

GENERALIZATION OF GEOGRAPHIC NAMES ON ATLAS MAPS

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Abstract

Even though geographic names routinely undergo the process of generalization, cartographers have not as yet analysed fully this problem. The literature provides only a few hints or comments pertaining to the generalization of geographic names. To find out more about generalization of names the best way is to study a large, comparable set of maps – world reference atlases. Because natural features constitute an important element of maps in those atlases, they were used in the undertaken analysis of generalization of names of geographical regions, peaks, and mountain passes. The analysis involved maps portraying two regions: the Sudety Mountains (a mountain range in southern Poland, along the border with the Czech Republic) and the Iberian Peninsula. The two areas abound in geographic names, with the varied relief and, in case of the Sudety Mountains, with the cross-border location. The maps included in six world reference atlases from various European countries have been analysed: Polish *Atlas Swiata (The World Atlas)* (1962–1968) [ASTS], which was also published in English as *Pergamon World Atlas* (1968), Russian *The World Atlas* (1967) i.e. the English version of the Soviet *Atlas Mira*, English *The Times Atlas of the World* (1999), Polish *Geograficzny Atlas Swiata* (1997), German *Brockhaus Enzyklopädie Weltatlas* (1993), and Spanish *Gran Atlas Aguilar* (1969). The analysed maps included 32 maps of the Sudety Mountains and 37 maps of the Iberian Peninsula, the total of 69 maps.

The aim of the analysis is to recognise criteria included during a generalization of geographic names, factors that influence this process, as well as to formulate rules that govern a generalization process of geographic names. Analysis of the name generalization allowed to derive qualitative information concerning the following issues: the selection of names, including the choice among names in different languages, as in the case of transboundary features (*Pirineos*), as well as between endonym or exonym (e.g. *Pirineos* in Spanish and *Pyrenees* in English); a shift from several names of an individual feature to one common name. Objects for analysis are chosen according several criteria. Firstly, the analysis of the names selection showed a priority to mountain ranges over valleys and lowlands, as well as the priority of mountain peaks over passes. This result complies with the Horn's claim (1945) saying that in generalization priority is given to convex objects. Another important criterion for

selection of objects is their height. The highest mountain ridges and their top peaks are labelled. In case of passes their relative height is important. Finally, a location of regions and their role are crucial, e.g. flank parts of mountain ridges, passes located on major transportation routes, mountain ridges which lie on state border are often labelled. Double naming is the least solved issue. A rational solution – linking the language of the name of a transboundary features to the main topic area presented on a map – is rarely applied. Moreover, quantitative aspect of generalization was also included: the densities of names on various scales and atlases were computed and analysed using GIS software. This showed that the rate of the generalization is different in each analysed atlas. Also various kinds of geographic name, i.e. names of region, peak or pass, undergo the process of generalization at a different rate.

Additionally, some models of generalization of names of regions, peaks, and passes have also been suggested. Subsequent stages of the process provide less information, only in the case of geographical region an additional piece of information is presented at a certain stage (name of higher-level region). The inconsistencies occurring at each individual stage of generalization in different atlases just confirm the thesis that generalization is a subjective process and its results depend on learning language of maps and mastering its use.

Introduction

Even though geographic names routinely undergo the process of generalization, cartographers have not as yet analysed it fully. The best way to find out more about generalization of names is to study a comparable set of maps. World reference atlases are used in this study. Because natural features constitute an important element of those maps, they were used in the undertaken analysis of generalization of names of geographical regions, peaks, and mountain passes.

Generalization is one of the fundamental features of every map. It is indispensable in preserving the clarity of any map adjusting the scope and presentation of the map content to the user's perceptual abilities (Dent 1996). At this stage of mapmaking, principles of generalization are not rigorously defined and subsequently, map makers have considerable freedom of choice in decision making (Darling, Fairbrain 1997). It has been even said that generalization is a kind of creative act defining the artistry of map language (Ratajski 1989). Nevertheless, certain factors help to guide the generalization process and they include the intended audience for the map, the map scale, the nature of the area and the theme being mapped (Darling, Fairbrain 1997), as well as the quality of source data, the form of a presentation and the map perception limits (Robinson et al. 1995). Individual generalization procedures such as selection, omission, classification, simplification, symbolisation, exaggeration, combination, displacement, induction have also been distinguished (Robinson et al. 1995, Dent 1996, Keates 1996). Additionally, some more detailed accounts also list masking and emphasis among the generalization procedures (Buttenfield, McMaster 1991). It must be stressed that while it is possible to define a number of composite elements of the generalization process, one has to remember that they are all closely interconnected.

