Chapter 7 Atlases

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7.1 Atlas purpose: narrative, scenario and structure

Atlases are deliberate and systematic combinations of maps. These maps have been put together in order to put across a specific view or to solve a specific task. That requires the data in the maps to be processed in a specific way in order to solve these tasks. Generally, atlas maps have been combined in an atlas in order to be able to compare these maps, allowing map readers to draw useful and relevant conclusions from these comparisons.

The point atlases want to get across can be called a narrative: atlases tell a story. They want to show for instance what the position of your country is in the world

Figure 7.1 Atlases tell a story (Drawing A. Lurvink).

or whether all inhabitants of a region have equal access to the resources (medical, educational, cultural, etc.) of that region. Their intention can be to show whether we are doing better or worse than our neighbours, or they can be created to allow for a single task, like navigation.

The way in which this narrative has been designed can be called the atlas scenario. This defines the way the geographical information is presented: is it a series of thematic maps, all of the same area, presented in a specific sequence, or is it a digital product where you can set the order in which you view the maps yourself?

Figure 7.2 Atlas scenario. (Drawing A. Lurvink).

For a digital school atlas of Sweden, the scenario could be for instance that a flight of geese from one end of the country to the other is simulated, allowing the atlas users to view the country from above, and touch down or zoom in, whenever they feel like it. By clicking on a specific area, population density, vegetation or climate maps of that same area might pop up next to the overview map, allowing for a better understanding of the characteristics of that region. Issues relevant for that region, like environmental problems, the disappearance of services and medical facilities from the countryside could be highlighted.

Figure 7.3 Example of an atlas scenario (Lagerlöf, 1907).

The narrative of an atlas, like the narrative in a speech, consists of sequence and emphasis. In a speech, different arguments are combined in a specific order, while some arguments get more emphasis than others. The same is valid for an atlas. Here the arguments are the maps with specific themes. Some themes are considered more relevant for the narrative than others, so they would get more emphasis or, in atlas terms, more coverage: the atlas would get more maps on the same topic or maps on that topic would be rendered on a larger scale.

Figure 7.4 shows the structure of a school atlas of Indonesia: the arrows show the sequence in which the various provinces of that country are displayed in the atlas, and the size of the circles are indicative of the scale: larger circles suggest that the provinces represented by them are drawn on a larger scale—for instance because they are considered to be more important areas for the national economy.

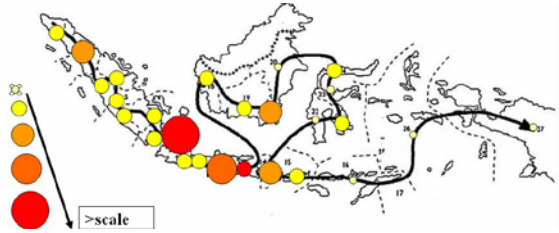


Figure 7.4 Structure of an Indonesian school atlas.

Sometimes, the sequence of the maps to be presented is considered to be so crucial, that it is implemented in the hardware of an atlas. In a school atlas of Québec, the information is presented in the form of atlas spreads that is in pairs of opposite pages that together cover a specific subject, and in each atlas spread the order in which the maps, illustrations and texts have to be read is indicated with sequence numbers (see figure 7. 5). So for instance in order to understand the spatial aspects of the wheat production in Canada, one is first confronted with a map of the suitability of the soils for wheat, then with a map showing the length of both the growing season and of the rainfall, and then with a map showing the actual wheat production, and finally, in this atlas spread (map nr 6 in figure 7.5) with a map showing the actual export of the wheat from the Canadian prairie provinces to distant markets. In this way, first the conditions wheat growing is subject to (adequate soils, enough rainfall and suitable length of the growing season) are shown, and can be compared with the actual production. Finally the result of the wheat growing practice is shown, with the transportation modes used.

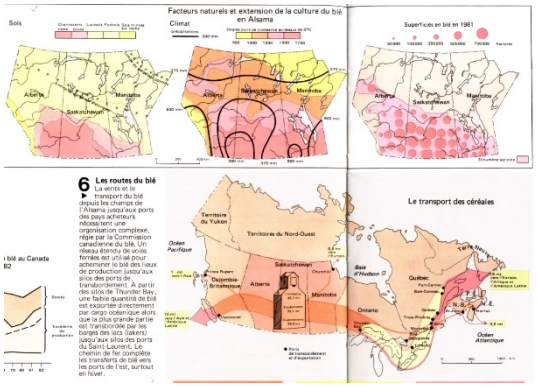


Figure 7.5 Preprogramed fixed sequence of maps in an atlas spread: wheat-growing in Canada. (From InterAtlas, Québec1986).

