

New Forms, Concepts, and Structures for European National Atlases

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After proposing definitions for "atlases," "national atlases," and "electronic atlases," this paper outlines the requirements for electronic national atlases produced in the 1990s. These requirements will then be compared with the actual national atlases produced in Europe between 1988 and 1994.

DEFINITIONS

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The 1973 *Multilingual Dictionary of Technical Terms in Cartography* defines "atlases" as "collections of maps to be kept (bound or loose) in a volume" (ICA 1973). This definition is clearly no longer valid in the computer age, as it only addresses format and not atlas contents or objectives. A new edition of the dictionary might be ready for the ICA Barcelona conference in 1995, but in the meantime a definition adapted from the dictionary of the Netherlands Cartographic Society seems more appropriate. The proposed definition reads: "a systematic and coherent collection of geographical data, in analog or digital form, representing a particular area and one or more geographical phenomena, based on a narrative, together with tools for navigation, information retrieval, analysis and presentation" (Koop 1993). Here, the term "narrative" is crucial, for an atlas is an intentional combination of specific maps or data sets. This highlights the realization that an atlas is not objective but relies on a certain rhetoric; data set combinations and the specific resolution, themes, and default sequences selected are intentional.

The function of the narrative is to increase the user's understanding of the information presented. With a logical sequence, it will be easier for the atlas-user to remember the information because a framework is created in which the user may store and accommodate new information (Van Elzakker 1993).

This same Dutch dictionary defines "electronic atlases" as "Information systems set up for the interactive consultation of digital geographic databases concerning a certain area or theme and containing data which are comparable in terms of the level of generalization and the resolution at which the data were collected" (Bos, et al. 1991). According to Van Elzakker (1993), electronic atlases have a characteristic capability for structuring the information flow. They differ from GISs in that they have an added narrative function that can be used for explanation. Van Elzakker therefore defines the electronic atlas as "computerized GIS-related to a certain area or theme in connection with a given purpose—with an additional narrative faculty in which maps play a dominant role." In short, according to this definition, electronic atlases are more than simply a GIS with a graphical user interface.

"National atlases," according to the *Multilingual Dictionary* (ICA 1973), are "Atlases that depict different aspects of one country." This definition seems a bit vague and meager now, but the new technologies allow us to concertize and expand it to assert that "national atlases" are "atlases

containing a comprehensive combination of high-resolution geographical data sets that each completely cover the same country."

In general, one could ask if "atlases" is still a useful concept in the electronic age. The concept was first elaborated by Ortelius and Mercator in the 1570s as an optimal way of presenting and comparing geographical information, and it might be outdated by now, 400 years after Mercator's death. However, by adapting atlases' form to the present electronic potential so that they will be competitive with other electronic modes of presentation, "atlases" certainly remains a valid concept, as its major asset is its strength in comparing situations. Atlases are time machine and geography machine combined. Because of the specific processing of the data for atlases, various data sets have been made comparable: they have been processed so as to get the same resolution and the same degree of generalization. In short, their representation has been standardized. And this major feat, this modeling of geographical reality in a consistent way, which was conceived of in the 1570s, is as important as ever.

In a motion picture, single shots are only meaningful when they are combined with other shots and built into an edited sequence. Atlases work in the same way. It is through the sequence in which the maps are offered to the reader that the reader will gradually get a grasp of the new areas or themes. The sequence also works as the glue that combines the single "shots" into a meaningful whole. This is why it is so important that electronic atlases, that have no fixed sequence of presentation, still have the possibility of setting such sequences and repeating them at will. This calls for software functions that allow the user to develop customized presentation sequences of the maps contained in an electronic atlas, which may be based on something like the input of user objectives. After the user selects an area—the Midwest, for example—and some keywords—prairies, vegetation, precipitation, soils, wheat growing, silos, transportation, government aid—the atlas should be able to present the relevant maps sequentially and so produce a narrative that will explain the geographical patterns.

Atlases nowadays have to compete with TV-soaps and computer adventures which pose crucial questions such as "Will the hero be able to find true love," "Will he conquer evil," or "Will he solve the mystery?" (Lodge 1990). Cartographic counterparts of these crucial questions would be: "Does one control the environment in this region?" "How far is this country from an ideal situation?" "Do all inhabitants have equal access to the nation's resources?" or "Do people here have better chances at success than people elsewhere, and, if so, at what price?"

