosis		
- Identification of the context/ start reality - Identification of the problems and it`s causes - Identification of the several instruments of the national planning system	- Identify the main demographic, economic, environmental and socio-cultural changes; - Identify the main problems and SWOT*presented by all territorial instruments - Identify the main territorial changes - Create different scenarios to reinforce the policy options	1.1 WEBGIS - Main themes: Agriculture, energy, Economy, Housing, Mobility, Population, Scholar network, Health network, Tourism; 1.2 WEBGIS - Land use dynamic (CLC 1990, 2000, 2006); 1.3 Consultation platform of the problems and SWOT identified in the main national and regional planning instruments; 1.4. Consultation platform of the main reports of the national planning instruments 1.5. Geographical modelling to create scenarios
2 Planning and Policy Implementation		
2.1 External coherence - Identification of the expected actions/changes in the several instruments that comprises the general structure of territorial planning - Identification of the results of the last planning cycle and/or the best experiences to determinate the problems and solutions	- Consult the expected goals for a particular instrument in the context of the national planning system (both territorial and sectoral approach), considering the objectives, the actions and the agents	2.1.1 Consultation platform of the objectives, measures, actions, indicators of the planning instruments organized by domains and/or agents and/or instruments; 2.1.2 Network analyses based on the agents that should respond to the planned objectives;
2.2 Internal coherence - Analyse the coherence among the diagnosis and the expected plan/programme	- Develop an internal analysis between diagnosis and plan goals, plan and indicators, diagnosis and indicators	2.2.1 Exercises of internal coherence to answer to the main planning concepts: sustainability, territorial cohesion, regional competitiveness, etc.
3 Evaluation		
- Confront the expected goals with the executed programmes - Identification of the new reality	- Resume of the executed or non-executed project and/or objectives and understand what and where are the main difficulties - Monitoring and evaluation - Actualization of the initial indicators	3.1 Analysis of the approved projects of NSRF 2007-2013 (quantitative analysis and WEBGIS) 3.2. Geographical modelling for monitoring and evaluation

2.0. PRESENTATION OF SPOTIA PROJECT

| **Spatial Data Base** (classical) | - **Statistical information, to produce diagnosis;**
- **Level of execution of instruments in the National Framework Programme 2007-2013** |

| **Analitical/ Non-Spatial Data Base** (innovation) | - **Data base supported in the main instruments (composed by itens: diagnosis, objectives, priorities, actions, indicators)** |

TOOL that allow:
- To consult instruments;
- To verify the level of relevance and coherence

The first step - selection of the instruments and their classification regarding the scale and scope of activity

National planning system

Methodology to verify relevance and coherence in four steps:

1. - the first step corresponds to the selection of instruments;
2. - the second step corresponds to the validation of each instrument relevance;
3. - the third step consists of the selection of the indicators associated with the previous analyses.
4. - the fourth step corresponds to the coherence analysis between the various instruments;
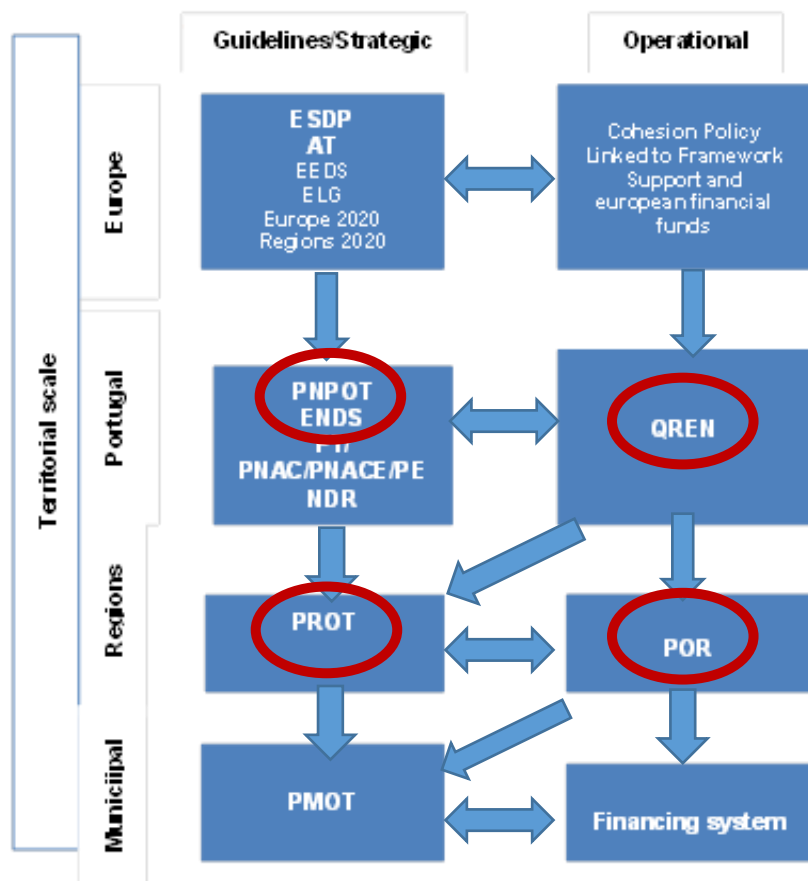
Focused documents:

National scale / Guiding approach:
- PNPOT – National Territorial Strategy
- ENDS – National Sustainable Development Strategy

National scale / Financing approach:
- QREN - National Strategic Reference Framework (Territorial Enhancement Operational Programme)
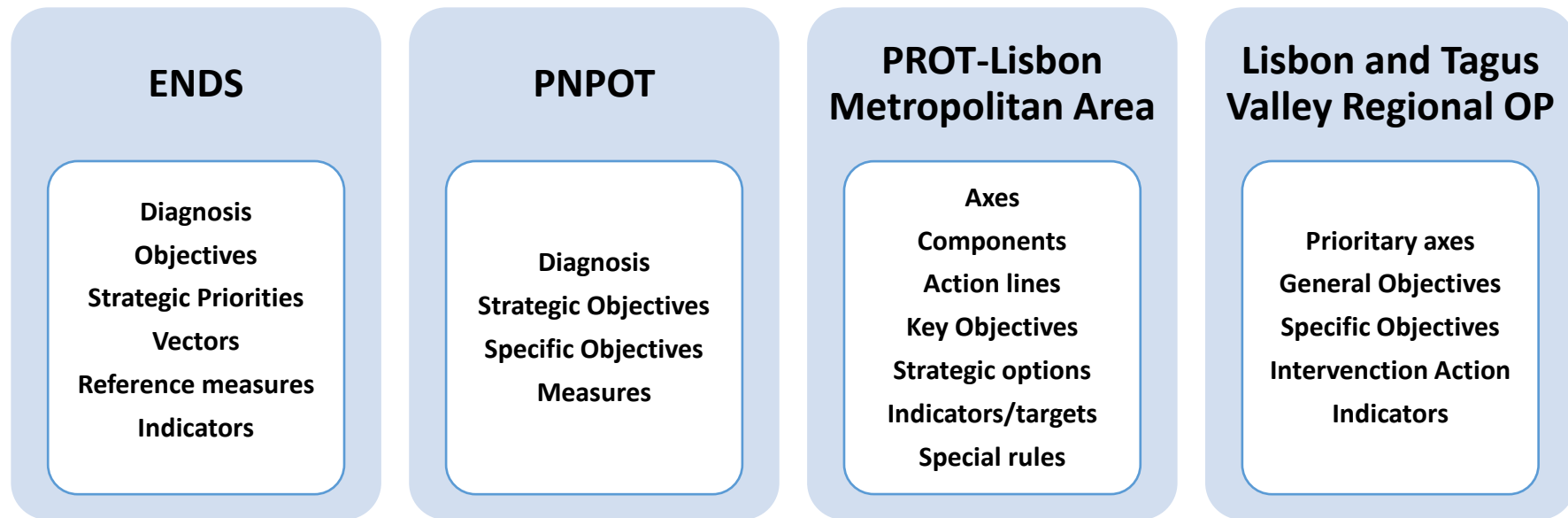
Regional scale / Guiding approach :
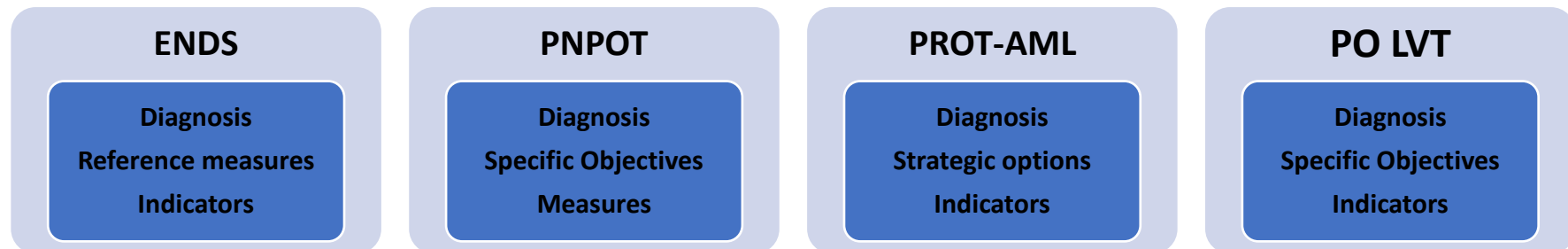- Regional Spatial Plan

