# A quantitative comparison of legends between Belgium and neighbouring countries as a starting point for an objective generalization

**Jan DE WAELE** [1] and **Philippe DE MAEYER**

Gent University
Department of Geography
Krijgslaan 281- S8, B-9000 Gent, Belgium

jdw@ngi.be
philippe.demaeyer@rug.ac.be

## Introduction

The purpose of the academic study was to make a proposal for the symbolisation of the new topographical map on a scale of 1:100.000. The map has to be produced according to a digital production scheme with the data and the concept M737 of the numerical 1:50.000 [2].

Generalization is the simplification of the map contents in the most efficient way according to the required scale reduction. Although geographical systems foresee for a fully automatic generalization process, this technology wasn't used because in this case the available software didn't gave satisfying results. To solve this complex generalization problem, a good balance has to be found between automatic processing and interactive editing.

**Gelöscht:** of interactive tools f, a

**Gelöscht:** was not possible with the available technology

**Gelöscht:** a

**Gelöscht:** we rather have to find

## Comparison of legends

The Töpfer-Pillewizer formula, more than 30 years old, is till now one of the only quantitative rules that includes the selection and the elimination of map objects. This formula could be used with an automatic generalization to verify if sufficient map objects are eliminated.

There are doubts of the requirement that an automatic generalization should have the same results as a manual generalization. One of the reasons is that generalization *always* will be effectuated on a subjective way.

**Gelöscht:**

**Gelöscht:** is being effected

By making use of a comparative analysis (between Belgium and neighbour countries on a scale 1:50.000) we have tried to develop a map that has been generalized on a *objective* way. Map objects that frequently occur get a priority when elements are eliminated.

**Gelöscht:** By making use of a comparitive analyse (between Belgium and neighbour countries on a scale 1:50.000) we have tried to develop a map that has

In Europe, there are some national and international specifications for exchange of digital geographic information. Other rules are still in discussion. But all these specifications are exclusively for digital mapping, not one European specification for printed maps can be found. Still, there are (for example in Belgium for the topographic maps on scale 1:50.000) military requirements. Beside these specifications, every cartographic institution has the freedom to represent the spatial

**Gelöscht:** are numerous in the statistics

**Gelöscht:** There are i

**Gelöscht:** only

**Gelöscht:** s

**Gelöscht:** . We can't find

**Gelöscht:** s

**Gelöscht:** feel

[1] now working at NGI-IGN, Abdij Ter Kameren 13, 1000 Brussel – Belgium.

[2] we would like to thank the National Geographical Institute that placed at our disposal vector data on a scale of 1:50.000.

model on a map. But, of course, the layout of the map will be influenced by differences in hypsography, geomorphology and land use in the concerned country.

Gelöscht: reality

Gelöscht: is of course

As every country has its own legend classes, a *uniform classification* had to be developed to allow for a representative comparison between the legends of different countries. In the different legends we can distinguish the next 10 classes: building, roads, roads information, railways, water features, boundaries, relief, land use, toponymy and other symbols (including triangulation points, other linear objects, tourist information, …) .

*Clarification:*

- If a class has no elements, this is sometimes due to the fact of map objects not being represented in the legend. Despite of that, we can consider that the legend is a representative indicator of the symbolisation and that the number of object classes in the legend is also proportional with the number of objects classes in the map.

Gelöscht: it

Gelöscht: the consequence of

Gelöscht: there are

- Some confusion on classes is possible, e.g. a parking place may appear as a symbol, road information, road symbol, …. To avoid confusion all map object classes were ordered according to a table. An extract of the table is given here.