The potential of the digital environment remains insufficiently used when atlas information is not related to a specific objective like those enumerated above. However, information-objective connections can be made by constructing scenarios. In addition to creating a necessary structure, the purpose of such scenarios would be to provide navigation directives throughout the data sets. In fact, since a scenario generates a number of analogies the user can more easily identify with the information offered. Examples could be: "How do other people live as compared to us?" "What will we discover on our journey into those unknown areas?" or "How did our environment change over the last 100 years?"

Atlases are used to get at specific information, because they are interesting and entertaining to browse through, or because one is looking for something one cannot define. For all these kinds of atlas use, one needs directions in order to either trace out a route through the atlas, find one's

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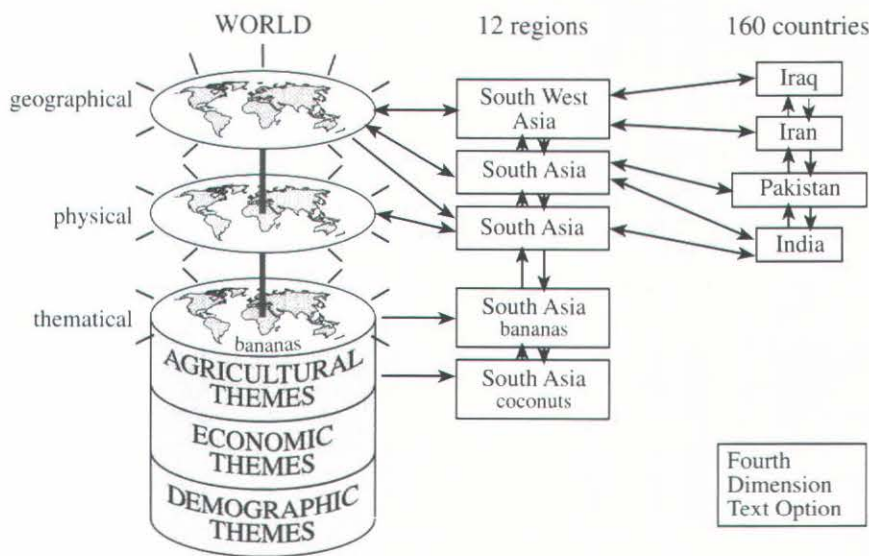


Figure 1 - Navigational aid proposed for Software Toolworks's World Atlas (Electromap), Novato, CA 1990, showing possible routes between maps with different scales and themes.

bearing, or retrieve the atlas exit. Such directions can be presented in the form of a map. Figure 1 tries to show the available paths between regions, countries, and map themes and is an example of such a navigation map for an electronic atlas.

Teaching atlas use is mainly teaching atlas access techniques (see Figure 2) and map comparison techniques. There are vertical relationships in which situations at different times or for different topics are compared through juxtaposition or through some overlay technique. Although this type of comparison is relatively straightforward, it is more difficult to teach horizontal comparisons—that is, comparisons of similar situations that occur in different areas at the same time. Here, patterns are looked for, and here many transformations might be called for. All three forms of map comparison (see Figure 3) require a reduction of complexity; atlas use problems are primarily problems in reducing complexity in order to get the overall view needed. For example, there is a danger when the whole atlas area is not treated in the same way as happens in electronic atlases that have, for example, as much information stored for San Marino or the Vatican City as for Russia or China.

In order to analyze the structural aspects of atlases, it might be useful to look at the tools used for structuring. Here, one may discern:

- the scale tool—used to render more important areas at larger scales than less important areas
- the geographic sequence tool—used when areas that are deemed more important are presented earlier in the sequence than less important areas