Regional scale / Financing approach:
- Regional Operational Programmes

Organisational structure of plans/programmes

Multiscalar analysis between instruments ONE EXAMPLE

ENDS	**PNPOT**	**PROT-Lisbon Metropolitan Area**	**Lisbon and Tagus Valley Regional OP**
Diagnosis **Objectives** **Strategic Priorities** **Vectors** **Reference measures** **Indicators**	**Diagnosis** **Strategic Objectives** **Specific Objectives** **Measures**	**Axes** **Components** **Action lines** **Key Objectives** **Strategic options** **Indicators/targets** **Special rules**	**Prioritary axes** **General Objectives** **Specific Objectives** **Intervention Action** **Indicators**

Selection of common levels

ENDS	**PNPOT**	**PROT-AML**	**PO LVT**
Diagnosis **Reference measures** **Indicators**	**Diagnosis** **Specific Objectives** **Measures**	**Diagnosis** **Strategic options** **Indicators**	**Diagnosis** **Specific Objectives** **Indicators**

List of "descriptors
National Strategic Reference Framework Priority Themes

Priority themes of QREN	SPOTIA Thematics
Research and technological development, innovation and entrepreneurship	1.1. Economy and business 1.2. Research, Technological Development and Innovation
Information Society	1.3. Information Society and ICT
Transport	4.4. Transport, Mobility and Accessibility
Energy	3.2. Energy
Environmental protection and risk prevention	3.1. Agriculture, Forestry and Industry 4.6. Land management 3.3. Sanitation and water 3.4. Risks 3.5. Environment
Tourism	1.5. Tourism
Culture	2.4. Culture and heritage
Urban and rural regeneration	4.1. Development of Urban System and urban areas 4.2. Development of rural areas
Adaptability of workers and firms, enterprises and entrepreneurs	2.2. Education, lifelong training and qualification
Access to employment and sustainability	1.4. Employment and labor market
Social inclusion of less-favoured people	2.1. Social inclusion / exclusion 2.2. Education, lifelong training and qualification 2.3. Health 2.5. Housing
Improving Human capital	4.5. Public Administration
Investment in social infrastructure	2.2. Education, lifelong training and qualification 2.3. Health 4.3. Equipments and infrastructures
Mobilisation for reforms in the fields of employment and inclusion	
Reduction of additional costs hindering the outermost regions development	

This step corresponds to the coherence analysis between the several instruments

Instrument | Strategic Objectives | Specific Objectives | Codification by descriptors | Codes | Measures

Instrumento	Objectivos estratégicos	Objectivos específicos	Temática	DOMINIOS_medidas_directo	SUB-DOMINIOS_medidas_directo	COD_Medidas_PNPOT	Medidas
PNPOT	1. Conservar e valorizar a biodiversidade, os recursos e o património natural, paisagístico e cultural, utilizar de modo sustentável os recursos energéticos, geológicos, e monitorizar, prevenir e minimizar os riscos	1.1. Desenvolver os sistemas de conhecimento e informação sobre o ambiente e recursos naturais	3.2. Ambiente	Ambiente e conservação da natureza	Instrumentos/políticas para o ambiente e conservação da natureza	PNPOT010101	Implementar um sistema de indicadores da biodiversidade e a recolha de dados para avaliar e monitorizar os ecossistemas costeiros e marinhos, recorrendo aos contributos inovadores da ciência e tecnologia
PNPOT	1. Conservar e valorizar a biodiversidade, os recursos e o património natural, paisagístico e cultural, utilizar de modo sustentável os recursos energéticos, geológicos, e monitorizar, prevenir e minimizar os riscos	1.1. Desenvolver os sistemas de conhecimento e informação sobre o ambiente e recursos naturais	3.4. Energia	Energias renováveis	Soluções e potencial para a produção de energias renováveis	PNPOT010102	Realizar o levantamento do potencial efectivo e da taxa de renovação natural dos recursos renováveis, incluindo a conclusão do levantamento do potencial energético renovável, e das pressões a que estão sujeitos
PNPOT	1. Conservar e valorizar a biodiversidade, os recursos e o património natural, paisagístico e cultural, utilizar de modo sustentável os recursos energéticos, geológicos, e monitorizar, prevenir e minimizar os riscos	1.1. Desenvolver os sistemas de conhecimento e informação sobre o ambiente e recursos naturais	3.2. Ambiente	Ambiente e conservação da natureza	Instrumentos/políticas para o ambiente e conservação da natureza	PNPOT010103	Complementar e aperfeiçoar o Sistema de Informação do Património Natural do ICN sobre o território continental, designadamente através do inventário, cartografia e cadastro de habitats e valores naturais classificados, assim como os sistemas de informação das Regiões Autónomas relativos a aspectos específicos da sua vulnerabilidade e da sua biodiversidade
PNPOT	1. Conservar e valorizar a biodiversidade, os recursos e o património natural, paisagístico e cultural, utilizar de modo sustentável os recursos energéticos, geológicos, e monitorizar, prevenir e minimizar os riscos	1.1. Desenvolver os sistemas de conhecimento e informação sobre o ambiente e recursos naturais	3.2. Ambiente	Recursos geológicos	Instrumentos/políticas para a gestão dos recursos geológicos	PNPOT010104	Completar e actualizar a cobertura do território continental, com as cartas de solos à escala adequada e com o levantamento do património geológico e mineiro, incluindo a identificação e classificação dos respectivos elementos notáveis
PNPOT	1. Conservar e valorizar a biodiversidade, os recursos e o património natural, paisagístico e cultural, utilizar de modo sustentável os recursos energéticos, geológicos, e monitorizar, prevenir e minimizar os riscos	1.1. Desenvolver os sistemas de conhecimento e informação sobre o ambiente e recursos naturais	3.1. Agricultura, floresta, indústria e pescas	Usos do solo	Instrumentos/políticas de intervenção na qualidade do solo	PNPOT010105	Avaliar e monitorizar a e...
PNPOT	1. Conservar e valorizar a biodiversidade, os recursos e o património natural, paisagístico e cultural, utilizar de modo sustentável os recursos energéticos, geológicos, e monitorizar, prevenir e minimizar os riscos	1.1. Desenvolver os sistemas de conhecimento e informação sobre o ambiente e recursos naturais	3.2. Ambiente	Recursos hídricos	Protecç... recurs...		...plement... água classi... ambientais definidos na...
PNPOT	1. Conservar e valorizar a biodiversidade, os recursos e o património natural, paisagístico e cultural, utilizar de modo sustentável os recursos energéticos, geológicos, e monitorizar, prevenir e minimizar os riscos	1.1. Desenvolver os sistemas de conhecimento e informação sobre o ambiente e recursos naturais	3.2. Ambiente	Zonas costeiras/Litoral	Instrumentos/políticas para a gestão da zona costeira	PNPOT010107	Implementar a recolha de... zonas de risco de erosã... acção necessários a um...
PNPOT	1. Conservar e valorizar a biodiversidade, os recursos e o património natural, paisagístico e cultural, utilizar de modo sustentável os recursos energéticos, geológicos, e monitorizar, prevenir e minimizar os riscos	1.1. Desenvolver os sistemas de conhecimento e informação sobre o ambiente e recursos naturais	3.2. Ambiente	Recursos hídricos	Estratégias para o oceano	PNPOT010108	Identificar, classificar e c... marino...
PNPOT	1. Conservar e valorizar a biodiversidade, os recursos e o património natural, paisagístico e cultural, utilizar de modo sustentável os recursos energéticos, geológicos, e monitorizar, prevenir e minimizar os riscos	1.1. Desenvolver os sistemas de conhecimento e informação sobre o ambiente e recursos naturais	3.2. Ambiente	Recursos geológicos	Instrum... para a g... recursos ge...		...ar a cartografa... reconhecimento das co...