Therefore, generalization is a holistic process. The literature provides only a few hints or comments pertaining to the generalization of geographic names. The textbook “Kartovedeniye” by Salistchev (1982) contains a chapter on the choice of names (pp. 164–166). Without using the term “generalization”, the author showed that choices depend on the map’s subject matter, its scale, purpose, and the nature of the mapped area.

The map analysis involved maps portraying two regions: the Sudety Mountains (a mountain range in southern Poland, along the border with the Czech Republic) and the Iberian Peninsula. The two areas abound in geographic names, with the varied relief and – in case of the Sudety Mountains – have the cross-border location. The maps included in six world reference atlases have been analysed:

- *Atlas Świata (The World Atlas)* of the Polish Army Topographical Service (1962–1968) [ASTS], which was also published in English as *Pergamon World Atlas* (1968),
- *The World Atlas* (1967) i.e. the English version of the Soviet *Atlas Mira*,
- *The Times Atlas of the World* (1999),
- *Geograficzny Atlas Świata (Geographic Atlas of the World)* (1997) published by the Polish Cartographic Publisher [abbreviated as PPWK],
- *Brockhaus Enzyklopädie Weltatlas* (1993),
- *Gran Atlas Aguilar* – a Spanish atlas of the world (1969).

The analysed maps included 32 maps of the Sudety Mountains and 37 maps of the Iberian Peninsula, the total of 69 maps.

Selection of names

The choice of names depends on a number of factors. One of the most important selection criteria is the nature of the portrayed objects. As far as geographical regions are concerned, the names of mountain ranges and highlands are usually used rather than the names of land lowerings, i.e. valleys and lowlands. By and large, the names of the latter are featured only on the large-scale maps (Figure 1).

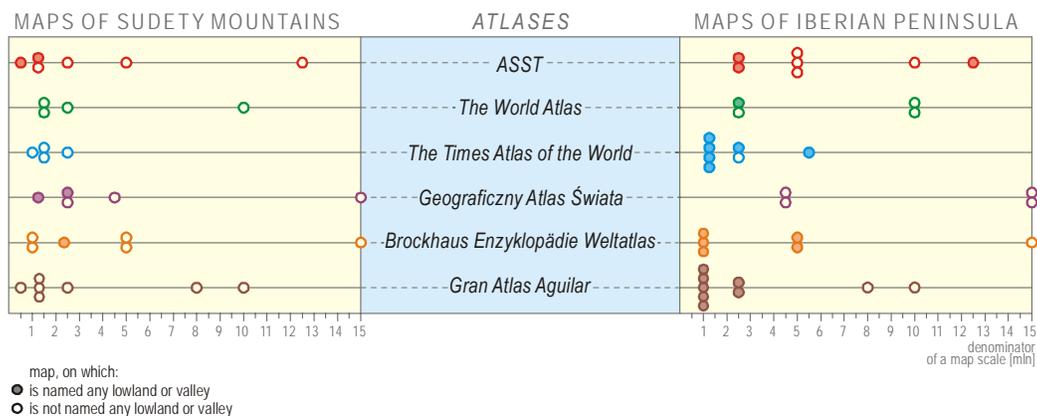


Figure 1. Lowlands and valleys are labelled mainly on large-scale maps

The names of such regions can be found on the maps of the Sudety Mountains at 1:500 000, 1:1 250 000, and 1:2 500 000 scales. The names of land lowerings are given only in the *ASTS* and the *PPWK* atlases published in Poland, so where the mountain range is located. The scale of maps of Iberian Peninsula, varies in the range mainly from 1:1 000 000 to 1:2 500 000. Names of lowlands and valleys were first to be omitted on small-scale maps. The percent of names of such regions as compared to all geographical regions named on a given map is relatively small: no more than 10% in the case of the Sudety Mountains and 20–30% in the case of the Iberian Peninsula. In the group analysed atlases, four of them featured no names for lowlands in the Sudety Mountains, and one of them, the *PPWK* atlas, had no names for lowlands in the Iberian Peninsula.