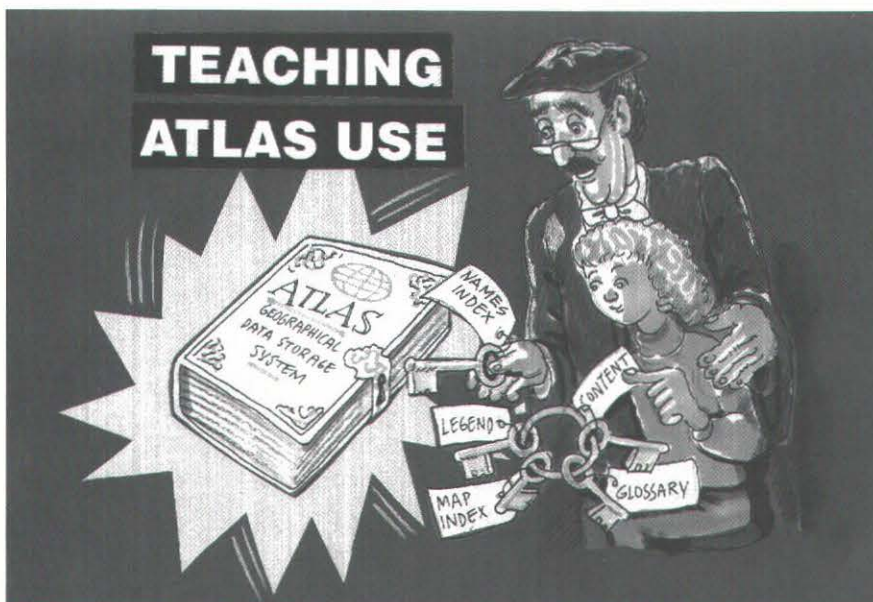
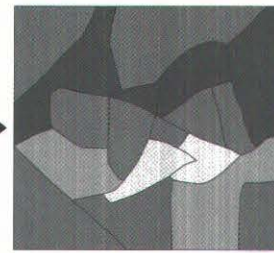
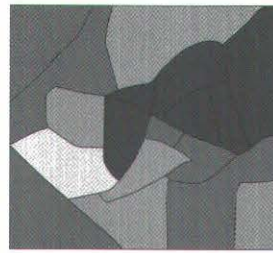


Figure 2 - Teaching atlas access (drawn by A. Lurvink).

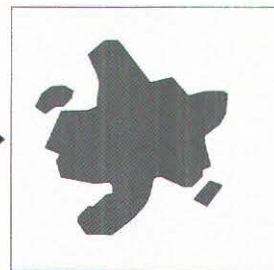
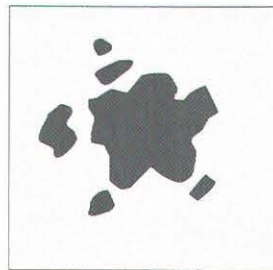
- the topical sequence tool—suggests causal relationships between different geographical phenomena in the same area that are presented in a specific sequence
- the time machine—presents everything in a chronological sequence
- the windowing tool—allows for either close ups or overviews, establishes (as films do) the shots that provide the relationships between single individual shots
- color coding and graphical emphasis tools—used in order to establish a graphical hierarchy that translates the information hierarchy established
- the highlighting tool—increases the contrast between figure and background either temporarily (blinks) or constantly
- the layering tool—allows one to construct a specific cartographic image layer by layer, thus providing extra information (A good example is provided by the *InfoNation* electronic atlas [Electromap 1993].)

Apart from these structuring tools, reference mechanisms have been introduced into atlases. In addition to providing standard traditional reference information such as scale references, these tools alternate various views of the same area (like geographical and economical maps), provide coordinates, or provide references to places on the same longitude or latitude.

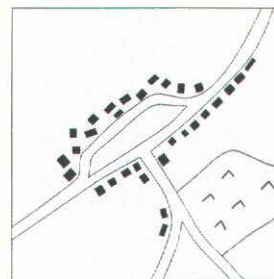
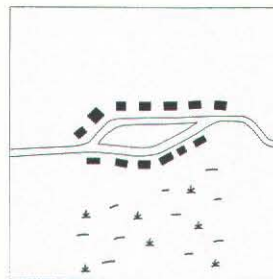
In order to access all the information stored in atlases, thematic and toponymical indexes have been developed. In electronic atlases, there are now search engines that allow one to touch an



*Topical
Comparison
Topic A (left)
Topic B (right)*



*Temporal
Comparison
Year A (left)
Year B (right)*



*Geographical
Comparison
Place A (left)
Place B (right)*

Figure 3- Forms of map comparison possible in an atlas environment.