Gelöscht: s sometimes

Gelöscht: the

| **buildings** | **roads** | **railways** | **water features** | **other symbols** |
|---|---|---|---|---|
| *house*<br>*wall*<br>*building*<br>*glasshouse*<br>*industry*<br>*factory*<br>*storage yard*<br>*…* | *viaduct*<br>*tunnel*<br>*bridge*<br>*…* | *tramway*<br>*metro(station)*<br>*aerial cableway*<br>*level crossing*<br>*tunnel* | *lock*<br>*dam or weir*<br>*bridge*<br>*landing-stage*<br>*…* | *triangulation point*<br>*tourism*<br>*population number*<br>*pipe-line*<br>*power transmission line*<br>*telephone*<br>*town hall*<br>*post office*<br>*church*<br>*antiquities*<br>*…* |
| **roads info** | **boundaries** | **relief** | **land use** | **toponymy** |
| *road number*<br>*exit*<br>*number of lanes*<br>*parking place*<br>*gradient*<br>*…* | *reserve*<br>*…* | *contour lines*<br>*dike*<br>*slope*<br>*levee*<br>*fill, crest*<br>*cliff*<br>*spot elevation*<br>*rock*<br>*embankment*<br>*cutting*<br>*…* | *vegetation*<br>*dune*<br>*…* | *danger area*<br>*…* |