Competitivness

1.1. Economy and business
1.2. Research, Technological Development and Innovation
1.3. Information Society and ICT
1.4. Employment and labor market
1.5. Tourism

Cohesion

2.1. Social inclusion / exclusion
2.2. Education, lifelong training and qualification
2.3. Health
2.4. Culture and heritage
2.5. Housing

Environment

3.1. Agriculture, Forestry and Industry
3.2. Energy
3.3. Sanitation and water
3.4. Risks
3.5. Environment

list of "descriptors

2.1. Consultation Platforms for diagnosis, planning and evaluation phases

Plataformas de Consulta:

1. **Diagnósticos** - itens do diagnóstico / SWOT dos instrumentos de planeamento à escala nacional e regional;
2. **Orientações políticas** – objectivos específicos ou similares; acções, agentes e financiamentos;
3. **Sistema de monitorização e avaliação** – sistemas de indicadores propostos pelos instrumentos;
4. **Agentes responsáveis** pelas acções identificadas nos PROT

The coherence between the instruments

NSRF Domains	PNPOT (National Policy Programme for Spatial Planning)		PROT Norte (Regional Spatial Planning Plan for the North Region)		PO Norte (Operational Programme of the North Region, 2007-2013)	
	Specific Objecti-ves	Measures	Strategic Options	Measures	General Objectives	Measures
	%					
1. Research and Technological Development (RTD) Innovation and Entrepreneurship	1,0	2,6	5,3	0,0	23,8	22,2
2. Information Society	4,4	8,7	4,3	5,2	9,5	3,2
3. Transport	8,1	11,7	26,3	24,1	9,5	12,7
4. Energy	2,7	2,6	10,5	5,2	4,8	3,2
5. Environment Protection and Risk Prevention	27,0	33,2	26,3	20,7	9,5	19,0
6. Tourism	2,7	1,5	5,3	6,9	4,8	12,7
7. Cultural activities	5.4	3.1	0,0	0.0	4.8	0,0
8. Urban and Rural Rehabilitation	2.7	12.2	1,0	17.2	9.5	9.5
9. Increasing Adaptability of Workers, Companies and Entrepreneurs	0,0	0.0	0,0	0,0	0,0	0,0
10. Improving Access to Employment and Sustainability	1.7	1,0	1,0	1.7	0,0	0,0
11. Improving Social Inclusion of Disadvantaged Groups	0,0	0,0	0,0	0,0	0,0	0,0
12. Improving Human Capital	1,0	2.0	0,0	0,0	0,0	0,0
13. Mobilisation for Reforms in the Areas of Employment and Inclusion	16.2	11,3	0,0	3.4	4.8	12.7
14. Investment in Social Infrastructure	0,0	0,0	0,0	0,0	0,0	0,0
15, Strengthening Institutional Capacity at the National, Regional and Local Levels\	2,7	3,1	0,0	0,0	4,8	3,2
16. Reduction of the Additional Costs hindering the Development of the Outermost Regions	0,0	0,0	0,0	0,0	0,0	0,0
17. Others	24.3	7.1	21.1	15.5	14.3	1.6
Total	100,0	100,0	100,0	100,0	100,0	100,0

3.1. Consultation Platforms for diagnosis, planning and evaluation phases

SPOTIA Consultation Platforms:

1. Main planning instruments at European, National and Regional scales;
2. Diagnosis - in the main national and regional planning instruments;
3. Policy`s guidelines - Objectives, measures, actions, indicators of the planning instruments;
4. Approved projects of NSRF 2007-2013 related with the respective programmatic axes and objectives.

- Query relevant information

- Greater transfer of knowledge

- Streghtening the colaborative action of several agents and the multiscale governance

- Dificulty to actualize the platforms

- Require an active participation of the various actors of planning

- Difficulties on the compatibilization

- Need to transform the raw information provided by the agents in the proper format

2.2. WEBGIS AS DYNAMIC AND USER-FRIENDLY MONITORING SYSTEM

The web mapping the SPOTIA project, with an interface platform, enabled visualization of thematic cartography for analysis on the pillars of national regional policies, local / municipal utility, **for example** :

- Population (2001, 2011);

- Land Use - mapping based on Corine Land Cover (1990 , 2000 , 2006);

- Employment - Persons Employed and Establishments (2005 , 2011);

- Schools Network - location of schools by level of education (2005 , 2013

2.2. WEBGIS as dynamic and user-friendly monitoring system

The web mapping the SPOTIA project, with an interface platform, enabled visualization of thematic cartography for analysis on the pillars of national regional policies, local / municipal utility,

