Territorial indicator system as a tool for evaluating territorial strategies

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1 ABSTRACT

Evaluation is a main challenge for every territorial strategy. Objectives are often defined in abstract terms, leaving space for different interpretations, which is an obstacle to a fair evaluation. This is certainly true for the Territorial Strategy of Navarra (ETN), an autonomous region in Spain. The ETN envisions the future territorial development of Navarra, based on the principles stated in the European Spatial Development Perspective (ESDP) to Navarre, defining some strategic objectives and a numerous set of directives. Based on this strategy, spatial plans (POT) are currently being elaborated for the five sub regions of Navarra.

The ETN contains a set of indicators in order to measure the evolution of regional territorial development until the year 2025. However, in practice, these indicators only give some general insights in the accomplishments of the strategy. This is why a new indicator system is being developed, which incorporates the objectives of the spatial plans, and enables decision makers to identify the results of their interventions. Not only does the system respond to the need of measuring tangible results, it also aims at integrating indicators from different policy domains into a regional territorial information, sustained by a Spatial Data Infrastructure (SITNA/IDENA).

2 INDICATORS AND TERRITORIAL STRATEGIES - A COMPLICATED MARRIAGE

Territorial strategies are usually produced by nations, regions or other territorial entities in order to design a common vision on the future development of the area in consideration. Despite the differences across countries and regions, due to different planning systems and varying degrees of involvement of different sectors of government such as economic development, social issues, housing or environment, most strategies share two common characteristics: integrality and translation into maps.

Indicator systems are put in place to evaluate the results of a certain strategy. In general, the more tangible the objectives of a strategy or plan, the better they can be measured by an indicator system. However, territorial strategies tend to be rather abstract due to the need to combine many interests in some overarching concepts such as for example polycentrism, territorial cohesion, accessibility or landscape quality. This makes the development of an indicator system for territorial strategies rather complicated.

On one hand, this situation has not to be dramatized. Spatial plans often play a role of provoking visionary views on the future of a territory, and visions can exist of concepts or dreams for a better future, which do not necessarily have to be translated in understandable bits and pieces to be implemented in every corner of the territory. On the other hand, the design of an indicator system for a territorial strategy has in many cases proven to be an exercise of compromising spatial planners to translate their general principles into workable objectives, which in turn forced politicians to express their ideas into real choices (de Vries, 2009).

Putting an indicator system together requires a profound understanding of the goals of territorial policies, a wise translation of these results into tangible results to be achieved, and the organization of the data flows and analysis to get to a useful product. In this article we explain the process of elaborating territorial indicators for territorial policies in the region of Navarra, where we are currently undergoing all of these aspects.

3 TERRITORIAL STRATEGY OF NAVARRA - IN SEARCH OF SYNTHETIC INDICATORS

The main policy document on territorial development in Navarra is the Territorial Strategy of Navarra (ETN), approved in 2005 (Navarra, 2005). This document is based on six principles, combining the three pillars of the European Territorial Development Perspective (ESDP) (polycentrism, accessibility and management of natural and cultural heritage) with the three pillars of sustainable development (competitiveness, social cohesion and environmental sustainability).

The ETN proposes to monitor territorial development based on these six principles, and includes synthetic indicators to measure its progress, both of the region itself as well as in comparison to Spain. Every indicator is calculated out of a combination of 10 to 20 variables which are considered to be crucial for the principle to be monitored. For example, accessibility is measured by different variables like proportion of population with access to high speed internet, accessibility by high way, and so on.

Since the approval of the ETN, two evaluations have been carried out (OTN 2008, 2010), and two problems have flourished. Although the synthetic indicator system seems convincing in putting one value for every principle, the numbers do not connect to politicians and citizens' real life. For them, an increase of polycentrism from 0,52 to 0,56 doesn't have any meaning, let alone that this would lead to policy adaptations. The second problem is the difficulty to maintain this indicator system in time, due to changing data availability and definitions. And if one variable changes or is missing, a time comparable synthetic indicator cannot be produced.

4 A NEW PROPOSAL: INDICATORS OF TERRITORIAL POLICIES

The need for more tangible indicators as stated in the evaluations has become more urgent as the subregional spatial plans in Navarra (POT) are about to be approved (Navarra, 2009). These plans are a translation of the ETN into decisions on the distribution and management of territorial amenities at supramunicipal level. This is why the Territorial Observatory of Navarra has proposed a new indicator system which combines the general development goals of the ETN with the need for tangible results as expressed in the POT.