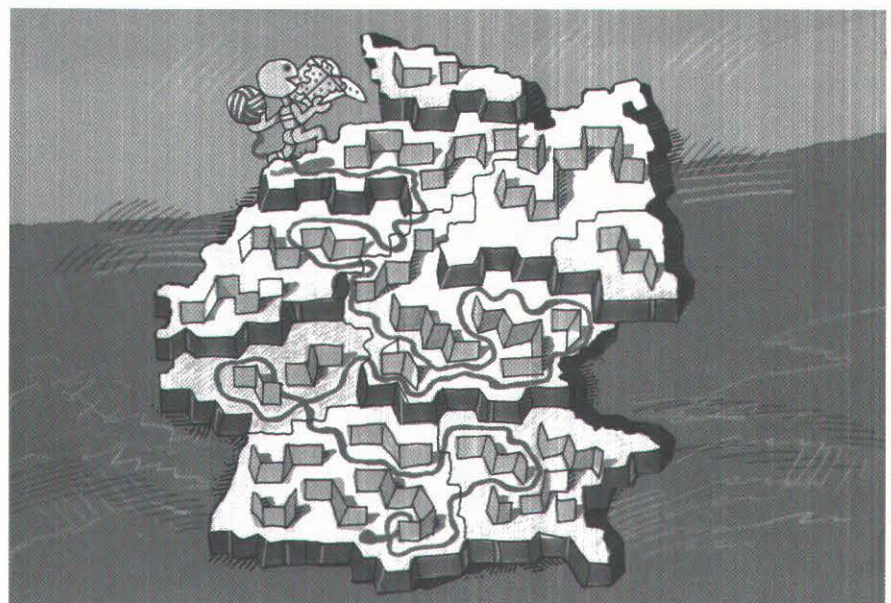


Figure 4 - Using Ariadne's thread in order to retrieve the exit in our current electronic atlases (drawn by A. Lurvink).

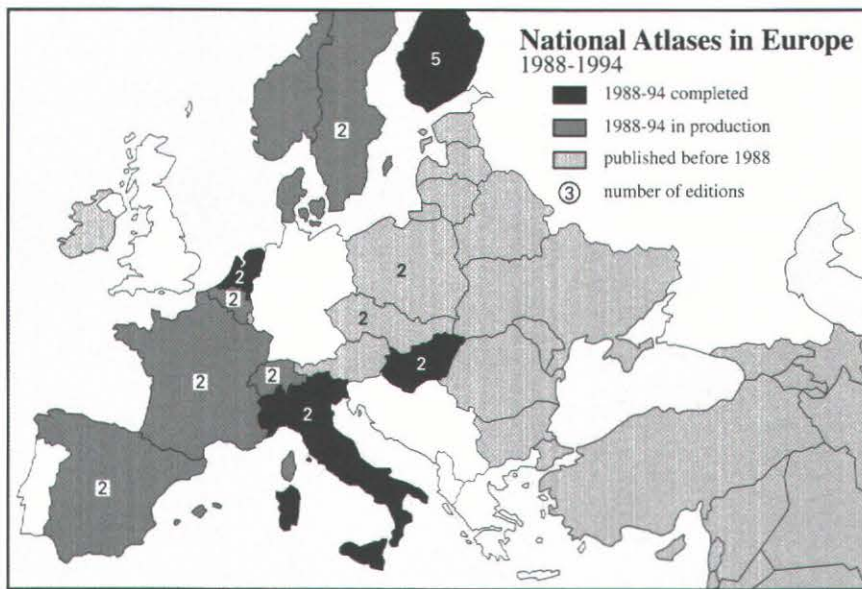


Figure 5 - Production of national atlases in Europe, 1988-1994.

object with one's cursor in order to have its name pop up, to type in a name in order to have the object highlighted, or to navigate through the atlas information in order to get at the specified item. The process for querying the atlas database and returning to one's initial position (see Figure 4, previous page) have been described at the ICA Cologne conference (Ormeling 1993).

RECENT EUROPEAN NATIONAL ATLASES

Armed with these definitions and concepts, a survey of recent European national atlases now seems possible. Figure 5 shows that, during the last six years, national atlases have been or currently are being produced for Belgium, Finland, France, Hungary, Italy, Netherlands, Norway, Spain, Sweden, and Switzerland. Some of these atlases (for Belgium, Hungary, and Italy) have been produced traditionally—in a manner similar to the *National Atlas of the United States* which was published in 1970. Some (for Finland, the Netherlands, and Switzerland) have been produced with interactive, computerized means but have been published in paper format. In other cases (for France, Spain, and Sweden), both paper and electronic editions were published. Norway's national atlas is the only example of an atlas which was intended to be published in both paper and digital form but which now is being produced as an on-line facility only.