7.2 Atlas map comparison

One of the key aspects of atlas maps is that they are designed to be compared: comparison of maps for the same area but with different topics (as in figure 7.6), comparison of maps for the same area and topic but from different time periods (such as would be the case in a history atlas, see also figure 7.7, or comparison of different areas with the same topic with data from the same time period as in figure 7.9.

For such comparisons to be relevant, special care must be taken, and the mapped data should be processed accordingly. For topical comparison, for instance, the maps should all represent a similar time frame, that is, the data for the maps should have been collected in the same period. There is no sense in comparing a map of Britain with its average income in 1960 with a map of the average number of patients for a GP in the 1990s. In Figure 7.6 the top-right map shows the distribution of cropland, and thus the intensity of agriculture, the lower left map shows land use, the lower right map shows the agrarian industry (vegetable oil mills) and the upper left map shows types of farming. Another requirement for map comparison is that the maps should have the same level of detail, and thus of generalisation, otherwise it

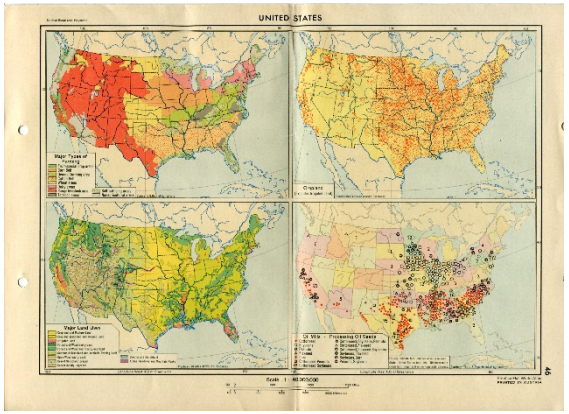


Figure 7.6 Topical comparison.

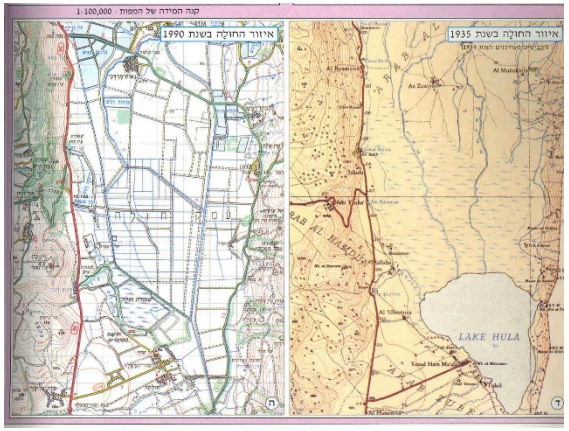


Figure 7.7 Historical comparison. The Hula Lake area in Israel in 1935 (right) and in 1990 (left). (From Atlas of Israel, 1995).

would be difficult to compare the respective patterns. A special type of topical comparison are the confrontations between the physical environment and the use mankind has made of this environment. This can be effectuated by putting opposite each other a physical map (showing layer zones or a satellite image) and a land-use map, as has been done in figure 7.8, or by opposing a physical map and an infrared satellite image, in which the vegetation—and thus agricultural enterprise—is highlighted. Both cases would show how humankind has made use of the physical landscape. By comparing such map combinations for areas with different or similar climates it can also be shown how different societies react to the same climatological and physical conditions.

Figure 7.8 physical map and land-use map (right) of Greece opposite each other in an Austrian school atlas. (From Pelzer Atlas, Ed. Hölzel, 1975).

For maps that show the same topic for the same area at different periods, or another area at the same time, of course the symbols in the map legends should be the same. Here as well it is of prime importance that all maps are generalised to the same degree. Take the image in figure 7.9: it is from a digital world reference atlas that enables its readers to compare different areas. When one selects different areas to be compared, these areas are automatically rendered at the same scale; if one zooms in on one area, the area it is compared with is zoomed in upon at the same time. In this way, the comparisons still make sense. One can still wonder whether the two areas have been generalised to the same degree: the area at left has about 6 million inhabitants, while Greater Calcutta has some 15 million inhabitants; still, because many more names are inserted at the map at left, that map gives the impression of a more densely inhabited area.

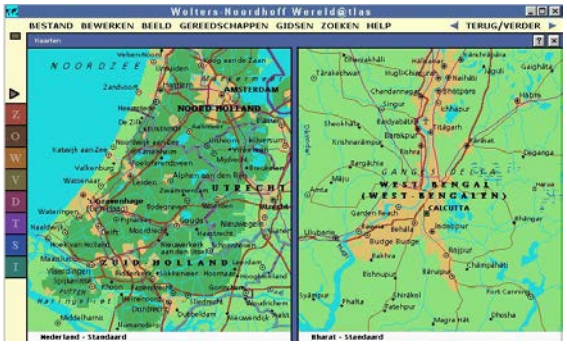


Figure 7.9: Geographical comparison between two areas in a digital world reference atlas: here the central area of the Netherlands (left) is compared to the Calcutta or Kolkata area in India. (From Wolters-Noordhoff digital World atlas).