Land Use Evolution

Example: Corine Land Cover 2006 (all classes)
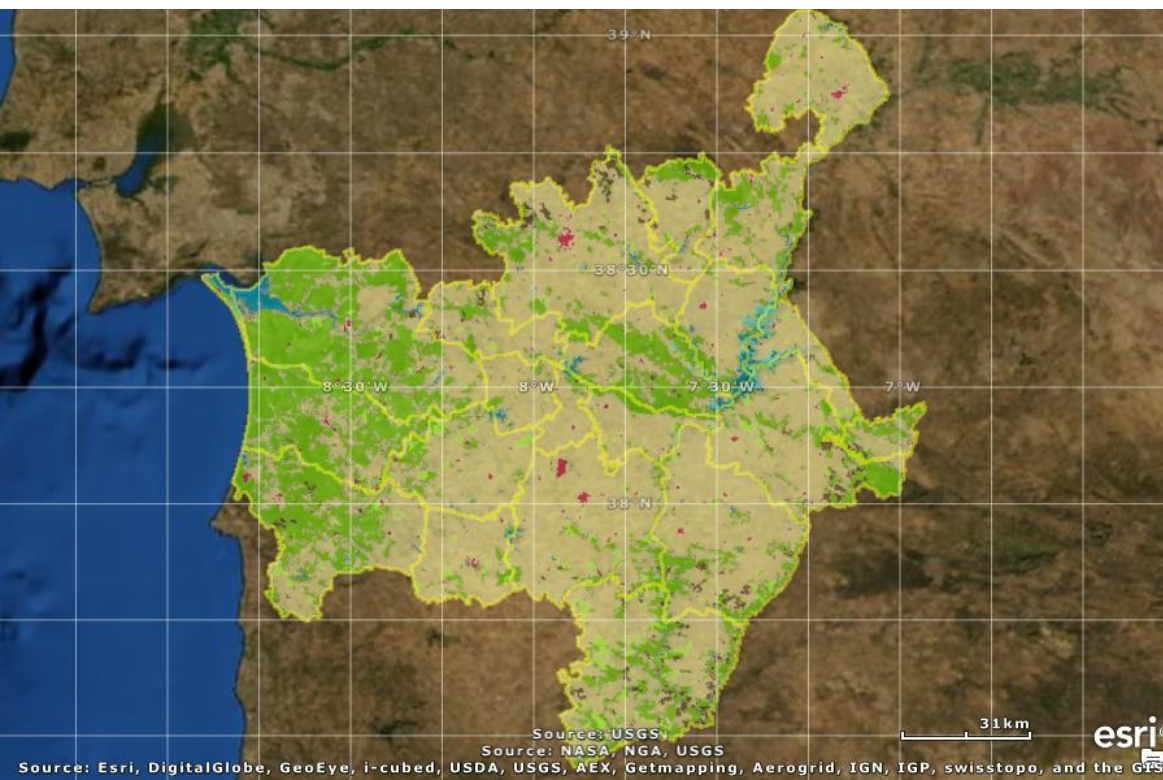
Land Use Evolution
Eg. Evolution of a single class of Corine
Land Cover 1990 – 2006
- Water bodies

4. Zonas húmidas
4. Zonas húmidas - 1990

4. Zonas húmidas - 2000
4. Zonas húmidas - 2006

5. Corpos de água
5. Corpos de água - 1990

5. Corpos de água - 2000
5. Corpos de água - 2006
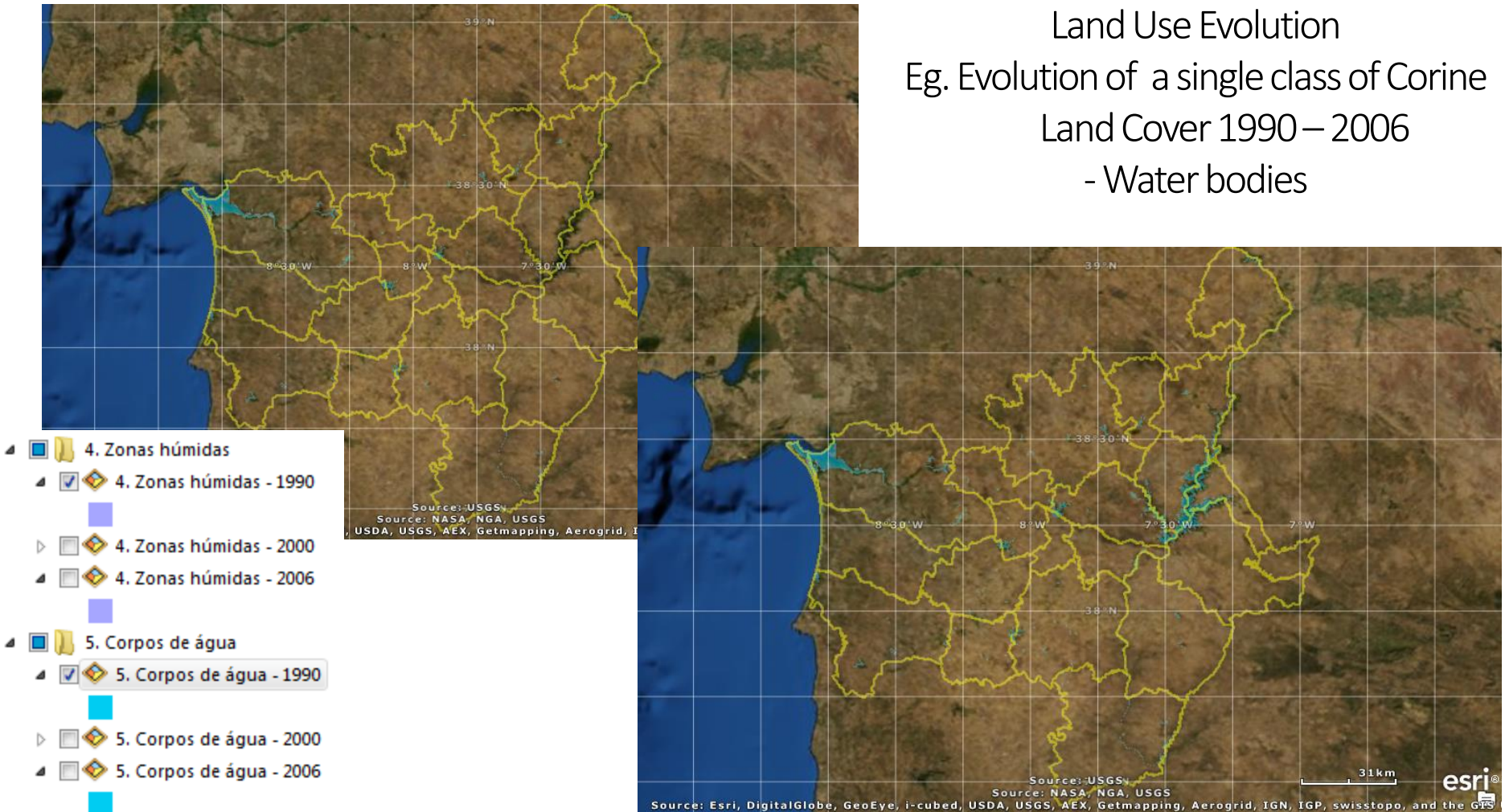
Land Use WEBGIS for EFMA area. Case of "Water bodies" CLC category
Data Source: CLC 1990 and CLC 2006. Own production

**After programming, the implementation
Objectives related to cohesion
Approved projects of NSRF 2007-2013**

Programs	Domains and Investment made until Juin 2013
Human Potential - 50%	Includes: Young people qualification – 26% (social capital investment) Adult qualification – 21% (social capital investment) Education – 27% (physical investment)
Competitiveness – 22%	Including Innovation and entrepreneurial investment
Territorial Valorization (including regional) - 28%	Includes: Cities policy – 19% Equipment's – 15%

QREN, Boletim Informativo 20, Junho de 2013

Physical Investment are decreasing importance
Human and social capital investment growth