Similarly, the mountain peaks are labelled much more often than mountain passes (Figure 2), and the differences in the occurrence of labels are even greater than in the case of upland versus lowland regions. Names of mountain passes are provided on the maps of Sudety Mountains mainly at scales ranging from 1:500 000 to 1:1 500 000. And again, two Polish atlases differ from the rest as they give the names of mountain passes even on small-scale maps of the Sudety Mountains. The atlases of Iberian Peninsula usually include the names of such objects on 1:1 000 000 – 1:2 500 000 maps. Maps in smaller scale with the names of mountain passes could be found only in Polish and German atlases.

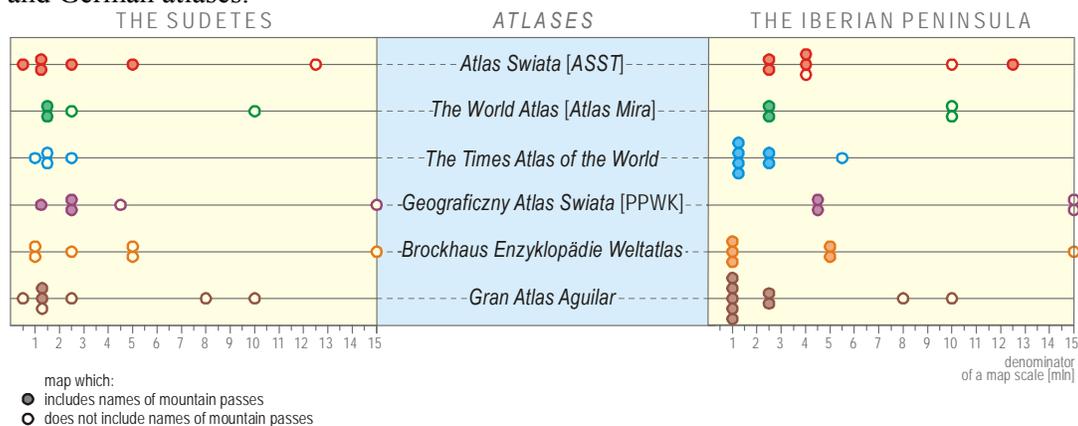


Figure 2. In similarity to lowlands, mountain passes are labelled primarily on large-scale maps

The tendency to label mountains and uplands more frequently than valleys and lowlands conforms to the thesis of W. Horn (1945), who claimed that convex landforms are more important than concave landforms and that quantitative generalization is applied primarily to concave landforms. Such regions often encompass an excessive number of names of towns and cities and consequently, there is not enough space to include the names of the regions themselves. The tendency can be considered to be reasonable. Mountains and other convex landforms often serve as reference object so that they are

more widely known, even though valleys and lowlands are usually places of human activity. Another important criterion influencing the choice of names is an elevation. Even the smallest scale maps give the names of the highest mountain ranges. For example, this is the case of the Giant Mountain (Karkonosze Mountains) in the Sudety Mountains or Sierra Nevada in the Baetic Cordillera. An application of this criterion during the process of generalization is of course a favourable solution.

The geographic location of a given region and its role (for example, a proximity to state borders) also affect the choice of names. The name of Pyrenees is the most frequently used name on maps of Iberian Peninsula. Also, the maps of the Sudety Mountains often include the name of the Lusatian Mountains (Góry Łużyckie). Despite their relatively low elevation, the border between Germany and the Czech Republic follows this range, which also extends the farthest to the west, than any mountain range of the Sudety Mountains. The choice of peaks names is often determined by their elevation and location. Maps usually include the highest peaks of a given mountain range and labels on smaller scale maps are limited to the highest peaks of the highest ranges. This is analogous solution to naming the highest mountain ranges. As far as mountain passes are concerned, what matters is the elevation difference between the saddle point and the mountains on both sides of the pass. Geographical location is also crucial, for example, mountain passes between countries or major geographic regions are important transportation routes. The Somport Pass in Central Pyrenees is a good example of popular routes for crossing the mountains. With a highway and a railway tunnel, the pass is labelled in *ASTS* on maps up to 1:5 000 000 and even 1:12 500 000 maps. Unfortunately, despite their potentially significant communicational function, mountain passes are rarely labelled on atlas maps. For example, only a few atlases (Times, Brockhaus, and Aguilar) include the name of Puerto de Guadarrama pass, which has an important highway connecting two regions of Castilla-Léon and Castilla-La Mancha.