There are some other means we use in order to help readers to get a correct impression from maps. One of them is to render the outline of an area the map reader is familiar with in the margin of a map of an area strange to the map reader. In that way the map reader may get a correct sense of the areal magnitudes involved. This principle is shown in figure 7.10 where, in order to give users of a Swiss school atlas a correct idea of the relative importance of the American manufacturing industry, an

Figure 7.10 Reference inset map in a Swiss school atlas. (From Schweizerische Weltatlas, 1981).

inset map of the manufacturing industry of Switzerland is shown at the same scale and with the same legend.

A similar procedure is shown in figure 7.12, taken from an *Atlas of Maryland*, one state of the United States. To all maps of that state in this atlas, whatever their topic, a map of the United States as a whole is added, mapped according to the same legend, so that map users can see to what degree the situation in the state of Maryland is different from that in the country as a whole.

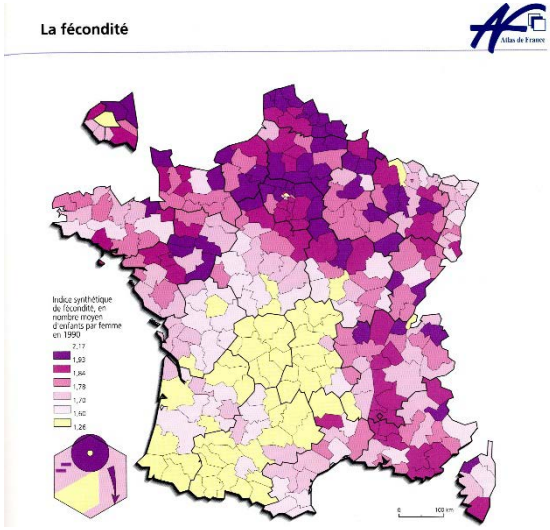


Figure 7.11 Average number of children per wife. The lower-left diagram generalises the map. From Atlas de France vol. 2, 1995. GIP Reclus.

In figure 7.11 a small generalised and stylised representation of the main map is added in the lower-left corner, to help map readers remember the image. It shows the highest number of children per wife occurs in the North of France, while fertility is decreasing in the South-East of France.

7.3 Types of atlases and atlas information systems

On the basis of the type of comparison they are intended for, atlases can be divided into different atlas types:

1. National atlases (meant for the comparison of maps with different topics for the same area);

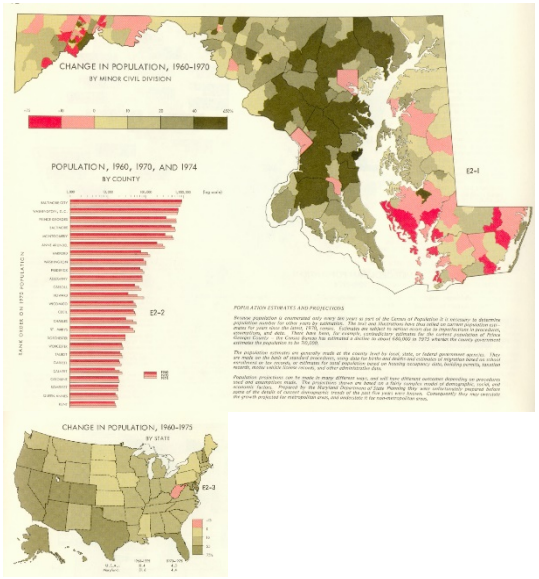


Figure 7.12 Map of the change in population 1960–1970 in the state of Maryland with an inset map of the United States with the same topic and legend. (Atlas of Maryland 1977).

2. Historical atlases (meant for the comparison of maps for the same area and theme from different time periods);

3. Thematic atlases (meant for the comparison of maps for different areas with the same theme from the same time period: world forestry atlas, world petroleum atlas, world atlas of epidemics, etc.);

4. School atlases (introducing students to both physical and socio-economic aspects of world geography);

5. Reference atlases (very detailed atlases allowing their users to find a maximum number of places); and

6. Task-specific atlases (road atlases, yachting atlases, etc.), for instance for finding optimal routes.

All of these atlas types can be in hard copy or in digital form. When speaking of digital atlases, these can be (a) 'view-only,' meaning that the design of the map cannot be changed, they can be (b) 'interactive' in the sense that colours or class boundaries on the map can be influenced (see figure 7.12), and that data layers can be added to the map (see figure 7.13), and they can be (c) 'analytical.' In that last case, on the basis of the underlying datasets available, the information can be visualised and analysed in a way selected by the map user.

