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SCENARIOS FOR NATIONAL ATLAS USE

Ferjan ORMELING [*]

[*]*University of Utrecht, Faculty of Geosciences, Netherlands,*
e-mail: f.ormeling@geog.uu.nl

Abstract. *Scenarios for National Atlas use.* This article focuses on national atlases as a synthesis of the spatial knowledge that characterize a country or a national territory. Study of national atlases can involve temporal geographical or thematic comparisons which are seem as a scientific methodology. Map use strategies for national atlases are also considered in the article. The analyses ends with "functionality required" based on Simon van Leeuwen's proposal (1996) based on eight functional classes of digital atlases: comparisons are made by zooming pairs of maps simultaneously.

Rezumat. *Scenarii pentru utilizarea atlaselor naţionale.* Acest articol prezintă atlasele naţionale ca o sinteză a cunoaşterii spaţiului ce caracterizează o ţară, un teritoriu naţional. Compararea atlaselor naţionale poate presupune asemănări geografico-temporale şi tematice. Comparaţia, văzută ca o metodă ştiinţifică şi strategiile de folosire a hărţii sunt reflectate de asemenea în acest articol, luând în considerare scenariile de utilizare a atlaselor naţionale. Analiza se finalizează cu "funcţionalitatea solicitată" bazată pe propunerea lui Simon van Leeuwen (1996), care distinge opt clase funcţionale de atlase digitale: este prezentată o comparare pentru reliefarea unei perechi de hărţi în mod simultan.

Key-words: *national atlases; map use strategies; scenarios; functionality.*
Cuvinte cheie: *atlase naţionale; strategii.de utilizare a hărţii; scenarii; funcţionalitate.*

1. NATIONAL ATLASES

National Atlases present a synthesis of the spatial knowledge that characterizes a country; they contain comprehensive combinations of high-resolution geographical datasets that each completely covers a country, with an added narrative function. All information sets in national atlases refer to the same area, the national territory. Generally these datasets are the most detailed available on the national scale. A very important aspect of atlases in general but also of national atlases is that all information has been processed to be rendered at the same scale, be it the same resolution, by applying the same level of generalization. As far as possible, all information has been collected for comparable reference periods; as much as feasible or relevant, similar classification methods would have been used. To allow for fruitful temporal comparisons, as much as possible similar class boundaries and legend colours have to be used.

All this is to allow for the various maps in the national atlas to be compared; the main point of bringing all the various types of spatial information together in a national atlas is to make sure that this comparison can be fruitful; learning to use atlases really is to learn to compare the maps and deduce information from such a comparison.

Comparison of atlas maps can take different forms: there can be *temporal comparisons* when we compare the situation for a specific theme at a specific moment in time or during a specific period. One must make sure then that that to allow for this comparison, the same class boundaries will be used on the maps, and the same colours or hues for these classes. Then there are *geographical comparisons*, and for this we produce maps of the same theme, with the same specifications, but for different areas. The point of such comparisons would be for instance the discovery of specific types of settlements, or distribution patterns of settlements over an area. Finally there is *thematic comparison*, when different map themes are compared for the same area. Here it is important to have a similar classification system (like quantiles or mean plus standard deviation-based classification methods)

2. COMPARISON AS A SCIENTIFIC METHOD

In the Wikipedia lemma on geostatistics[1] it is indicated geographers use statistics to describe and summarize spatial data, to make generalizations concerning (related) complex spatial patterns, determine if the magnitude or frequency of some phenomenon differs from one location to another, or try to learn whether actual spatial patterns match some expected pattern or the pattern of another phenomenon.

If we want to compare patterns, however, we also have to study the nature of the boundaries in those patterns, as they would also have a strong influence on the perceived distributions. A phenomenon's projection on a map might have a specific natural shape (like the fan-like shape of a detritic cone or the circle of a volcano), specific transitional

[1] http://en.wikipedia.org/wiki/Geostatistics#Role_of_statistics_in_geography (consulted January 2009)

characteristics (like the sharp swift transition of a national boundary or the indistinct gradual transition of a soil boundary) and have a distinctive degree of overlap (source:)