TRADITIONAL ATLASES

Currently, even traditionally produced national atlases diverge in form and content from earlier national atlases. For example, the one produced for Hungary contains an extensive interpretative text for all maps, which describes the ways data have been processed as well as the resulting patterns. The second edition of the *National Atlas of Belgium* contains applied maps instead of the inventory maps of the first edition; it provides soil suitability maps instead of soil maps. In addition, problem-oriented map themes such as crime rates and unemployment, have been incorporated.

The objectives of national atlases have changed as well. For example, the main objective of the Hungarian atlas was to enable an evaluation of the environmental aspects of the economy in order to safeguard and improve the people's welfare. In fact, nearly all of the atlases discussed here aim at providing a basis for further research. For example, the main objective of the new Italian atlas is to visualize the radical changes that have transformed the country since the second world war into a post-industrial society. The atlas is oriented towards solving problems such as urbanization and environmental pollution. Another significant aspect can be seen in the descriptions of the map spreads, where there is a continuing reference to other maps with related themes or related patterns. By referencing maps of Europe or global maps, the atlas compares the situation of the Italians to the situations of the rest of the world's inhabit-

ants. Finally, the Italian atlas is special in its provision of synthesis maps. One of its real strengths lies in showing temporal comparisons by using a series of consecutive maps. It also bears witness to the fact that national atlases need not be boring series of choropleth maps.

Thus, traditionally produced atlases already show important changes from traditional atlases. Most significantly, these atlases are problem oriented and people-oriented. They are not inventories of information but suggest answers to problems; they are not overviews of total production per category but statements on the welfare of the population and the environment. Moreover, these atlases are increasingly being produced for a larger, general audience rather than exclusively for restricted circles of scientists.

The new generation of computer-assisted national atlases can be characterized by their greater accessibility and their focus on the country's inhabitants; only those aspect of the physical environment that are relevant to the people's welfare are addressed. In addition, atlases are no longer produced in heavy, unmanageable bindings but in sets of slim volumes, which can be acquired separately or in electronic form. The national atlas of the Netherlands was published in 20 volumes, the one on Sweden in 17 books, Finland's has 25, and Spain's consists of over 40 atlas volumes. The traditionally large sizes have been trimmed down, and this is the clearest indication that it is no longer necessary to impress others with a display of printed square meters. For many of these atlases, digital versions are now either being produced or examined. For example, the national atlas for Sweden is available on diskette and France's is out on CD-ROM. Currently, both a diskette and a CD-ROM version of Spain's atlas are in production. Some of the benefits of these new digital formats are increases in the potential for spatial data analysis and decreases in production costs.

The scenarios referred to above have not yet been applied to national atlases, although commercial products aimed at the same group of customers have introduced them, e.g. the *Canadian Geoscope Interactive Global Change Encyclopedia* (Simard 1993). This product uses the scenario of space travelers who have returned to Earth after a 40 years journey. They have to be kept in quarantine for some months but are allowed to make use of the time by viewing the Earth with the sensors available in the craft in order to check the changes since their departure. It will not take long before the advantages of scenarios will compel national atlas editors to introduce them into these works.

Another concept which is changing the national atlas is the idea that people who use the atlas have different levels of interest and expertise. This is seen in the provision of different modes of access which depend upon the user's expertise (like the hierarchy of different game levels in adventure games). For example, in the Swedish electronic atlas, there is a level for laymen which allows one to browse ready-made maps; there is a level for initiates which permits the user to change the parameters of the maps; and there is a level for experts which helps the users to analyze the maps, combine them, etc. (*Sveriges Nationalatlas PC Atlasen*). In the last two cases, the user is able to customize maps by selecting layers to combine. However, in most of these new, electronic national atlases it is not yet possible to rotate the maps at will and have the labels remain horizontal during rotation. Another omission up till now is the possibility to compare maps by having them next to each other on the screen (although