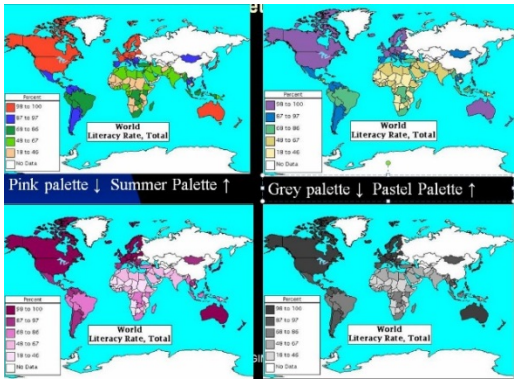
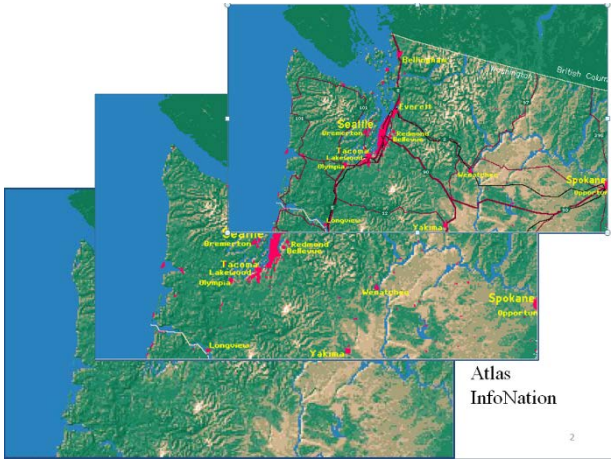


Figure 7.13. In an interactive atlas, the same data (World Literacy rate) can be visualised by different colour sets. Electromap World Atlas.



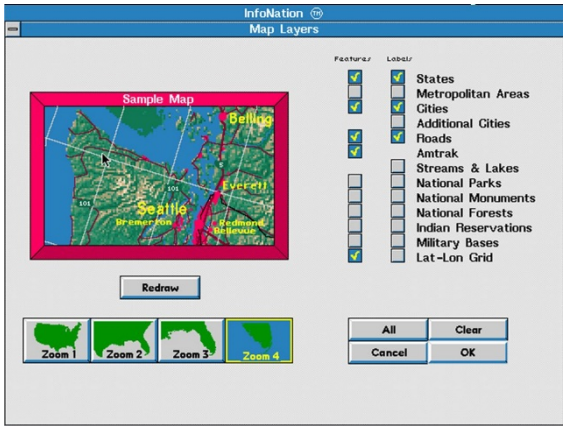


Figure 7.14 Selection of map layers for a map in a digital world atlas. Atlas Info Nation.

When digital atlases are presented in a form that allows for access to the data underlying the atlas maps, we speak about atlas information systems. Similar to hard-copy atlases, atlas information systems can be subdivided into a number of types, such as national atlas information systems, historical atlas information systems, educational atlas information systems, etc. The difference between these atlas information systems and GIS (see chapter 3) is that the first are 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. The requirement that the data are pre-processed to allow for comparisons between maps, and that a selection has been made of the data in view of the purpose of the atlas, distinguishes the atlas information systems from ordinary GIS systems.

It should be highlighted here how important it is to be able to change colours (as in figure 7.13), and class boundaries when visualising datasets in map form in an atlas. When we still only had paper atlases, there was only one way in which the data were visualised, dependent on the insight, expertise, bias or taste of the cartographer. In an interactive or analytical, digital atlas, these limitations no longer apply. No map is the only true map, meaning that there is no best solution to visualise a specific dataset—depending on the intended audience for the atlas, the fact whether the map is to be compared with other maps in the atlas, different designs might fulfil the requirements.

Another aspect of interactive and analytical atlases is that they are no longer restricted by the fixed map frames of paper atlases. In a paper atlas, the map frame, the map topic and the time frame are fixed. In a digital environment it has become possible to experiment with the map frame, by panning or zooming (as in figure 7.15), it is possible to change the map topic, and it is possible to change the time frame, even in an animation mode.

Figure 7.15 Fixed map frames in a view only atlas (left) and adjustable frames in an interactive atlas (right). (Drawing A. Lurvink).