The most important function of the indicator system is the translation of the objectives of ETN and POT into numbers that express a wishful development. The question is not putting a fixed number as a targeted objective, since this is a political task, if desired at all. It can neither be said that any development is exclusively to be contributed to territorial policies. However, putting indicators which express "wishful development" enables an open debate about the convenience, priority, and compatibility of different objectives and their impact on territorial development.

To illustrate what we mean we explain briefly two examples. A clear objective of territorial policies is to reduce damage caused by flooding. A way of doing this is the assignation of flood risk areas and attributing some land use regulations. Therefore, the indicator system will measure the number of new houses constructed in flood prone areas of a certain risk. This way, planners can keep track of real developments and see to what extend these are in line with their policies. However, this does not necessarily mean that planners have failed if new constructions in flood prone areas are increasing. There might be a number of reasons that this has happened (shortage of land, river side development, or even shortcomings in the definition of risk areas), and measures might have been taken to reduce vulnerability.

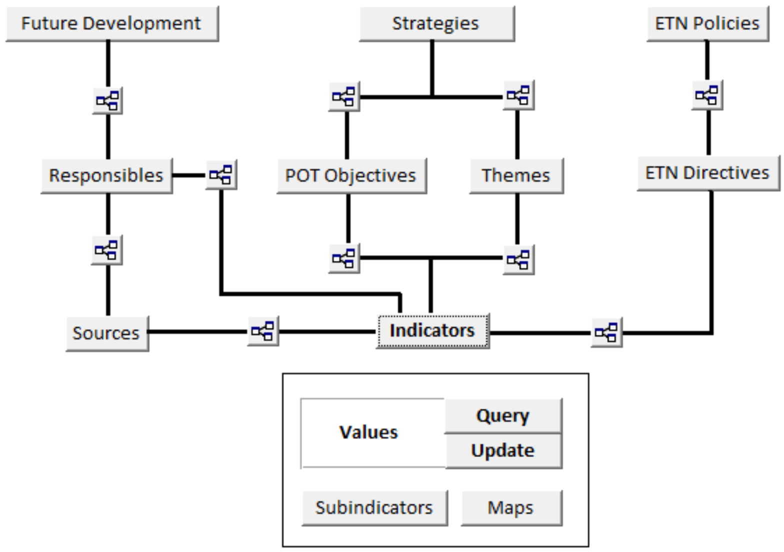
A second example is rural development, being an integral part of spatial plans in Navarra. An important objective of the territorial strategy of Navarra is to strengthen the agricultural sector, and at the same time to promote diversification of rural economies, decreasing the percentage of persons working in the primary sector. Both objectives are not immediate results of spatial planning, but territorial decisions indirectly influence economy trends, such as investments in infrastructure or information services. In this case, given existing type of policies, the indicator - dependency on agricultural sector - allows stakeholders to evaluate the indicrect results of these interventions.

The examples illustrate the need for the second function of the indicator system: the contextualization of the observed trends. Numbers in themselves are useless, if they are not explained in a wider context. Questions like comparability with other regions, degree to which the number in particular explains a greater phenomenon, the way policies are having an impact are fundamental to increase the usefulness of the indicator. In our products we try to balance between a synthetic system and the need for explanatory texts.

5 THE PRODUCT

The system envisioned to be in place by summer 2010, consists of two different outputs: a website and a biannual publication or evaluation report.

The website is the main communication platform of the indicator system, and is meant for different types of consults. In the first place, visitors will be able to access most actual version of all indicators, as the system will continuously be updated with the latest data files available from other institutions. But it will also be possible to have easy access to the most relevant objectives of the different territorial policy documents, and the way these objectives can be evaluated by the indicators included in the system. At medium term, temporal and geographical queries should be available. And in any case, all indicators will be accompanied by explanatory sheets which shortly address the questions raised in the previous section on comparability, explanatory power of the indicator, and policy impacts.



In order to achieve a wider impact, every two years a document will be published named "Sustainable Development in Navarra", in which a snapshot of the system will be given, organized according to the main themes which are of importance for territorial policies of the region.

6 ORGANIZING THE DATA FLOW – INPUTS FROM OTHER INSTITUTIONS

As territorial indicators are very diverse, the system relies to a large extent on data available in other institutions. In this paragraph we describe shortly the way we are working in order to achieve a data input flow as efficient as possible.

One of the first decisions in the conceptual design phase of the indicator system is to use existing data, rather than producing totally new data layers. That strategy takes into account the high degree of data availability in the region. In this way, maintenance will be assured as well as production costs are kept relatively low.