After programming, the implementation
# Approved projects of NSRF 2007-2013

The pattern of Regional Programmes
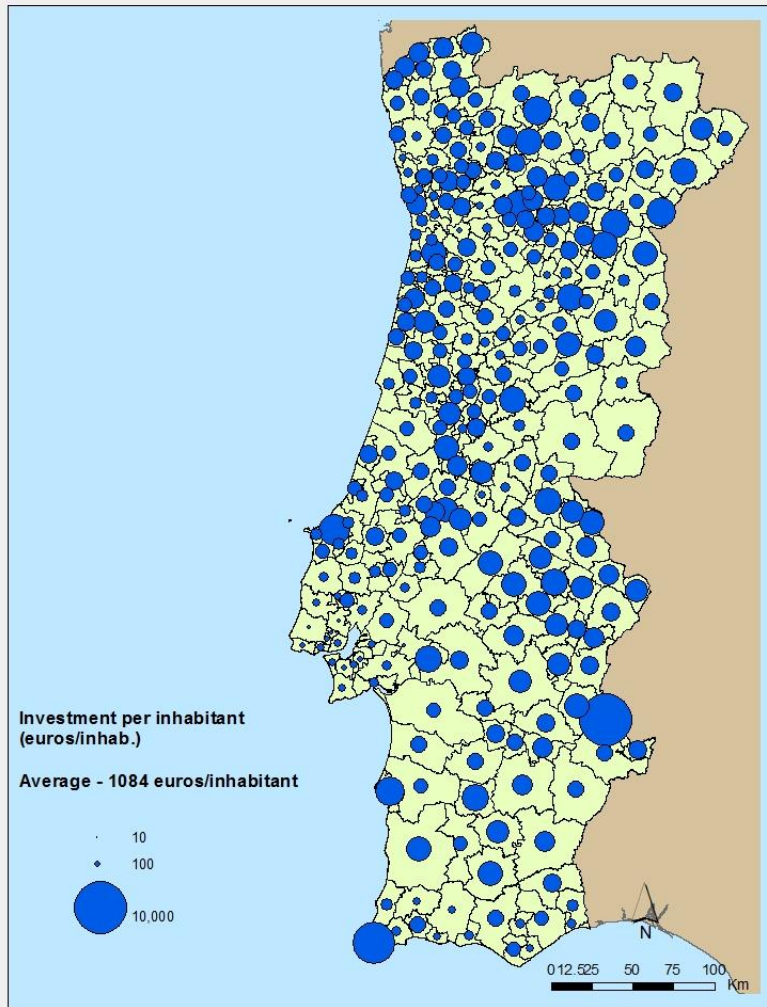
Competitiveness, I&D Axe

Investment per inhabitant in Regional OP (euros/inhab.)

Investment per inhabitant (euros/inhab.)

Average - 1084 euros/inhabitant

- 10
- 100
- 10,000

Investment per inhabitant in Regional OP (euros/inhab.)
Axe 1 - Competitiveness, Inovation and Knowledge

Investment per inhabitant (euros/inhab.)
Axe 1 in Regional OP`s

Average - 418 euros/inhabitant

- 10
- 100
- 1,000
- 10,000
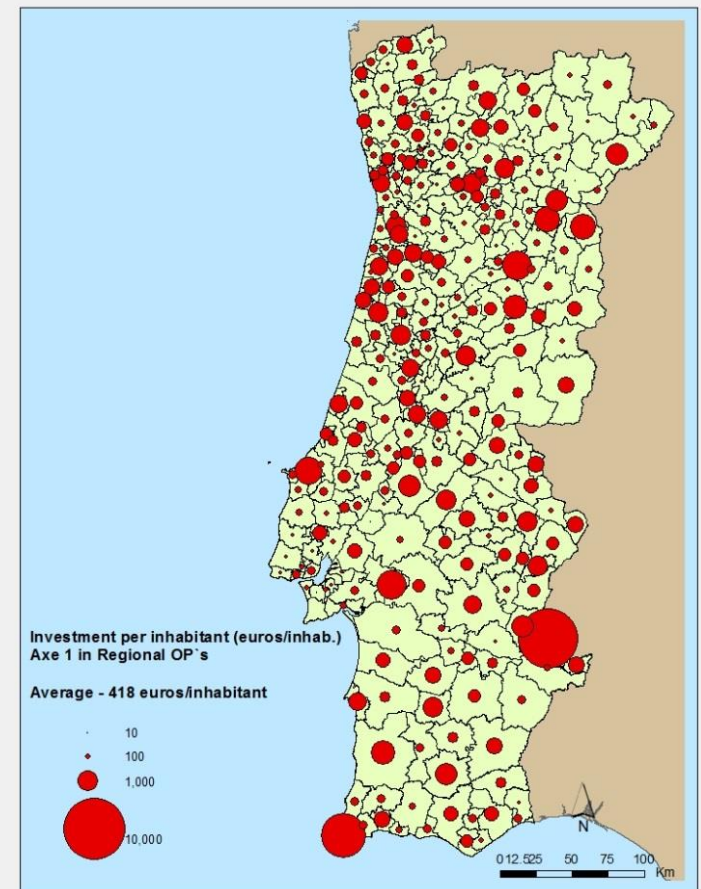
After programming, the implementation
Cities Policy - Approved Investment NSRF 2007-2013

	Lisbon Metropolitan Area	Porto Metropolitan Area	Municipalities with cities	Other Municipalities	Multi-municipal /regional	Total
Cities Policy	137818514,7	159010390,2	181467871,3	707543147,7	202639058,5	1388478982
	9,9	11,5	51,0	13,1	14,6	100,0

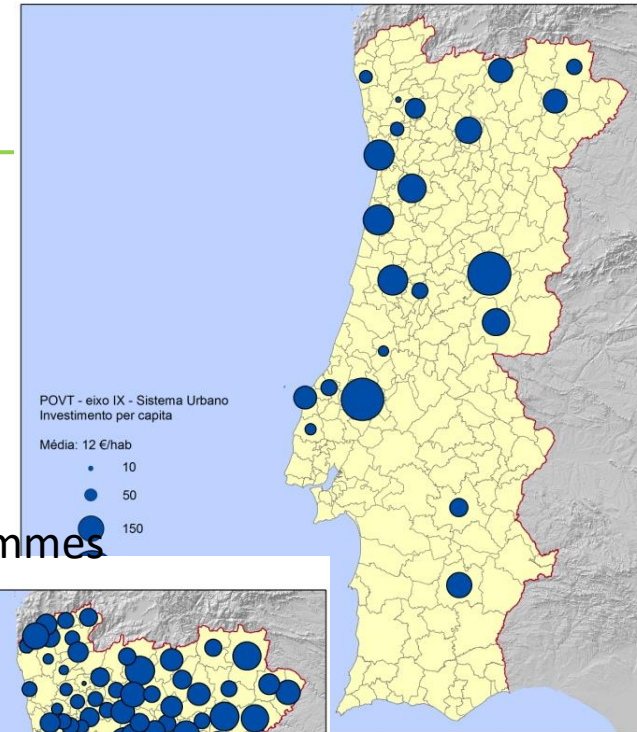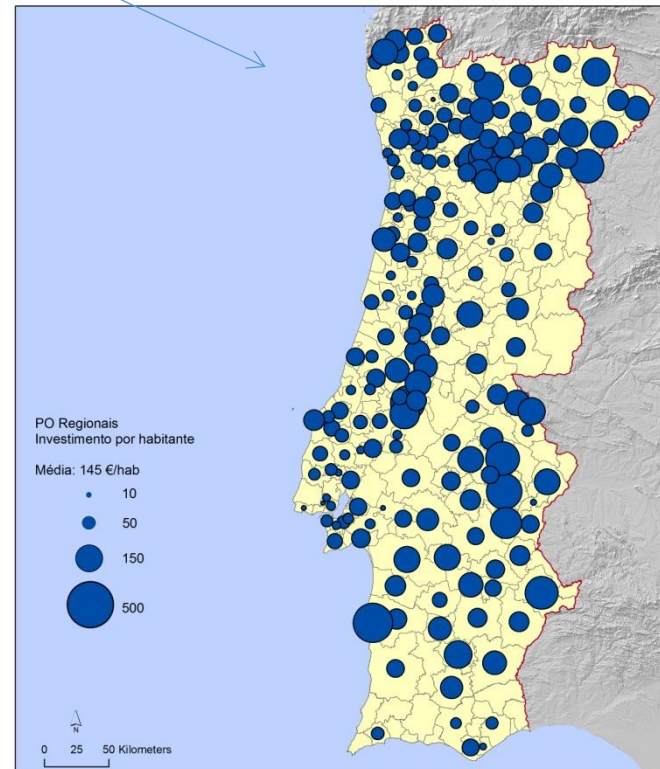| **6 Operation Typologies**	Total	%
POVT - "Innovative Actions for Urban Development"	11438743,8	0,8
POVT - "Urban Structure Equipment System"	219854537,5	15,8
PO R - "JESSICA Community Initiative"	165510639,1	11,9
PO R - "Cities Policy - Partnerships for Urban Regeneration"	866052684,2	62,4
PO R - "Politics of Cities - Urban Network for Competitiveness and Innovation"	97707123,9	7,0
PO R - "Urban and Rural Rehabilitation".	27915253,9	2,0
CITIES POLICY	1388478982,0	100