Gelöscht: L

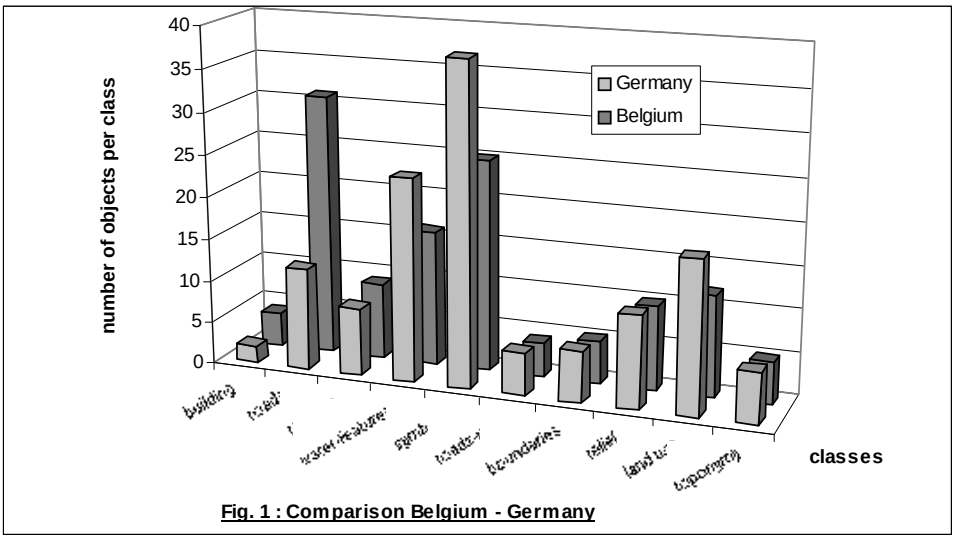



**Fig. 1 : Comparison Belgium - Germany**

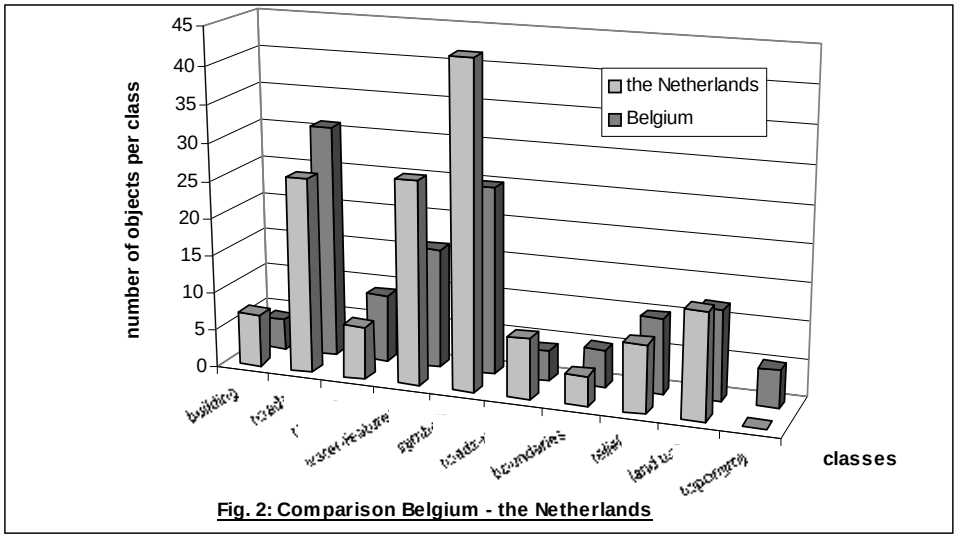



**Fig. 2: Comparison Belgium - the Netherlands**

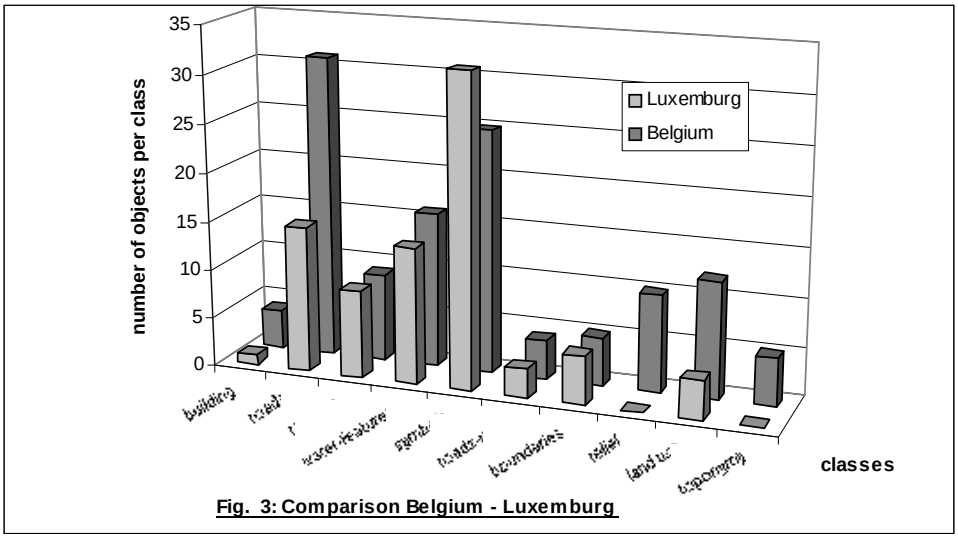



**Fig. 3: Comparison Belgium - Luxemburg**

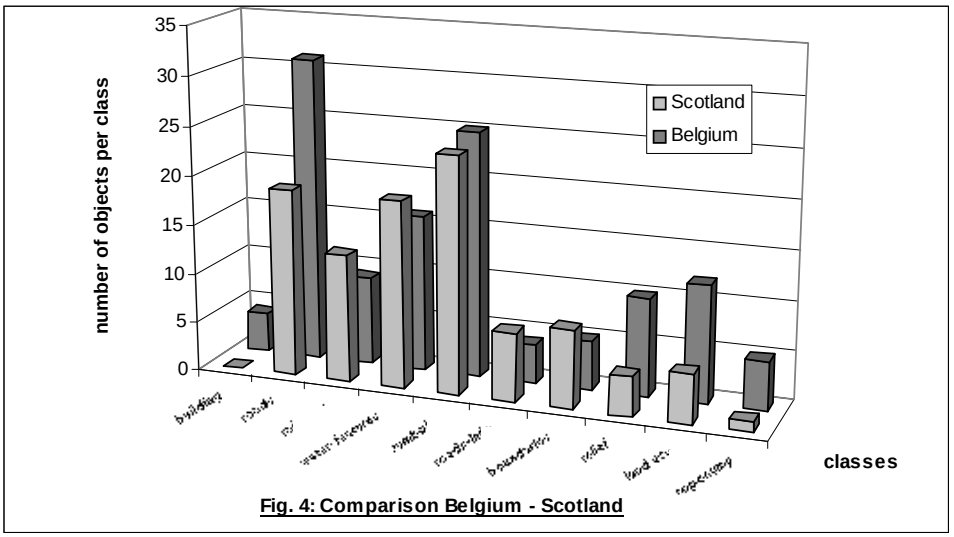



**Fig. 4: Comparison Belgium - Scotland**

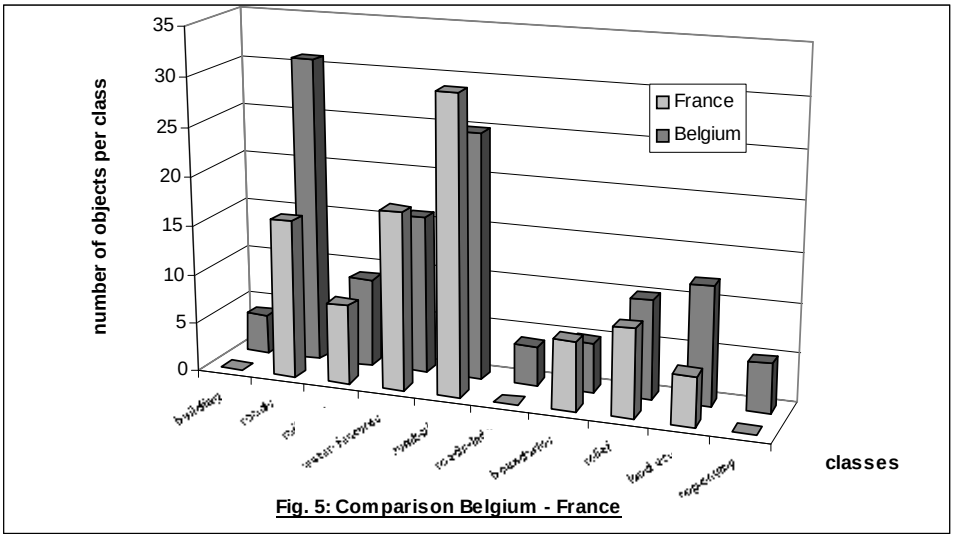



**Fig. 5: Comparison Belgium - France**

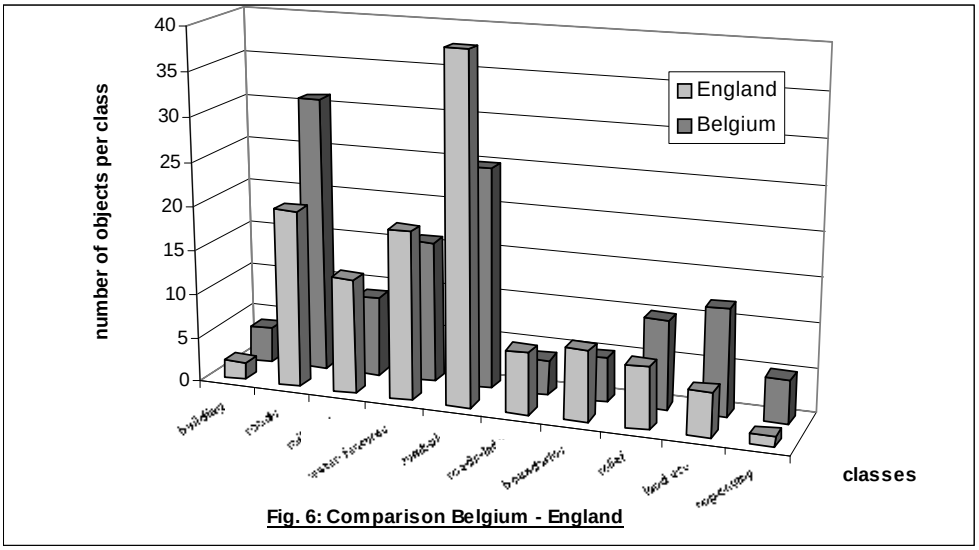