We briefly characterize the diversity of our data suppliers. The Territorial Information System of Navarra (SITNA) is our main source of information. Navarra has a rather unique concept of a corporate system in which different data suppliers put their data available to users outside their own institution. However, many more data are needed. A next step is to access Spatial Data Infrastructures (IDENA, IDEE). Unfortunately, results so far are relatively small, since these systems are still under construction, and data sharing is not on top of the list of priorities of most institutions. Other source of great importance are the Statistics Institutes (IEN, INE), geographic institutes (IGN), governmental departments (Agriculture, Cadastre) and public and private companies (TRACASA, ESRI). At European level, networks and agencies like ESPON and EEA are important sources, although we try to confine national and European data gathering as much as possible to existing indicator systems as those published by the Sustainability Observatory of Spain (OSE, 2009).

Data suppliers vary greatly in the way they are focussed on data management, and as a result, many difficulties have to be tackled. One of the main issues is data availability. Lack of certain data can lead to slight modifications of an indicator, such as the case of compactness, which originally would be calculated by number of housing units per building, but will now be calculated by number of housing units per parcel. A second issue is privacy policies, which sometimes hamper the calculation of an indicator at the desired scale level, as for example in the case of number of enterprises per industrial area. Time series constitute a recurrent issue, since many suppliers do not maintain outdated information, or just produce a data file for one particular project, without maintaining the data up to date. As a result, indicators do not all have the same update frequency. Some are updated every year, others might only be available every ten years, like data based on census information (of example secondary homes).

A second issue is data quality. Data used to calculate a particular indicator might originate from studies with different levels of accuracy. For instance, flood areas are derived in a large period, with different methods and inputs depending on the obtaining year. In that case, indicator is calculated for every possible year any time the flood area is updated. In that way, you could still compare indicators between different years. Older versions of the indicator values are kept and are related to the newer version for comparison purposes.

Finally, different data formats and their difficulties to integrate external data files into the indicator system constitute another challenge. Every supplier uses different formats (ACCESS, XLS, SHP, PNG, DXF). Moreover, suppliers often change their data model, changing field names, type of data, etc. Both aspects are dealt with in the enterprise GIS explained in the following section. As far as possible, data suppliers are asked to deliver their data according to an input data model based on the first import experience in order to prevent changes and avoid reprogramming import routines.

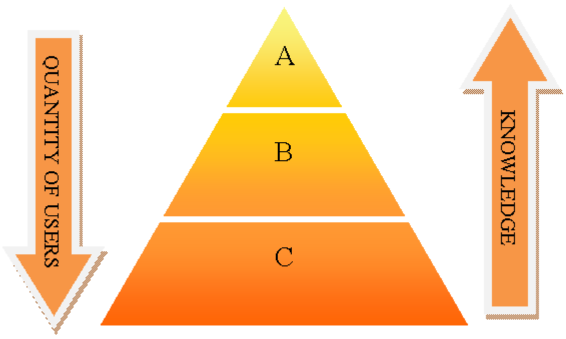
7 ENTERPRISE GIS

The large data volume and the complex analysis needs required by the indicator system makes the development of an enterprise GIS system a vital operation. In this section, the conceptual design of this system is explained.

The goals of the enterprise GIS are to optimize, to standardize and to automate processes of data acquisition and maintenance, territorial analysis, calculation of indicators and sharing of results. In order to achieve these goals, attention is paid to five essential parts of the system: users, data storage, work flow, metadata, and output.

In the first place, the system has to serve three levels of users defined as shown in the image below (increasing upside down by number of users and decreasing the same way by knowledge required to use the information provided by the system): (A) Indicator system architects, consisting of scientific staff involved in the conceptual evolution of the indicator system, and GIS staff responsible for the technical implementation and maintenance of the system and the calculation of indicators. (B) Planning experts, being decision makers and technical advisors using the outputs of the system for making, implementing and evaluating spatial plans. (C) General public interested in the progress of their region and their living environment.

Depending on the user level, users will access to the system through different applications (see applications section below). In the same way, permissions to read, to write and to modify concepts and values will depend on the user level.



A second issue is data storage, which is being organized according to four different data tiers, in order to respond to the complicated environment in which the indicators are being developed. To illustrate this environment, some issues are mentioned here, like different versions of geographical zoning in time, different time series according to data sources, or combinations of data sources for the calculation of one indicator. Moreover, other projects carried out in the Observatory are intimately related to the indicator system, since they both derive from the same base data, and contribute by proposing the adaption of existing or the inclusion of new indicators. Therefore, data storage beyond that required for the indicators is a must.