Issues of double naming

Whenever dealing with borders crossing some geographic objects, decision has to be made whether one or two names should be used, and if single-name option is chosen, which name should be given the priority. It seems reasonable to choose the name corresponding to the area on which a given map is focused. The analysed atlases provide a few relevant examples to this effect. As far as the names of regions are concerned, the rule is observed primarily in the Polish atlases (*ASTS* and *PPWK*), in particular with regard to the Sudety Mountains. Unfortunately, a number of the analysed publications show that on maps with different portraying area, the name in the same language is chosen. This is often the case when choosing the names for the mountain ranges within the Sudety Mountains, with the preference given to Czech names. Relevant examples can be found in the following atlases: *Atlas Mira*, *The Times Atlas of the World*, *Gran Atlas Aguilar*, and for some of the ranges also in the *PPWK* atlas. Moreover, the Times and Aguilar atlases not only use Czech names, but the names are also positioned on the Czech side of the border, even when this means not showing the whole extent of a given mountain range. On the other hand, the Pyrenees, another range

divided by a boundary is not approached so “one-sidedly”. The same is true for transboundary mountain peaks, where usually just one name is used irrespective of the boundary. Features along Czech-Polish border should be labelled more balanced and suited to the main topic area, using mainly Czech names is not justified.

The choice of language version for the names of areas located outside the country where a given map is published is more complicated as it is often necessary to use an endonym or an exonym, or even both. The map survey shows that endonyms are used more often on large-scale, whereas preference is given to exonyms on small-scale maps. Maps in the *ASTS* and *PPWK* atlases confirm this point. This seems to be a reasonable solution: a small-scale map provides only few area to put names on it, this is why only more familiar names are left. The Times atlas, on the other hand, is consistent in using only endonyms to describe objects. The Pyrenees are the only exception as the Times atlas uses the English exonym and the Spanish and French endonym to describe the mountain range.

Replacing names of individual features with one common name

The practice of substituting lower-level names with a high-level name is usually applied to geographical regions when shifting from relatively large-scale maps (1:500 000 or 1:1 000 000) to maps in considerably smaller scales. Thanks to this, the graphic content of a given map is not overloaded and a map user can read only the most important names (information) from a small-scale map. Therefore, this solution should be considered as a positive one. An analogous approach has been in use with regard to graphic symbols for a long time.

The names of individual mountain ridges are omitted on small-scale maps in all of the analysed atlases and only the names of whole mountain range are featured. In several cases, only the names of low-level regions are provided on large-scale maps and no superior name is given, which can be found only on a small-scale map. Apart from individual mountain ridges, a 1:500 000 map of the Sudety Mountains in the *ASTS*, contains also the names of the Western, Central, and Eastern Sudety Mountains constituting the main parts of the chain. The same map, however, gives no name of the whole range, which appears only on small-scale maps. Similarly, the name of Jesioniki mountain range can be found only on a small scale map, whereas a 1:1 250 000 map features only the names of Wysoki Jesionik and Niski Jesionik constituting its parts. Also, the small scale-maps in the Brockhaus, *ASTS* and Aguilar atlases include names omitted on large-scale maps.

Density of names

In an attempt to quantify some of the features of generalization of geographic names, two indicators of density of names will be used, namely the number of names per 1 dm² of map (density of names on a map) and the number of names per 10 000 km² for maps of the Sudety Mountains and per 100 000 km² for maps of the Iberian Peninsula. To calculate the number of names per 1 dm² of map, the area covered by the Sudety

Mountains and the Iberian Peninsula on each map was computed. MapInfo software was used in the calculations. The number of names per 10 000 km² or 100 000 km² was determined by counting the number of names within the actual area of the Sudety Mountains and the Iberian Peninsula or their parts visible on a given map. Figure 3 shows the name densities for the two surveyed geographical regions on all the analysed maps. The density of names per km² is the highest for large-scale maps. Consequently, the smaller the scale is, the lower is the number of names per km² and the rate at which the name density decreases with decreasing map scale. The density of names per dm² change differently when the map scale changes. The large-scale maps have the lowest name density, which are also least diversified. As the scale decreases, the name density and its diversity grow.