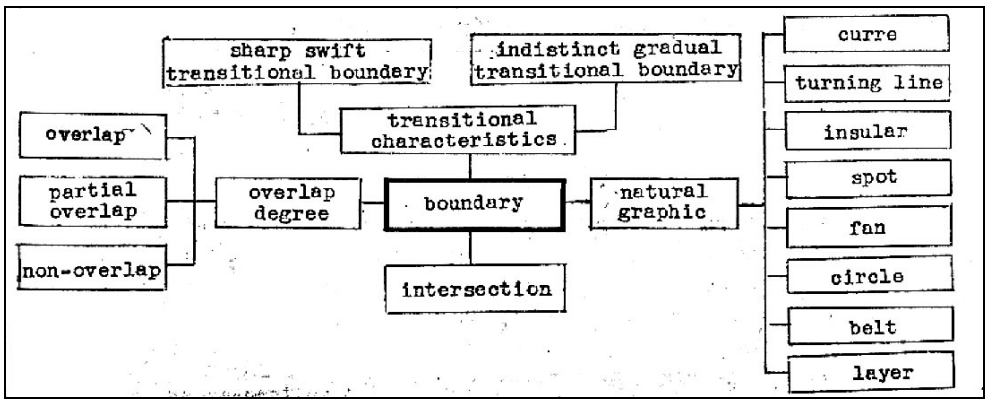

Figure 1: *Boundary characteristics*.

The phenomena themselves might refer to single features, like religion or postal delivery, or multiple features like agricultural systems or trade centres, which would result in either homogeneous regions or nodal regions. Clearly the boundaries between those regions would have a completely different nature (see Figure 2 and Sorrell 1974).

Describing patterns would entail saying something about their orientation, their composition (homogeneity, diversity or continuity) and their arrangement. We can discern the arrangement of point patterns, with their particular dispersion (regular, random or clustered) or spacing, of line patterns which can have specific connectivities, discontinuities or hierarchies, and area patterns with their specific hierarchies or trends.

It is also important to set the proper conditions under which to make our comparisons: similar reference systems, similar levels of generalisation or aggregation, map construction methods (it makes no sense to compare an isoline map with a choropleth map), use the same data collection reference periods and have the presentations on the same map scale.

It is only after all these aspects of boundaries have been studied and all the conditions for a relevant comparison be met that the actual comparison can take place: here we see what theme is rendered for which area and time period (external identification), how it is visualised with symbols and signatures (internal identification) before we finally can properly read the maps and compare them, eventually also with the help of cartometric techniques. It is on the basis of such an analysis that we will interpret the results. This actual map use should be performed in a systematic way, and in order to stimulate this, map use strategies have been developed.

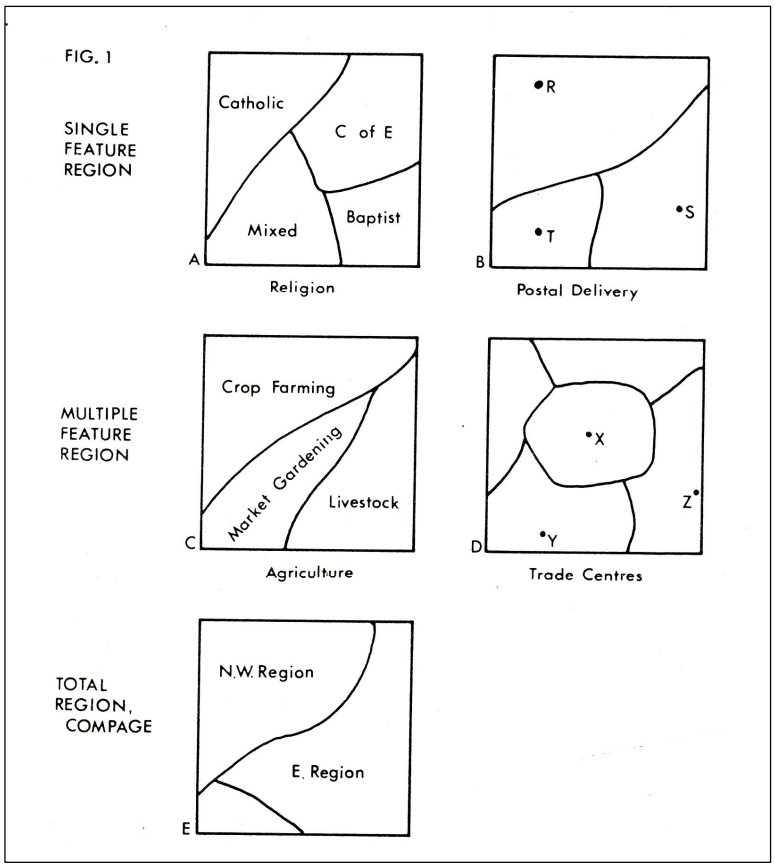

Figure 2: *Homogeneous (left) and nodal regions (right) (Sorrell 1974).*

3. MAP USE STRATEGIES

French researchers for instance developed the following set of questions for map analysis, after external and internal identification, consisting of global and detailed analysis : global analysis consists of identifying the large units, describe their location and the reason why they stand out, and describe the contrasts perceived. Detailed analysis consists of identifying and describing sub-units and their specific characteristics and the explanation of the contrasts between them. The conclusion based on those two steps consists of a statement regarding the main idea being conveyed and an analysis.