The four data tiers which are currently being developed should deal with these issues:

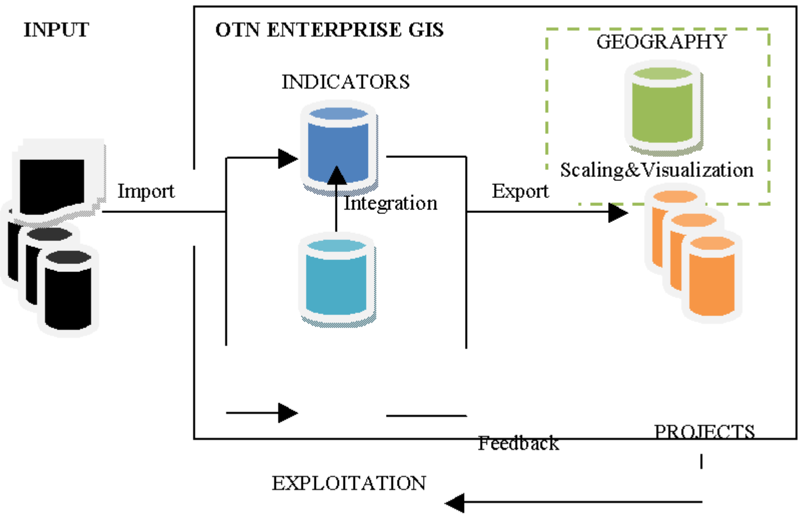
- The geography tier stores those layers used to produce the indicators according to the geographical units defined in the conceptual model, like administrative units of different scales, flood prone areas, urban areas, economic hot spots etc. These layers are also used to produce maps for reports. All the historical versions of these zonings are maintained by version management.

- The indicator tier is used to store the conceptual model of the indicator system, the input data required to calculate every indicator (apart from geography), and the resulting indicator values. As with the geography tier, all historical data is maintained by version management. Additionally, tables within this tier are designed according to a vertical storage model. This means that one record represents just one indicator value, in one moment of time, on one scale level (see figure). More conventional table formats, for example those in which values for different years are stored in different columns, offer less flexibility, since changes in input models, geographical zoning definitions or the proper indicator calculation model can not be dealt with, as opposed to the vertical tables proposed in this data tier.

Nombre del campo	Tipo de datos
ID	Autonumérico
Indicator	Número
Date	Número
Scale	Número
Value	Texto
User	Texto
User_date	Fecha/Hora

Image 1. Fields in the only indicator values table within the system.

- The exploitation tier is used to store inputs needed for territorial analysis carried out within the Observatory which are not necessarily part of the indicator system. This tier includes three types of table using a mixed vertical/horizontal approach for the table design. Firstly, catalogue data keep record of all layers stored in this tier. These data follow a horizontal approach as there is no need to track changes (mostly new layers declaration). Secondly, input data are those exploitation data which are directly imported from external sources into vertical tables. This is done to isolate these data from changes in inputs, to improve data maintenance and to take into account the temporal aspects. Opposite to the indicators tier approach, there is one vertical table per theme (cadastral uses, housing per parcel, companies and workers) to account for the diverse data models and scales involved. And thirdly, exploitation data is transformed from vertical to horizontal tables to assure a proper connection to the graphic layers in the geographic tier within the GIS system. This is the only redundant information within the system at the purpose of maintaining high performance both on import and maintenance procedures (vertical tables) and on data exploitation (horizontal tables).
- The project tier is introduced to avoid overloads to the exploitation tier. All intermediate data which is needed or generated for analysis purposes (derived from exploitation tier) are stored within a specific database per project rather than in the exploitation tier.

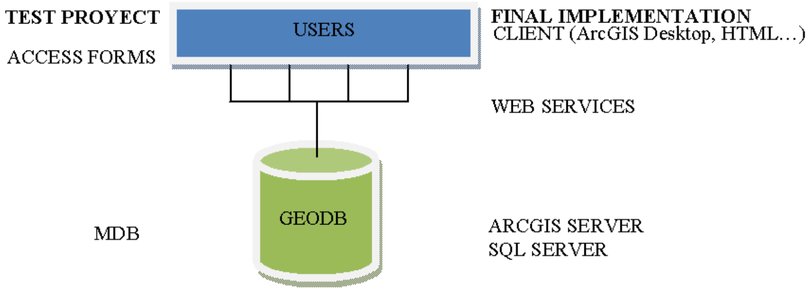


In the third place, users and data storage come together in an organized way, according to different work flows as shown in the image below.