GOOD TERRITORIAL DISTRIBUTION, BUT STILL RELATED TO PHYSICAL INVESTMENTS

After programming, the implementation

POVT – Eixo IX – Development of Urban System

POLIS XXI

Regional Programmes

Política de Cidades
Investimento por habitante

Média: 157 €/hab

- 10
- 50
- 300
- 900

0 25 50 Kilometers

POVT - eixo IX - Sistema Urbano
Investimento per capita

Média: 12 €/hab
- 10
- 50
- 150

PO Regionais
Investimento por habitante

Média: 145 €/hab
- 10
- 50
- 150
- 500
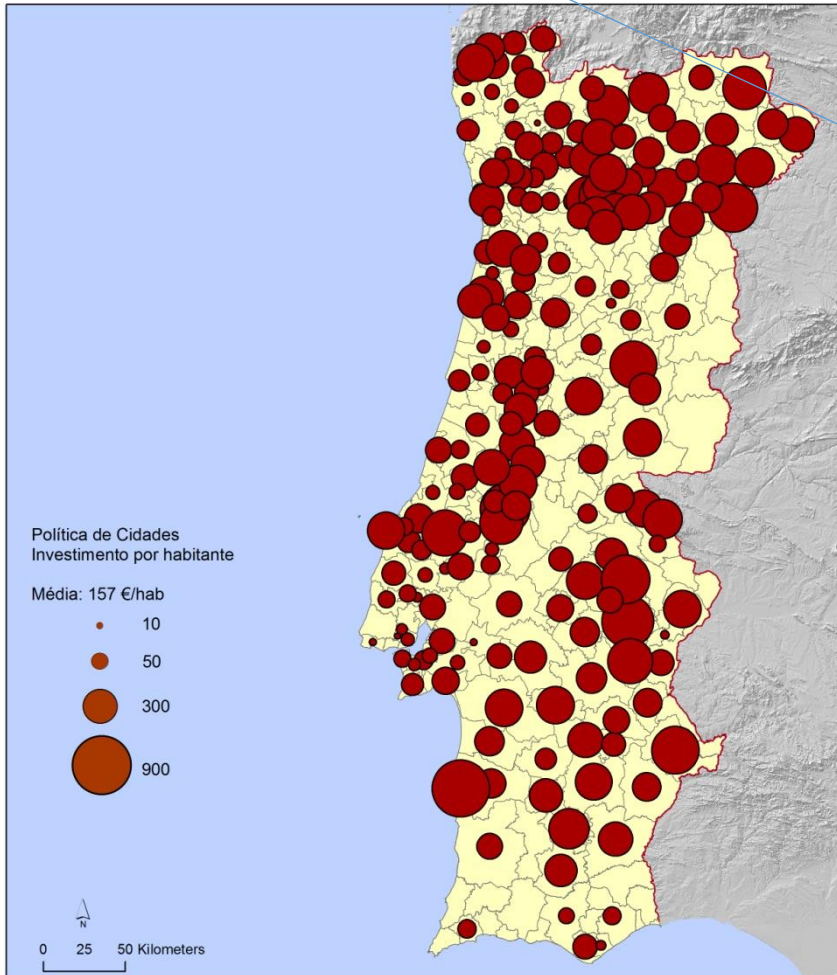
0 25 50 Kilometers

2.3. Geographical modelling as a tool to reinforce the decision-making process

Some working groups developing different studies, using several methods:

- Graph Theory and Complex Networks;
- Neural networks (e.g. SOM); combining neural networks with Multicriteria Analysis;
- Cellular automata (combining neural networks and or Multicriteria Analysis, i.e. Weighted linear combination (WLC) to adjust the transition rules).

Activities that are now under development:

1. Build, analyse and visualise the network of actors (stakeholders) concerning spatial planning, for all scales of Spatial planning instruments (IGT) and for each individually

2. Data-mining, namely to explore the variables of the different domains (social, economic, demographic, biophysical, legal, etc.), and to develop explorative (what if scenarios?) and predictive scenarios

3. Building a predictive model to land use/cover changes

Evolution of School network (all schools) » basis for geographical modelling
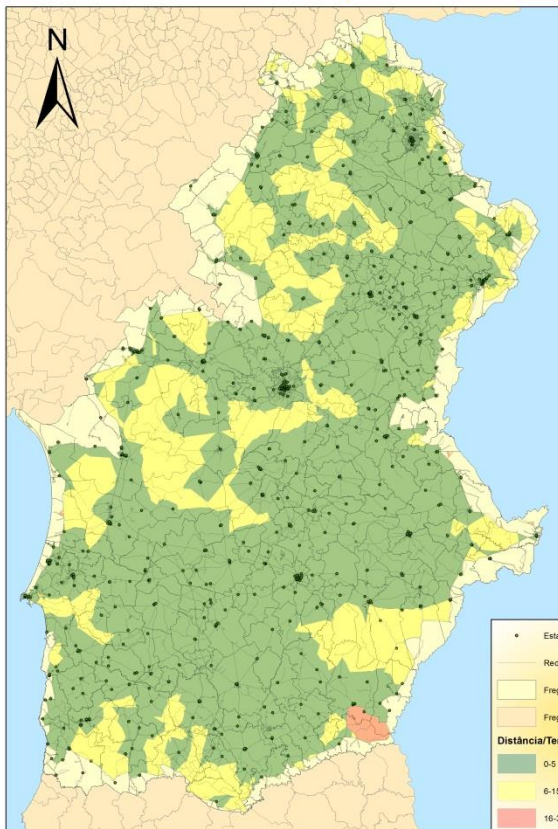Before and after the scholar network reform
2005 – 2010 - 2013