7.4 Atlas functionality

Paper atlases have a number of ways of accessing the maps they contain: there are tables of contents showing all the map titles, there are topical indexes showing all maps that portray specific topics, and there would be indexes of geographical names showing the maps with the largest scale where a specific geographical name occurs. There also would be a graphical index, with the outlines of all maps shown on a world map, with a reference page number where those maps can be found (see figure 7.16). A general legend explaining the signs and symbols occurring on the different types of maps would be incorporated as well.

In a digital atlas the access mechanisms are greatly enhanced. Not only would all the tables of contents and indexes all be there, but clicking a specific geographical name would immediately bring up the respective map containing that name, which would be highlighted. Clicking a topic in the topical index would show all the maps answering that description, in sequence.

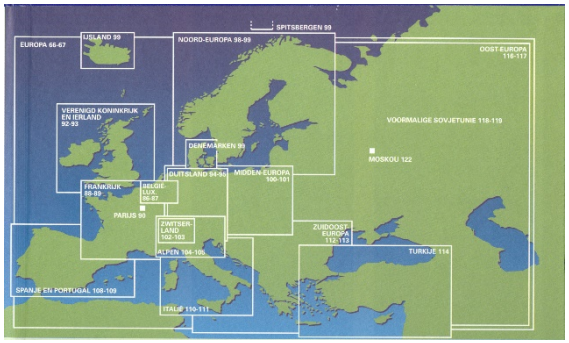


Figure 7.16 Graphical index of the European maps in a paper school atlas. Bosatlas53rd ed., 2007.

A legend would not always be necessary in a digital atlas, as clicking a specific symbol would always result in a pop-up explanation of that symbol. Apart from that, clicking map objects like symbols or areas would result in additional information, such as height above sea level, number of inhabitants or, on economic maps, production figures. This possibility to query all map objects is one of the major benefits of digital maps; it also clears the map image, as all information that is not strictly necessary can be hidden in a pop-up mode. Furthermore, there would be the possibility to hide images or explanations under hot spots. The search engine to find places has already been discussed under the indexes, as have the zoom and scroll functions. In order to allow for zooming in, more detailed datasets need to be available, and will be accessed whenever given scale thresholds have been passed.

7.5 Our school atlases are biased!

Nowadays in many countries it is one of the educational goals of the geography curriculum to make students aware of the usefulness, reliability and representative-ness of the information made available to them—in textbooks and newspapers or on the Internet. As an example of such an evaluation we will try here to gauge the bias, reliability and representativeness of school atlases.

School atlases introduce pupils and students to the world from a given position or point of view. That position can refer to a geographical position (a school atlas from Sweden will be different from a school atlas from Zambia), to an educational viewpoint (what is the necessary basic knowledge all students should have), or to ideological or political views. Because we are so familiar with the image of the world presented by our own school atlases, we do only recognise their bias when comparing these school atlases with those from other countries. We would also recognise it when comparing our current school atlases with those produced in the past. When we would do so, we would find that society's ideas of what a country's characteristics are has changed, as have its ideas of what constitutes the country's desired development. The amount of geographical information on other countries and the world at large has increased (plate tectonics, climate change) and the world itself has changed as well, with an increasingly complex infrastructure, higher population numbers and environmental problems (desertification, deforestation, etc.). When following the development of atlases over time we would also find the effects of different atlas editors, each with their own view of the geographical information belonging in the atlas, different interests of society at large and changing didactical insights and geography curricula.

a. Style of the atlas and standpoint in the world;

Every school atlas has its own structure, based on choices regarding the sequence of the maps and the emphasis on given areas or topics. It would also have its own particular style, defined by the selection of specific script types, the level of generalisation of the line work and the use of colour. In the spelling of geographical names, specific choices would have been made, either favouring local official names or exonyms (see Chapter 8). The country's standpoint in the world would determine which areas of the world are dealt with first, and its global socio-economic position probably would strongly influence the selection of map topics in the atlas. If a country has a prime position in the per capita income, in health care, life expectancy, energy consumption, good governance, political stability and the absence of corruption, that country has more incentive to include maps on these phenomena than other countries that do not. Of course this is also linked to the willingness of a society to also address negative aspects in its educational products like school atlases. Are maps on unemployment, the unequal distribution of wealth, marine pollution, domestic violence or the percentage of smokers also included? Should the attitudes towards capital punishment, gay rights, the part of the gross national product spent on the military, the investment climate and freedom of the press be mapped as well? All these are aspects in which school atlases worldwide differ.

b. Terminology;

School atlases provide schoolchildren with the tools and concepts to find their place in the world. They do so with the special terminology with which we can describe the world, with overall concepts like continents and oceans, countries and seas, deserts and mountain ranges, lowlands or continental shelves. In order to simplify the overview, objects are grouped together. Take the case of Spain: Here mountain ranges have been grouped together for educational purposes and given names no one in the field ever mentions: The Castilian plateau or Meseta Central is divided into two parts by the 'Sistema Central' mountain range (see figure 7.17). This is a notional or fictitious object, however; no one in Madrid in winter-time will say that he or she is going to ski in the

Sistema Central—they go for the Sierra de Guadarrama, the Sierra de Gredos or the Sierra de Gata (see figure 7.18).