NEW FORMS OF NATIONAL ATLASES

NEW CONCEPTS OF ATLASES

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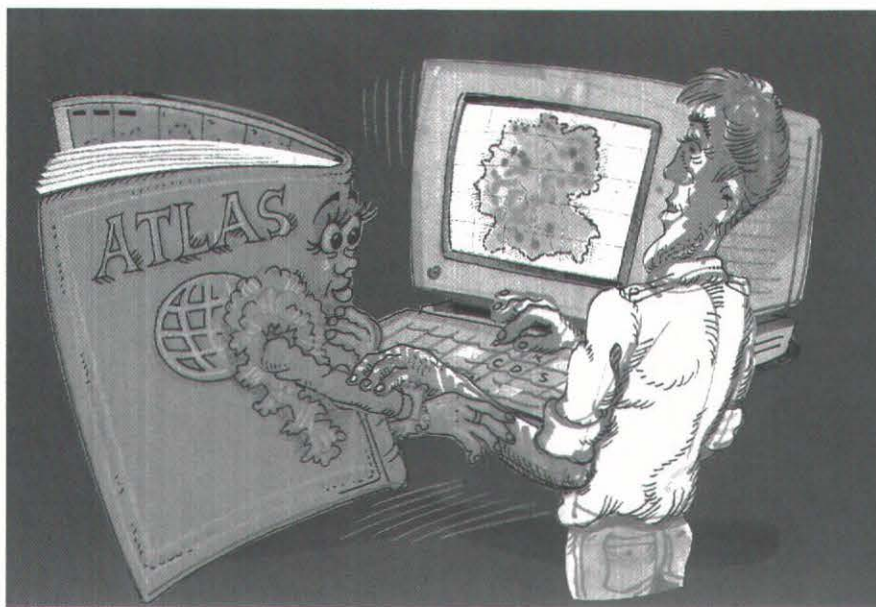


Figure 6 - The paper version of a national atlas stimulating the use of the digital version (drawn by A. Lurvink).

the Swedish national atlas comes close). Analytical means are available in the on-line *National Atlas Information System for Canada*, and the new French national atlas allows for numerical comparison of individual sets of spatial data.

Maps and explanatory texts can now be flipped, but they cannot yet be seen together on the screen. The HYPERCARD environment has taught us how to combine texts, illustrations, photographs, and maps at will; these are accepted now in atlases as well. Even animated cartographic sequences or video reels are becoming part of electronic atlases.

The Swedish national atlas finally shows the division of functions between a paper and an electronic atlas version. The paper version animates, points out the interesting images, and refers, for those that have become interested, to the diskette version which contains far more information than the paper version (see Figure 6).

NEW STRUCTURES FOR NATIONAL ATLASES

National atlases have been structured primarily by dividing maps into groups of map themes—that is, through vertical subdivision. For example, the Italian national atlas is subdivided vertically into four thematic areas, forty sections, and seventy-three individual map themes. It also has a horizontal subdivision that is characterized by temporal or dynamic aspects, resulting in time series. The environment serves as a linking element, for it is being looked at from the viewpoint of all individual themes.

The Spanish national atlas shows the landscape first as a natural environment, then as a result of physical and human factors, and finally from the point of view of environmental problems such as degradation and pollution.

The French national atlas allows one to aggregate thematic data to larger regions. This really is an important option for map use because it allows one to find new patterns as the scale of the enumeration areas changes. Soon, it will be possible to effectuate this with a slide bar. This interactive atlas also has options that allow the user to portray the data either relatively or absolutely through proportional symbol. In addition, the atlas has explanatory functions.

The new French national atlas, which will be released soon, will be able to show phenomena with different levels of detail and will be able to portray them by the proportional circle method or relatively by choropleths. It will show the situation within France as well as the situation of France in Europe. It will show less positive aspects of French society, such as the distribution of crime (gang warfare, rape, abuse, etc.),

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AIDS, and unemployment. This is a far cry from the visiting card concept national atlases once had, but it is with atlases like these that society's problems can indeed be tackled.

Finally, a list of the fields that researchers in Europe are exploring as ways to improve electronic national atlases includes options that would allow: interactive use; dialogues in which one can produce one's own maps; displays with additional graphical formats, such as photographs, diagrams, animations, etc. (multimedia); a realization of new analytical potential (such as changing the temporal or geographical resolution); creation of a separate role for digital and paper versions of the same national atlas; and the addition of adventure (or at least an explanatory structure).

Equipped with options like these, national atlases (and even atlases in general) should be able to fulfill current users (both general users' and researcher's) needs and demands.

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RESUMEN

Después de proponer definiciones para "atlas", "atlas nacionales", y "atlas electrónicos", este trabajo resalta los requisitos para atlas electrónicos nacionales producidos en los noventas. Estos requisitos pueden ser comparados con los atlas nacionales producidos en Europa entre 1988 y 1994.

SOMMAIRE

Après avoir proposé des définitions pour "atlas", "atlas nationaux" et "atlas électroniques", ce document souligne les exigences des atlas nationaux électroniques produits dans les années 90. Ces exigences seront ensuite comparées aux atlas nationaux produits en Europe entre 1988 et 1994.