**Fig. 6: Comparison Belgium - England**

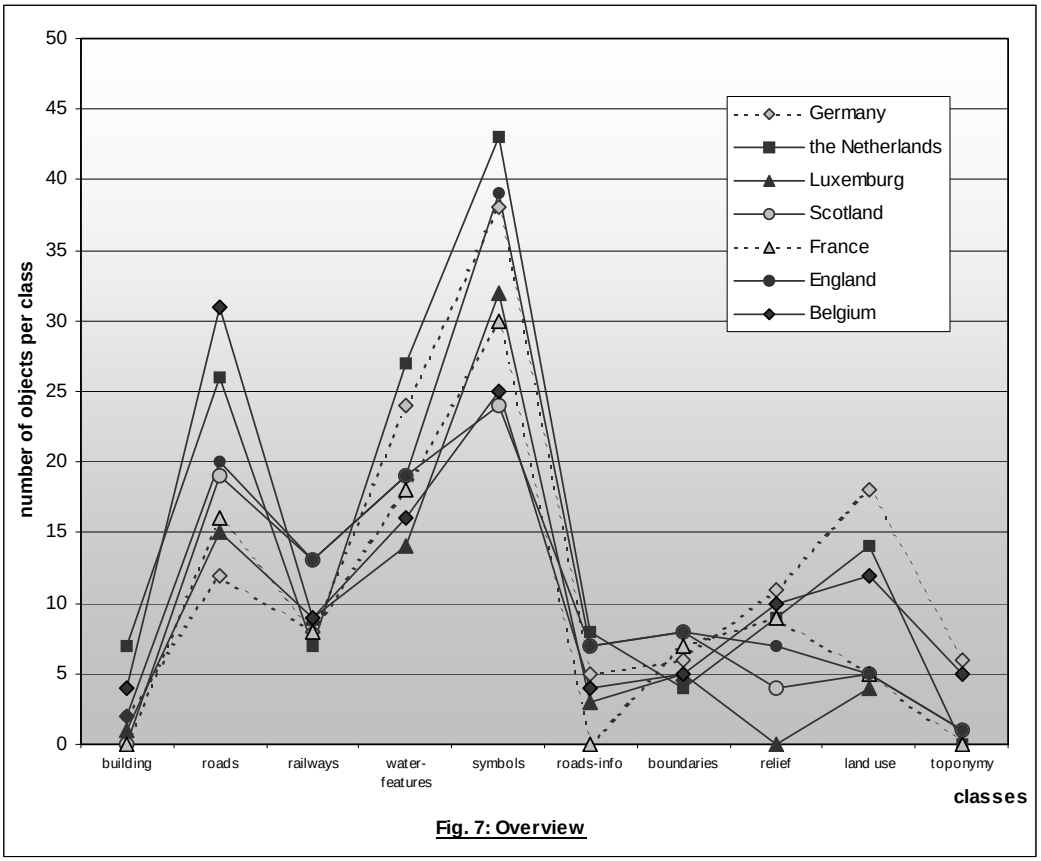



**Fig. 7: Overview**

Maps of a specific country are based on its geographical characteristics. The Netherlands, for a great part below sea level, will especially be concerned with the representation of dikes, fills, crests, ... what also can be deduced from the graphics (classes water features and symbols).
In the first six graphics we make a comparison between the different classes of each neighbour country with the classes of Belgium. In the last graphic we can see that the Netherlands handle the most map objects (145). Then follow respectively Germany (130), England and Belgium (121), Scotland (100), France (93) and finally Luxemburg (83).

**Gelöscht:** the surface of the sea

**Gelöscht:** for

**Gelöscht:** The map of the polders in the Netherlands is of course different of the Scottish Highlands. Every country has also a different density of population and different spreading of buildings.