Van der Schee (1987) distinguished between horizontal and vertical relationship in map use: In studying vertical relationships we check whether different phenomena overlap or correlate in their quantitative distribution. In studying horizontal relationships we check whether a specific phenomenon has anomalies or regularities in its geographical distribution.

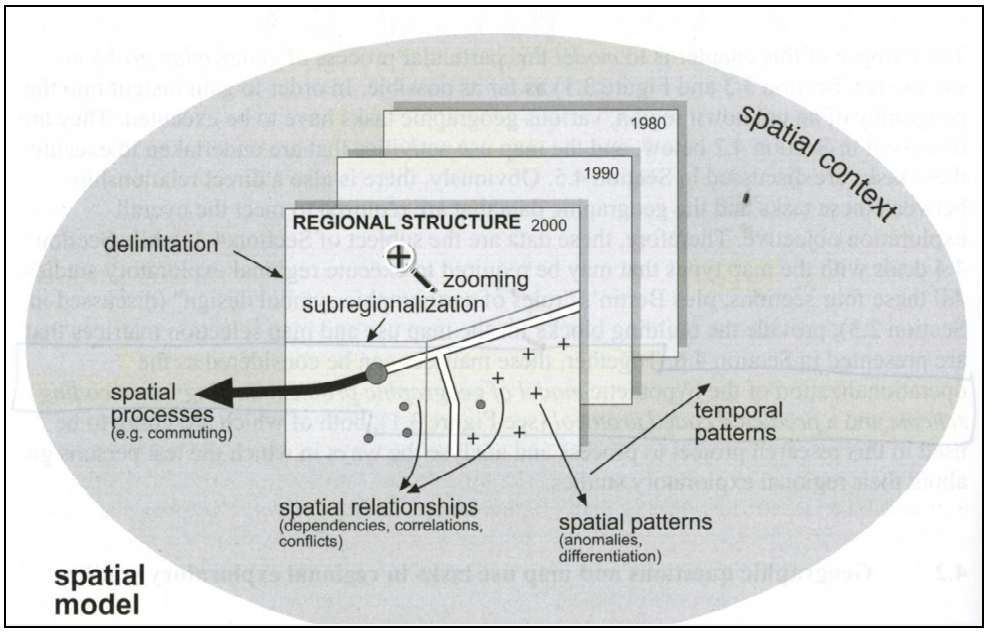

Figure 3: *Model of spatial analysis (Van Elzakker, 2004).*

What are we interested in in regional exploratory studies? Van Elzakker (2004) has modelled our spatial curiosity (see Figure 3) by discerning between delimitation of the regional structure in a spatial context (see above, French research), identifying spatial processes, spatial relationships, spatial patterns and – by comparing these patterns at different times – temporal patterns.

These analytical procedures we are performing during these regional exploratory studies consists of numbers of steps , some of them based on the questions we are asking. Chris Board (1984) has discerned the following geographical questions:

What is its location
What is its extent
What is its distribution
What is its pattern
What is its spatial association
What is its spatial interaction
What is its spatial change?

To answer any of these questions requires a set of specific actions, and such actions have been grouped into a number of atlas use scenario's. These are not only valid for national atlases but for any atlas type targeting the description of a specific region.

4. NATIONAL ATLAS USE SCENARIO'S

The following national atlas use scenario's have been elaborated:

Scenario 1a: What is at a specific point location?

Scenario 1b: Where is a specific geographical object?

Scenario 2: What is (the value) in a specific area?

Scenario 3: What is the overall pattern of that phenomenon?

Scenario 4a: What are the relationships between these patterns?

Scenario 4b: What are the temporal trends in that phenomenon?

Scenario 5a: Which linear spatial processes are taking place?

Scenario 5b: What areal spatial processes are taking place?

Scenario 6: What are the overall spatial characteristics of that area?

1a. What occurs at a specific point location?

Why would we bother to look for that specific point location in a national atlas? Because it is the place where the most detailed spatial information on that country can be found. This very detailed information can also be found in primary, dedicated datasets from which the map data have been drawn (such as alphabetic tables or statistical tables). However, in the national atlas this information can be accessed much quicker as we can search geographically.

1b. Where is a specific geographical object?