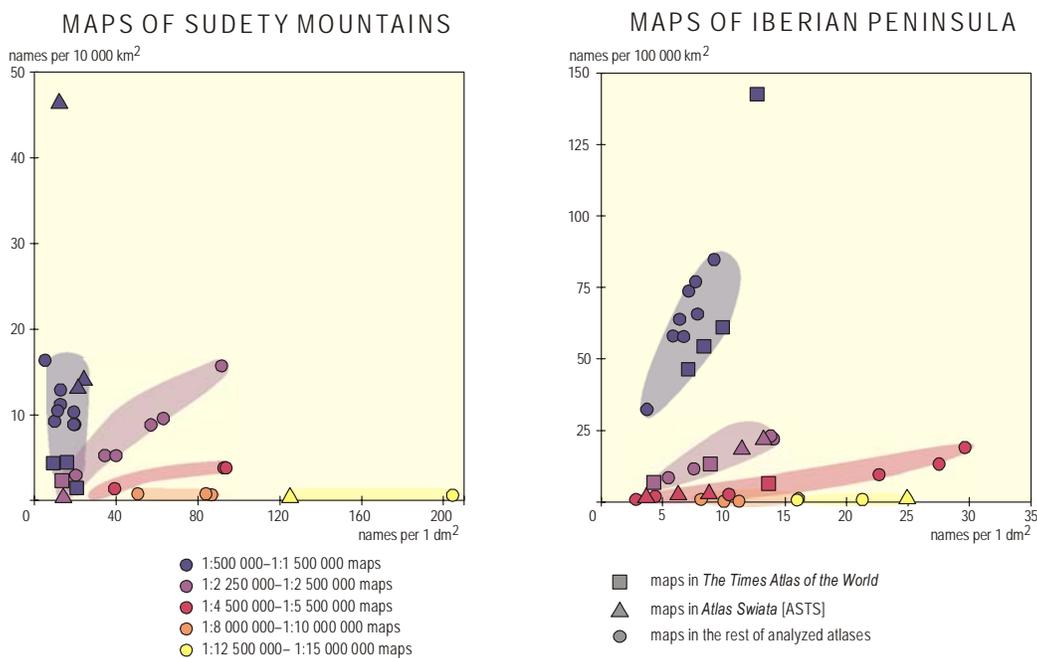


Figure 3. Density of names in the Sudety Mountains and the Iberian Peninsula

Additionally, the maps from the Times and *ASTS* atlases are taken considered. It is possible to observe the differences in the generalization in individual cartographic publications. The maps from the Times atlas feature a relatively low density of names of the Sudety Mountains and the Iberian Peninsula. The maps in the *ASTS*, on the other hand, have relatively high indicators, in particular the larger scale maps. The maps smaller than 1:2 500 000 have one of the lowest name densities. It was also observed that a similar trend in decreasing name density can be observed in the PPWK atlas, where the sharp drop begins with the 1:4 500 000 scale. Although the highest and the lowest name densities across all map scales within a given group can be found on maps from different atlases, it is worth to note that for the largest scale maps of the Sudety Mountains, the highest name densities were observed in the *ASTS*, and for the Iberian

Peninsula, this distinction goes to the Aguilar atlas. So the geographical proximity to the place of map publication influences the names density.

Stages of generalization of geographic names

Having analysed the names of geographical regions, mountains peaks and passes in various atlases, it can be said that the process of generalization of geographic names in every atlas followed different rules, all of which brought about similar results.

The process of selecting the names of geographical regions is different from the process of selecting the names of mountain peaks and passes. A number of stages of generalization could be identified on the analysed maps. However, individual atlases do not always feature all the stages.