Figure 7.17 Educational names used in Spanish school atlases (Atlas nacional de España, 1991).

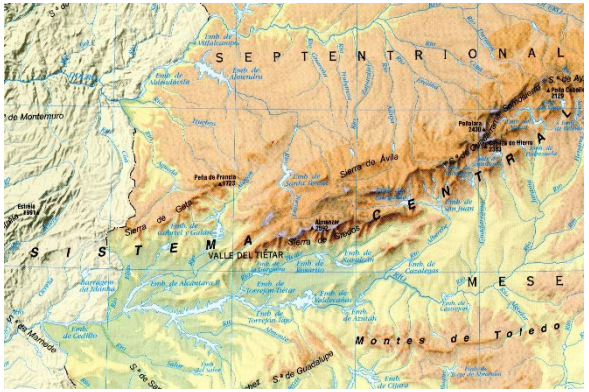


Figure 7.18 Composition of the Sistema Central mountairange in Spain. (Atlas nacional de España, 1991).

Examples of similar educational groupings of geographical objects without any local knowledge of them in the terrain are the Greater and Lesser Sunda isles, the Greater and the Lesser Antilles (subdivided again in the Lee-ward and the Windward Isles); Siberia is divided into the Western Siberian Lowlands, the Central Siberian Plateau and some East-Siberian Mountain Ranges. Geography teachers distinguish the Finnish Lakeland and the Central Africa Lakes, as they do with the North and South Equatorial Ridges in Africa and the East African Highlands. All these groupings of mountains, lakes, islands or plains have been effectuated for educational purposes, to simplify teaching the structure of the world. Ideological points of view

Ideological or political points of view can be expressed in the sequence of countries presented in an atlas (for instance, in the past, communist countries, members of the COMECON bloc were dealt with before dealing with the capitalist countries, irrespective of their geographical location. Ideological views were expressed in map titles (see figure 7.19).

The ideological views can also be expressed in the selection of map projections. Some projections are thought to favour Western or capitalist views, the Mercator projection which exaggerated the size of countries in more northerly locations being one of them. As a substitute sometimes the Gall-Peters projection is used, first developed in 1855, which is an equal-area projection, meaning that the size of countries on the map is proportional to their true size. To realise this, the Gall-Peters projection results in rather extreme deformation (see figure 7.20).

Some countries would include the military infrastructure of their country in the school atlas, others would favour countries where the same language was spoken, for instance French (see figure 7.21).

Elsewhere, geopolitical views, like the division of the world into an economic heartland and its peripheries, surrounded by a number of emerging or threshold countries, are rendered in school atlases, thus visualising theories of global development (figure 7.22).

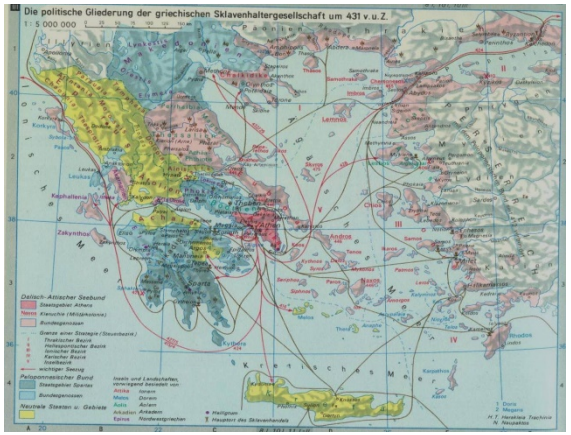


Figure 7.19 Map from a history atlas produced in 1970 in the German Democratic Republic, with the title The Political Segmentation of Greek Slave-Holding Societies*, where the usual title would be Ancient or Classical Greece. Haack Atlas zur Geschichte, 1970.*

Figure 7.20 World population density map in a Zimbabwean school atlas in the Gall-Peters projection. Harper-Collins Senior Atlas for Zimbabwe, 1992.