- Imports: inputs are loaded to the indicators or exploitation tier depending on the current and foreseen use of the information. To avoid redundancy, a choice is made in which one of the tiers data is imported.
- Integration: exploitation data can evolve towards a new indicator. In that case, data will be transferred to the indicator tier. In the same way, data used to calculate indicators could be derived to generate new information at the exploitation tier.
- Export: the territorial analysis carried out at OTN require very specific inputs, so detailed that they would be useful for just one project and thus making it unnecessary to store them at the indicator or exploitation tier. All intermediate data which is needed or generated for analysis purposes (derived from exploitation tier) are stored within a specific database per project rather than in the exploitation tie
- Feedback: results from territorial analysis worth sharing with other projects are placed into the exploitation tier or even in the indicator tier through integration.
- Scaling&Visualization: all the indicators calculation, exploitation tasks and analysis within projects are obtained at a specific scale (regional, sub regional, local...) by using layers in the geographic tier as base data. These layers are then used to represent results in maps and reports.

In order to keep track of all information in the system, metadata is being assigned to all tiers. In the geography tier metadata delivered by the data supplier is used. For the indicator tier metadata of every indicator is made up by the conceptual framework of the indicator system. The person responsible for data harvesting and indicator calculation is stored together with the harvesting procedure (web service, download, petitions, and time schedule) and calculation steps. Within the exploitation tier metadata is made up of the catalogue elements describing the layers included in this tier. For projects data and processes are described in the project specific documentation whereas metadata is not regularly stored at this tier as it constitutes a too detailed level of data.

And finally, the system has two kinds of outputs. On one hand there are the regular maps and reports, not only related to the biannual report on territorial development, but also in many other products like territorial observations, advisory reports, European projects, development projects etc. On the other hand, client applications are being developed such as the indicator website. At this moment, emphasis is being put on the development of the conceptual model, data storage and paper outputs. Once this phase is being concluded, attention will shift towards a more efficient platform development and the development of web clients, as shown in the following graphic.



In any case, the system design allows clients easy access to a complex set of information, from any point of view (monitoring of strategic objectives, time series of a particular phenomenon, geographical comparisons at different scale levels, or comprehensive overview of all data related to a particular issue). Interestingly, the system also allows for keeping track of the evolution of the conceptual model. This flexibility is a base condition for expanding the system in the near future towards a real corporate system in which different governmental departments share their indicators.

8 CONCLUSIONS

This short overview of an experience of territorial indicator development in Navarra shows the complexity of such an endeavour. In this section we want to highlight some lessons learned so far.

Developing indicators for territorial policies require serious involvement and even some courage of politicians. Indicators can scare off certain administrations, since they might show undesired tendencies for which they can be criticized. In Navarra we opted for a middle road, taking the objectives of territorial policies as a reference for indicator development, but not selling these indicators as absolute measurement of success. It still remains to be seen if this will be accepted. However, it is a way to stimulate debate about the real goals of territorial policies and interventions needed to reach them.

Another issue is the danger of overload of information. In this indicator system, we try to stress the importance of both the facts, the explanation behind those facts and their relation to existing policies. Only if the indicators are put into a wider context, the risk of abuse will be reduced, and the chance of receptiveness of the politicians will improve.

The data harvesting, transformation and storage is a large effort which cannot be underestimated. In spite of all modern interoperability guidelines like INSPIRE and emerging Spatial Data Infrastructures SDIs), data availability remains low and quality and format is still diverse. In an ideal world, SDIs should take over large part of the data gathering and transformation processes which is now carried out by the Observatory. On the other hand, demands from initiatives like the Territorial Information Systems can inspire further development of regional and national SDIs.

An aspect that needs more attention in the development of SDIs is the inclusion of statistic information and makes them geographically available at different aggregation levels, allowing for instance dynamic aggregations. Indeed that would first require the definition of a European standard for Territorial Development Indicators and levels of aggregation.

Finally, we want to emphasize that the indicator system presented in this paper is a GIS-driven approach aimed at standardizing data gathering and treatment, obtaining comparable results with a high level of flexibility in order to incorporate adaptions to the indicator systems and changes in data input. A vertical data structure and extensive version management have proven to be crucial to reach this flexibility.

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