Figure 7. Stages of generalization of names of geographical regions

As concerns geographical regions, the name of the higher-level region is often omitted at the largest scale and only lower level names are provided instead (Figure 7). Occasionally some additional information is provided by changing the type for a given label, for example, bold print is used to distinguish the highest mountain ridge. At the second stage, pertaining to the name of the superior region, the difference in importance is clearly marked by typographic differences: bold, upper case, and varying size. Among the lower level names only some are chosen and named. Typically, the region distinguished at the previous stage cannot be omitted, but now it is not highlighted in any way. At the third stage only the name of the superior level is used. Finally, the names of individual lower level regions are replaced with one name of the superior region. The choice of names of regions is subject to quantitative and qualitative criteria. The quantitative criteria applicable to mountain ranges include the area they cover and their elevation. The qualitative criteria are equally important and usually features such as uplands or mountains are named.

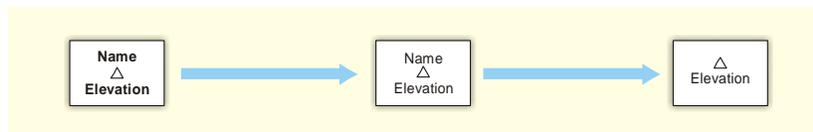


Figure 8. Stages of generalization of names of mountain peaks

The arrows show consecutive stages, which were deduced in the process of analysing maps. The direction of arrows shows the change from a larger scale to a smaller or the same scale. The large-scale maps provide comprehensive information concerning a given mountain peak: the name and the elevation. Additionally, other significant

features are distinguished by applying lettering in bold or upper case. The second stage also provides full information including the name and the elevation of a given peak. The lettering, however, is not used to provide extra data on the significance of a given mountain in the whole range. In the subsequent stage partial information is provided, usually just the elevation. In majority of publications the next stage consisted of omitting a given mountain peak.

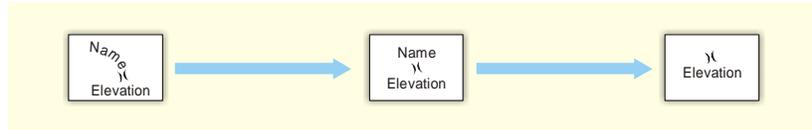


Figure 9. Stages of generalization of names of mountain passes

Mountain passes, just like mountain peaks, have names and elevations. The stages of their generalization are partly the same as the stages of generalization of mountain peaks. At the largest scale, the cartographic symbol of a mountain pass is accompanied by its name and elevation. Additionally, the positioning of the name shows the direction of the given mountain pass (Figure 9). At the next stage, full information is provided (name and elevation) without any additional data. The next stage means providing only the name or the elevation together with a cartographic symbol. The elevation is given more often than the name.

Conclusions

The analysis of generalization of geographic names in individual atlases clearly showed that the process is not uniform and consistent. Individual atlases resorted to different criteria of selection, different rules were applied, some of which were typical for just one atlas. The article includes explanation that indicates the evaluation of various ways of generalization: some of methods are not favourable, but many of them are considered to be reasonable. What is more, varied degrees of generalization were used at a given scale, and the generalization of individual categories of features took slightly different forms. The process is rarely regular, because the degree of generalization does not depend only on the scale of a given map. While generalizing, any cartographer uses both qualitative and quantitative criteria, also when generalizing names. What also matters is the nature of a given feature: the names of mountain ranges are omitted less frequently than the names of lower lands. The same is true for mountain peaks and mountain passes, which complies with the Horn's claim (1945) saying that in generalization, priority is given to convex objects. The elevation of a given mountain range or mountain peak is also important. So is the geographical location and the functional role of a given feature, for example a mountain ridge reaching farthest from a given range, a mountain pass of some importance in communication and transport, mountain ranges forming a political border. The issue of double naming is the least resolved. The reasonable solution consisting of choosing the name of a transboundary feature most suitable for the main area depicted on a given map is rarely used. It is worth mentioning that in majority of the analysed atlases, the maps of the Sudety

Mountains consistently use Czech names for transboundary ranges. Even when names in two languages are provided, they are often positioned in an inconsistent manner, even within the same map.

Notwithstanding all the differences at individual stages of generalization, the main objective was to make map contents, including geographic names, transparent and easy to read. Generally, the generalization of geographic names is coincident, which makes it possible to come up with some general models of generalization of names of regions, mountain peaks and mountain passes. The inconsistencies occurring at each individual stage of generalization just confirm the thesis that generalization is a subjective process whose results depend on learning the language of maps and mastering its use.

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