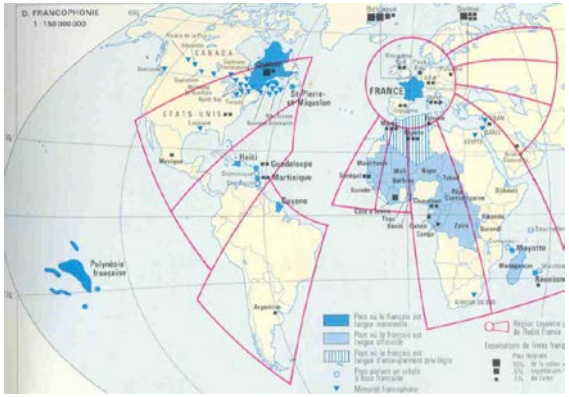


Figure 7.21 Distribution of French-speaking countries, from a French school atlas.

Figure 7.22 Geopolitical map dividing the earth in Centre and periphery, with operating systems in world economy from an Austrian school atlas. © Ed.Hölzel.

Sometimes, countries would favour the incorporation of maps in their school atlases that would show that they are particularly good in some fields. In figure 7.23, a map of a school atlas from Sri Lanka is shown. This country does not score particularly high on most economic yardsticks like per capita income, but it does rather well in fighting illiteracy. Thus it is understandable that a map of world literacy is incorporated, the darker the tint, the higher the percentage of those that can read and write, and the position of Sri Lanka in this respect within the South Asia region is certainly remarkable.

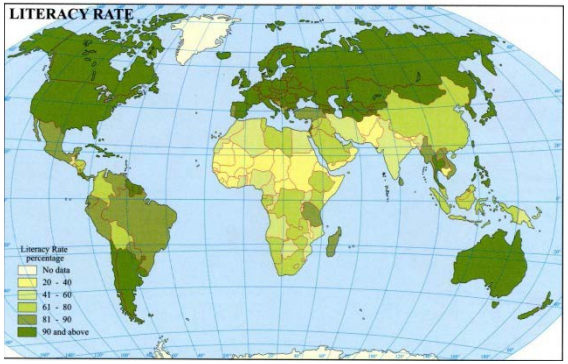


Figure 7.23 World literacy rate map from a Sri Lankan school atlas. Sarasavi School atlas, 2004.

c. Basis for overview maps;

Traditionally, the overview maps in our school atlases have either been administrative or physical maps, showing either the administrative subdivision of our countries or their physical characteristics, the latter through the use of isohypses and layer zone tinting. Neither of these two representation nodes is very informative about the country's landscape diversity. The height above sea level, as portrayed in isohypse and layer tint maps cannot say anything about the country's vegetation or agricultural potential. That is why some school atlases advocate the use of land-cover tints, combined possibly with symbols for non-agrarian economic activity, as land-cover tints would already inform about agricultural production (see figures 7.24 and 7.25).

Figure 7.24 Detail of economic overview map of China. © Ernst Klett Verlag GmbH.

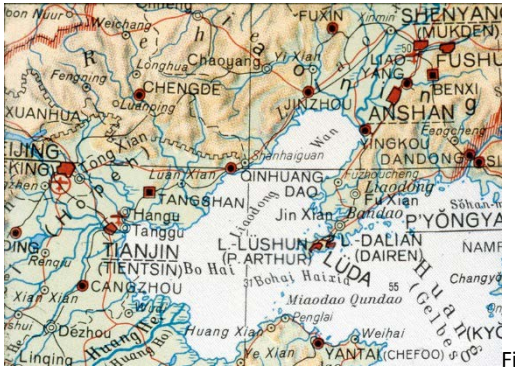


Figure *7.25 Detail of physical overview map of China.* © Bertelsmann Weltatlas/wissenmedia mapworks.

7.6 Correcting Eurocentric school atlases

As we saw in section 7.1 an atlas narrative is built on sequence and emphasis. Every country favours the representation of its own territory in its school atlases. Figure 7.26 shows the number of maps in a Dutch school atlas which covers the home country, as opposed to those for the rest of Europe, the various continents and the world. The home country would also figure first, in the atlas sequence, with neighbouring countries, the home continent, other continents and the world dealt with successively.

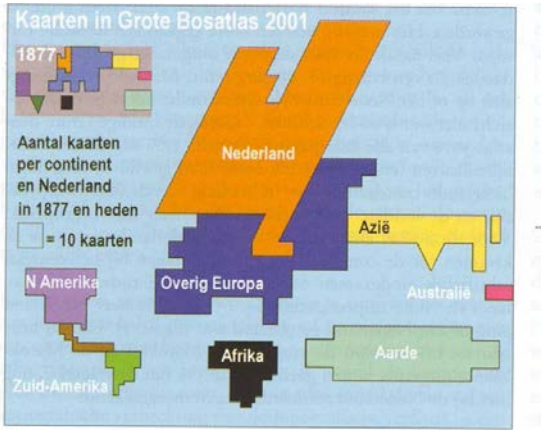


Figure 7.26. Proportional number of maps covering the Netherlands, the rest of Europe, other continents and the world (=aarde in Dutch) in a Dutch school atlas in 1877, (top left) and 2010.