Compared to the previous scenario, this one is mirror-reversed. Not the map page is the starting point here but the object or feature. In order to find it we need first to define what kind of information we are looking for, and translate that into the theme of the map we need to consult, and the scale/resolution at which the map should be consulted. When all these requirements have been set the relevant map can be accessed, the point location required can be ascertained and on the basis of the symbols or signatures present there the question can be answered. On the basis of the surrounding features, the relative location of the geographical object can be assessed as well, and this relative location is often more important than the absolute location.

2. What is (the value) in a specific area?

Instead of point locations we might be interested in the specific characteristics of regions, be they natural or administrative: what is the prevalent vegetation in that mountain area, or what is the ratio between teachers and school children in that municipality? The initial steps are similar to the previous case: define what kind of information we are looking for, and translate that into the theme of the map we need to consult, and the scale/resolution at which the map should be consulted. When the relevant map sheet has been accessed and the area studied found or delineated, its dominant aspects can be ascertained.

3. What is the overall pattern of that phenomenon?

Again, this is the reverse of the previous scenario, starting from the phenomenon instead of from the location. First we define the kind of information we are looking for and translate this into a map theme and a map scale. When the relevant map has been accessed we can assess on the map the extent or shape of the distribution of our phenomenon and describe (with cartometric means) its pattern.

Important questions here are how the various regions can be delimited (subregionalization), what the spatial anomalies are, whether there is a spatial structure or hierarchy, and where the highest or lowest values or densities are located. This can also be termed its horizontal relationship.

4a. What are the relationships between these patterns?

Here we are interested in vertical relationships. For assessing vertical relationships, we should first define the datasets needed and find the corresponding maps at the required scale or resolution level, zooming in on the area studied. We then combine the data from the map sheets and measure their correlation or simply make an estimate of the degree of overlap or check whether the phenomena show the same trend from high to low values. We are interested here in dependencies, and in phenomena with similar distributions.

4b. What are the temporal trends in that phenomenon?

To assess temporal relationships we should first define the datasets needed for the various periods, after having selected the map theme to get at them, and the required scale/resolution and map window. We then combine the various snapshot data from the relevant map sheets and compare their patterns and analyse them in the same way as in the previous case. Finally we deduce the overall or subregional development of our phenomenon over the indicated time period. We assess the amount of spatial change between consecutive snapshots, and may even be able to predict future development on the basis of the rate of change deduced from past snapshots.

5a. Which linear spatial processes are taking place?

After determining the map theme in order to access the relevant map, we find source and target areas and measure or determine the strength, frequency or volume of the traffic flows between them and the amounts involved. On the basis of a comparison between these amounts we determine the major linkages, and thus are able to characterise the spatial interaction.

5b. What areal spatial processes are taking place?

After determining the map theme in order to access the relevant map, we assess the initial and final stage and acquire the relevant datasets. By comparing their visualizations we are able to assess the changes in between the stages discerned, and thus are able to determine growth patterns or at least patterns of development. On a basis of comparison of the changes between successive changes we can characterise the spatial interaction or the spatial processes, taking account of the fact that the temporal resolution selected might or might not enable us to spot cyclical variations.

6. What are the overall spatial characteristics of that area?

Here, again, one may question why the national atlas is used in order to answer this question. The reason is that the national atlas is the only place where all spatial information sets have been made comparable.

In order to answer the question we have to define the relevant area (a natural, administrative or economical unit), draw all the data pertinent to this area from the various atlas sheets or underlying datasets, combine and characterise these data, taking account of the diverse characteristics of the boundaries used, and the different weights assigned to them. An interesting case of such a procedure from the 20th century is the Grensgurtelmethode developed by the German geographer Otto Maul in 1913, when he tried to elaborate the boundaries of Macedonia, characterised by religious, linguistic, physical (height, suitability of olive trees), and educational considerations.

5. FUNCTIONALITY REQUIRED

This discerning of map use scenario's is not brought here as an academic exercise, but in order to allow us to find out what functionality our national atlas should possess. Simon van Leeuwen (1996) discerns between the following functionality classes of digital atlases:

- Atlas functions (comparison,find map with largest scale where a specific name occurs)
- Database functions (query database under the map)
- cartographic functions (zoom, scroll, change projection)
- Educational functions (monitor pupil achievements)
- Navigation functions (retrieve start position)
- General computer functions (import, export, print)
- Map functions (pop-up legend, highlight legend class, link to hotspots)
- Map use functions (annotate, measure, buffer, overlay)

She presents a total of about 80 functions, and on the basis of the functionality required for the various national atlas use scenarios presented above we would be able to prioritise between them and select those deemed most useful like the abilities to put maps next to each other for comparison, to zoom a pair of maps simultaneously, to query all map objects: their name, the class/category they belong to and their exact value, the ability to measure, to access the legend, or to highlight on maps legend categories.

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