Despite the differences, we can see in the last graphic that there is a similar pattern for all countries over the different classes. The two largest classes are the symbols (with the Netherlands on the top) and the roads (with Belgium on the top). The largest deviation of these peaks is respectively observed on the maps of Scotland and Germany. The number of classes with water features is about the same size as the number of classes with roads. Remarkable is the difference in number of classes of land use between Germany (18) and Luxemburg (4). The smallest classes are toponymy and building. These classes include few different map objects in the legends.

**Gelöscht:** biggest

**Gelöscht:** biggest

**Gelöscht:** en

## Results

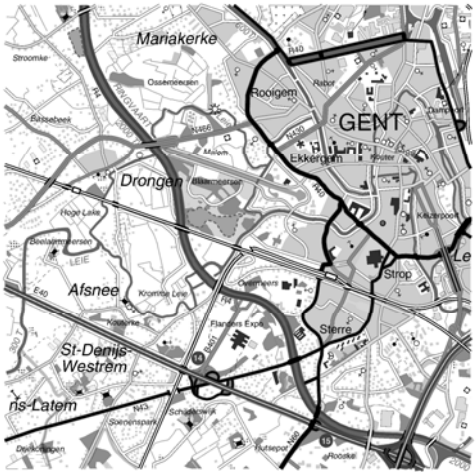
The new 1:100 000 topographical map will be produced completely digitally using an ArcInfo dataset. The production flow has to be developed, but will normally look like the one used for the 1:50 000 map. For this series the photomechanical production was recently replaced by a digital production flow. It implies that there was an important change of symbolisation between the two editions (resp. M736 and M737).

The dataset will be derived from the original created for the M737. The data were specifically built for the 1:50 000 map and were not generalised from an former and larger-scaled dataset.

Following questions raised for a final selection of the map objects proposal:

1. In the preceding generalization from the 1:50 000 M736-edition to the old 1:100 000:
   - What are the map objects that were eliminated?
   - What are the changes in symbolisation of the retained map objects?
2. Comparing the two generations of 1:50 000 map:
   - What are the changes in map object classes?

From this data analysis a proposal was developed. A legend was built first in a CAD program and afterwards the symbolization was applied in a map production environment. Real data coming from an ArcInfo dataset of the 1:50 000 map were generalized (partially manually for this experiment purpose). Symbolization was performed on Mercator, a professional cartographic symbolization software from Barco.




Study area
*51° 00' 32" N – 51° 04' 19" N*
*03° 38' 21" E – 03° 44' 10" E*

Bk/Wh copy of a proposal of a new 1:100 000 map, based on the cartographic database of the 1:50 000 topographical map

## Conclusion

For the comparison we started from the legend, but there are also elements in the map that are not present in the legend. This study can therefore be considered as a possible approach of map object classes selection for generalization. The amount of elements depends on the geographical characteristics of the area.
The legend gives an idea of the map image output and it will proportionally change with the contents of the map. A statistical approach is a handy help for selecting and eliminating map objects.

**Gelöscht:** s
**Gelöscht:** also recently
**Gelöscht:** ly one
**Gelöscht:** d
**Gelöscht:** are
**Gelöscht:** a
**Gelöscht:** ation
**Gelöscht:** of
**Gelöscht:** earlier
**Gelöscht:** were
**Formatiert:** Nummerierung und Aufzählungszeichen
**Gelöscht:** the
**Gelöscht:** have
**Gelöscht:** of course
**Gelöscht:** to find
**Gelöscht:** So, we can consider this study as
**Gelöscht:** relative one: we don't compare the same elements on the same place.
**Gelöscht:** is also dependent
**Gelöscht:** If generalization should be analysed on individual mapobjects, we have to perform a comparison between the base map and the derived, generalized map. ¶
**Gelöscht:** But t
**Gelöscht:** So, these statistics
**Gelöscht:** when mapobjects have to be
**Gelöscht:** ed
**Gelöscht:** ed
**Gelöscht:** ¶