While we realise that all countries producing school atlases would favour their home area and home continent, we still should not be blind to the distortive effects of those views. If one is only used to a world map with Europe and Africa in the centre, then there would be many geographical relationships (like in figure 7.27), like those between the Pacific Rim countries, that would stay hidden. That is why it is so important to also look at the viewpoint of atlas producers in other parts of the Earth.

Figure 7.27 shows the view from the United States. Here the central meridian of the world map bisects the United States, nicely showing its pivotal position between the Atlantic and Pacific world oceans.

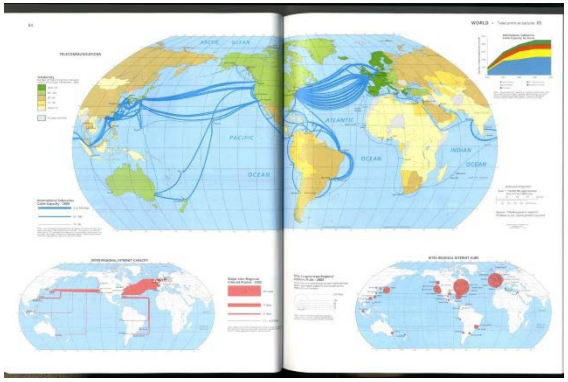


Figure 7.27 World map from an American school atlas. (21st ed., Goodes'world atlas, RandMcNally, 2005).

Figure 7.28 is from a school atlas of Sri Lanka, dividing the world in the Eastern and Western Hemispheres, and Sri Lanka is located at the central meridian of the Eastern Hemisphere. Finally, figure 7.29 is from a school atlas of China.

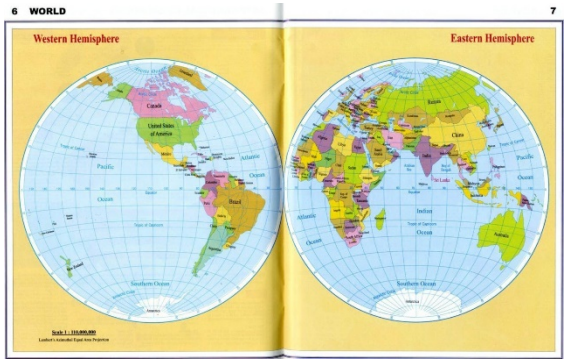


Figure 7.28 World map from Sri Lankan school atlas. Sarasavi school atlas, 2004.

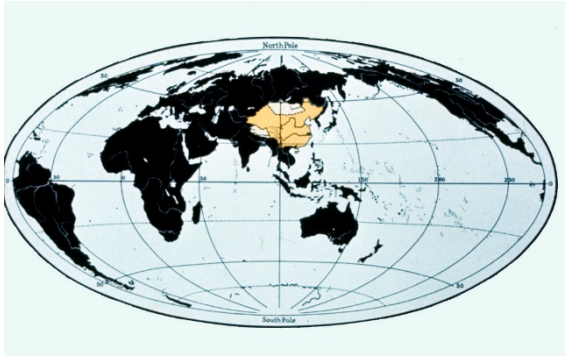


Figure 7.29 World map from a Chinese school atlas.

7.7 Web atlases

The current challenge for atlases is to develop atlases for the Internet that do more than just show pre-produced maps, but allow for directly and automatically produced maps, generated case by case from the data available in the database at the website. The system should allow for selecting a visualisation mode, on the basis of the data characteristics for instance: absolute quantitative data to be mapped by proportionate circles, and relative quantitative data to be mapped by choropleth (see Chapter 6). This system should allow for influence by the user, for instance in setting the class boundaries and in selecting the colour tints with the data to be rendered.

Research is now taking place to work out how statistical or environmental data collected from statistical offices can be combined with atlas base maps and atlas metadata, using spatial aggregator services in a data integration and mapping component, allowing for user input regarding classification and visualisation modes, resulting in user-defined atlases maps.

Figure 7.30 Demonstration of a web atlas of the Netherlands, interactively produced.

Figure 7.31. The 20 crown note from Sweden showing Nils Holgersson flying on the goose Mårten over the Swedish landscape (Lagerlöf. 1907). See also Figure 7.3.

References:

Lagerlöf Selma (1907) *Nils Holgersson´s wonderful journey through Sweden.* Search on www.amazon.com.

For further information on atlas cartography, see the website of the ICA Commission on national and regional atlases: *http://www.univie.ac.at/cartography/karto/project/cnra/*

The ICA Atlas commission will produce a cookbook for atlas production in 2015.