14.073 schools

10.518 schools

9.514 schools
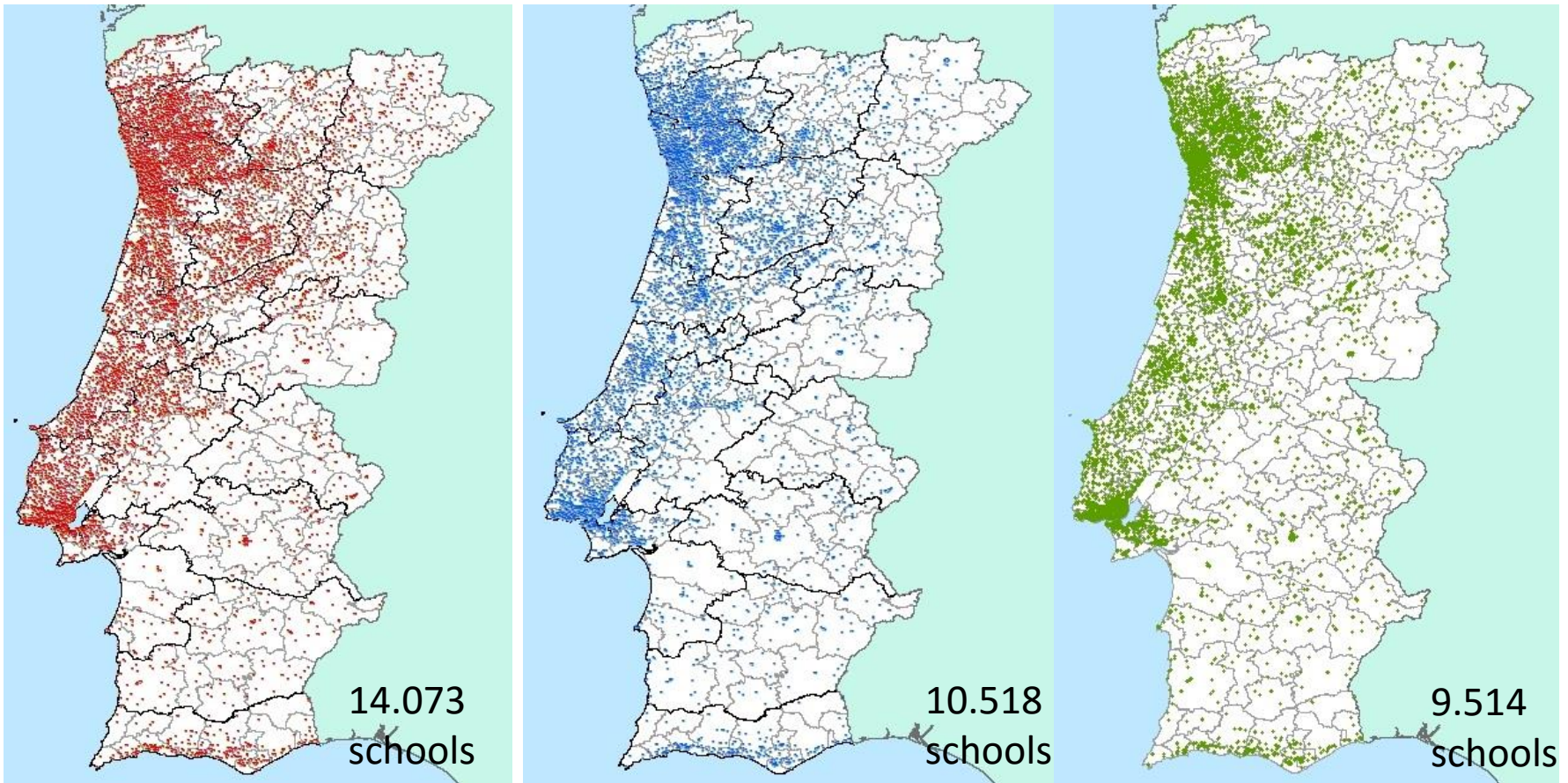
3.3. Geographical modelling as a tool to reinforce the decision-making process
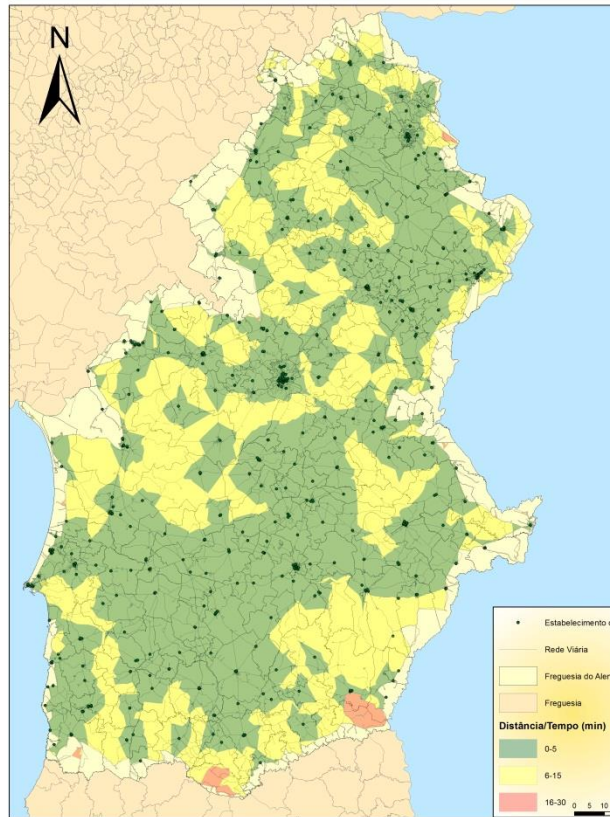
Distance-time to the nearest school
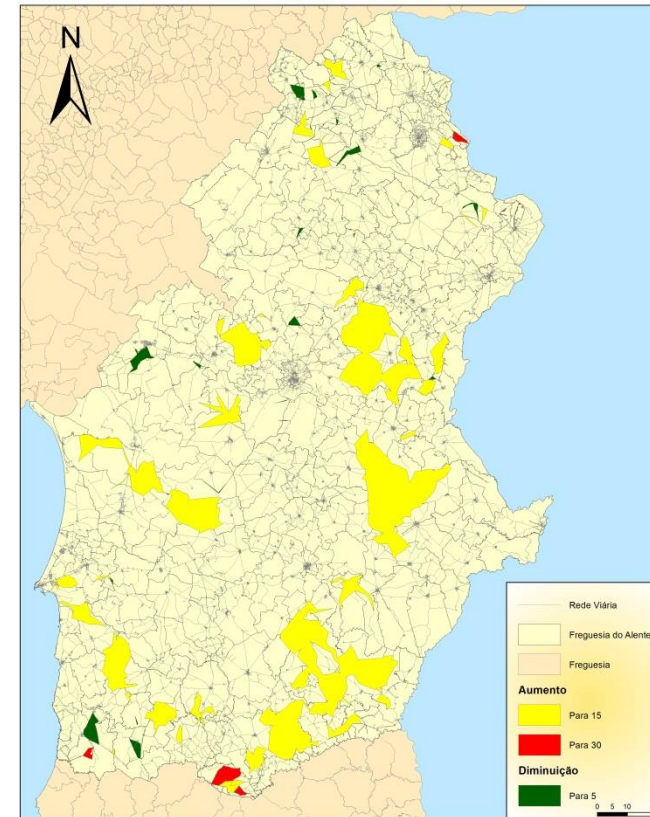   **- Region of Alentejo**
   - All schools

Distância/Tempo ao estabelecimento de ensino mais próximo, 2005

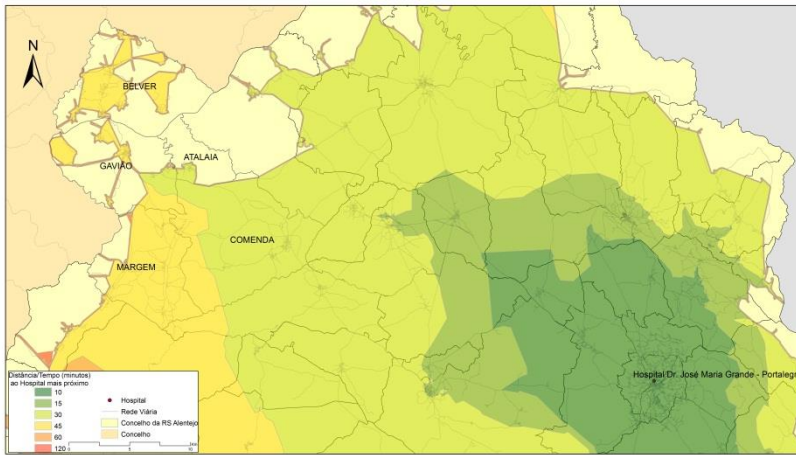Distância/Tempo ao estabelecimento de ensino mais próximo, 2013

Variação da Distância/Tempo ao estabelecimento de ensino mais próximo, 2005-2013

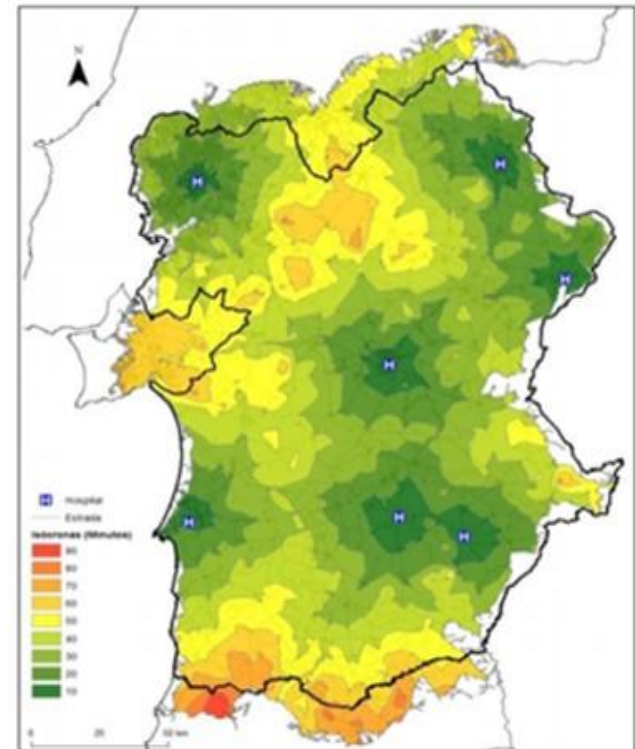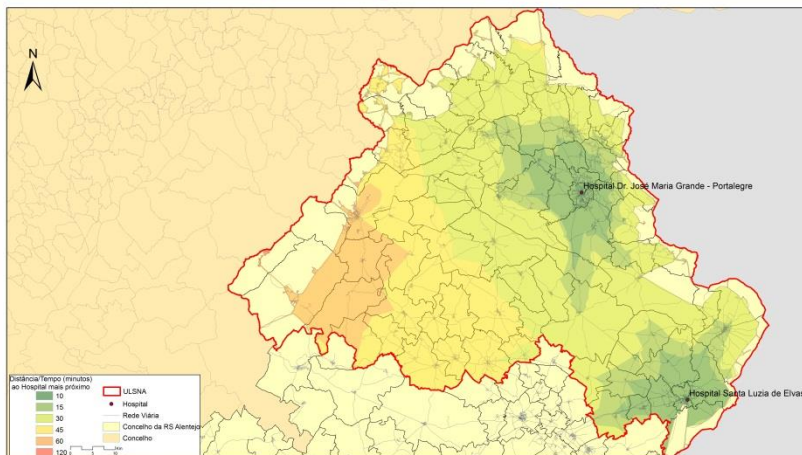# 3.3. Geographical modelling as a tool to reinforce the decision-making process

Distância/Tempo ao hospital mais próximo

Distância/Tempo ao hospital mais próximo na ULSNA

Distance-time to the nearest hospital (Region of Alentejo)

Note: these areas don`t cover linearly the resident population

2.3. Geographical modelling as a tool to reinforce the decision-making process

Evolução da SAU

1989

1999

2009

2019

Land Use

Evolution of Agricultural Area (1989-2019)

Variação da SAU

1989

1999

2009
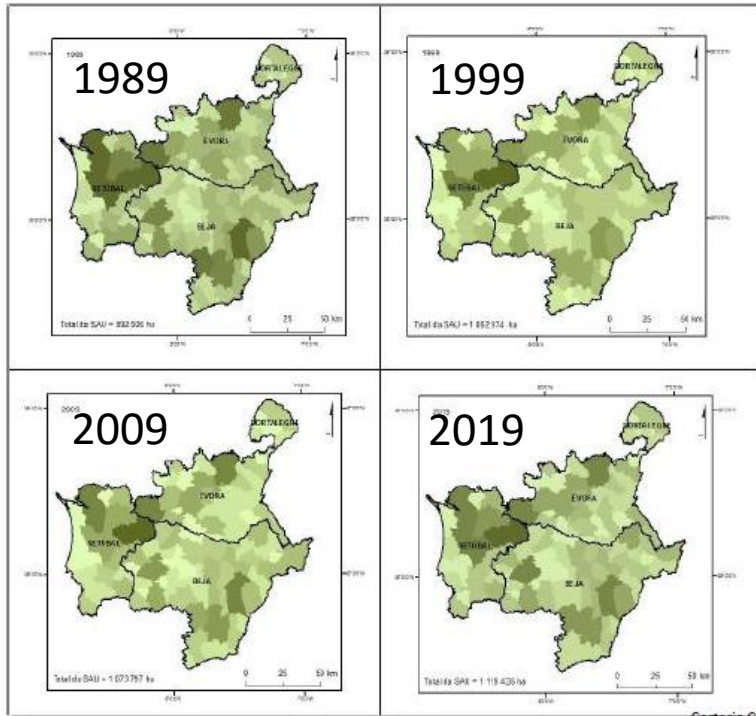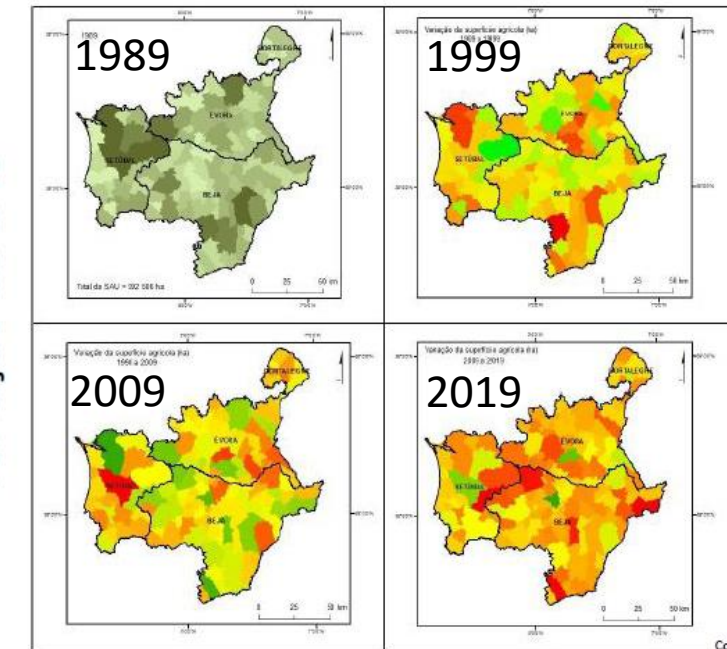
2019

Cortesia Catarina Rodrigo e Rita Rosa

3. FINAL REMARKS

Participation of GIS on almost all planning phases
1. Objectives
2. Data collection
3. Data analysis
4. Modelling and Projection
5. Development of Planning Options
6. Selection of Planning Options
7. Plan Implementation
8. Plan Evaluation, Monitoring and Feedback

Benefits:

- Produtivity – more info in less time

- Efficiency – advanced analysis, faster and cheaper mapping

- Cost reduction (work, space)

- Improvement on decision support

Constrains:

- Great volume of work to create and maintain an actualized GIS;

- The huge cost of data and it`s updating;

- Need of high specialized workers

- Lack of data - existence and actualization

- Gap between the available tecnologies and the technics, decision-makers and community`s knowledge

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