EuroBoundaryMap Technical Guide

File name	EBM_v11_TechnicalGuide		
Version	Author	Date	Comments
v11.0	Jörgen Spradau	13.03.2016	Review of v10.0
v10.0	Marcus Brühl / BKG	18.3.2015	review of v9.0

Contents

1 Introduction

The purpose of this document is to provide additional information about content and specification of EuroBoundaryMap (EBM). It is addressed to the data producers (NMCAs). The document is part of the quality control as well. The Technical Guide refers to the EBM Specification, which is the main document for EBM describing the general structure of the database and the definition of all features and attributes.

This Technical Guide is a draft version and not answering all technical questions. It's focused on new issues for EBM v11.0. It might be expanded during the update cycle till the release of EBM v11.0. Some parts of the document are related to a special platform: ESRI ArcGIS. But the most parts don't depend on a specific GIS environment. Please get in contact with BKG, if any problems or questions occur:

joergen.spradau@bkg.bund.de

2 EBM update

2.1 Starting point

The basis for the EBM update is the previous release: EuroBoundaryMap v10.1. This release was created by merging the national contributions sent to BKG in 2015. In some cases BKG made minimal changes in the national contributions, in order to harmonise the database.

The final EBM v10.1 data release will be provided by BKG to all NMCAs. Please inform us, if there are errors which have to be corrected immediately.

All NMCAs are asked to update the national contributions referring to **1 January 2016**.

2.2 Type of update

The intension of the EBM v11.0 update is to avoid unnecessary work. That's why you should first analyse the changes in your source data. Depending on the identified changes, different activities are asked concerning the EBM v11.0 update.

The different types of update can be classified in the following way:

Type	Changes in the source dataset	Activities for EBM v11.0 update
A	Complete change: • Administrative reform • New administrative hierarchy	• Inform BKG as early as possible about new administrative hierarchy. • Table EBM_ISN and diagram in lineage file have to be updated. • Probably, national EBM contribution has to be created completely new.
B	Some "real" administrative changes: • Administrative units have been merged or subdivided • Boundaries have changed significantly after agreement between neighbouring units • Administrative codes (SHN) or names have changed	• Use country dataset from EBM v10.1 (delivered by BKG) and integrate all changes. • Avoid to create national EBM contribution completely new. • Document changes, see section 3.5.
C	Improvement of data quality: • Positional accuracy • Generalisation degree • Corrections	• Create EBM contribution new, if the whole geometry is concerned. • Otherwise, use country dataset from EBM v10.1 and integrate all changes.

| D	Adjustment of geometry: • Improvement of large scale source data with changes less than 50m.	• No update of the EBM data necessary.
E	No changes	• No update of the EBM data necessary.

Apart from changes in you national data, there might be remaining issues from the last EBM update or new questions concerning your EBM contribution.

2.3   Content of national update contribution

Every NMCA has to provide an update of the national metadata. The EBM metadata comprises an Excel file (***XX_Metadata_EBM_v11.xls***) and an additional Lineage file (***XX_Lineage_EBM_v11.doc***). At least, the information about point of contact and reference date of your source data have to be updated in the Excel-file.

Depending on changes in your data (type A, B and C), an updated EBM database has to be provided. This database has to contain the basic geometry in feature class ***EBM_A*** and the main table ***EBM_NAM***. In case of changes, also the feature class ***ResidenceOfAuthority*** and the tables ***EBM_ISN*** and ***EBM_NUTS*** have to be updated.

It's not necessary to update the other feature classes, like *AdministrativeBoundary* and *AdministrativeUnit_x*, because these feature classes will be created automatically by BKG.
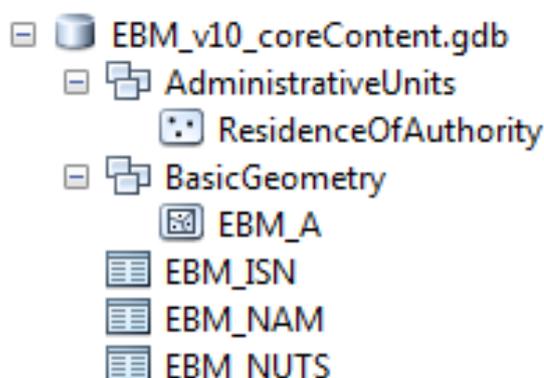
In case of update type A and B, a table (***XX_Changes_EBM_v11.xls***) summarising the changes has to be provided, see section 3.5.

2.4   Validation and data finalizing

Please provide the national update as early as possible. This makes it easier for BKG to schedule the validation of the different national updates. The final delivery date for the national EBM contributions is **30 June 2016**.

The data will be validated by BKG. You will receive the final database for confirmation. This will include also the automatically created feature classes, like *AdministrativeBoundary* and *AdministrativeUnit_x*.

The complete EBM v11.0 database has to be ready in autumn. It will be provided to Eurostat in December.

3 Technical issues EBM

3.1 International Boundaries

The international boundaries stored in the database **ELF_IB_Regional_v3.gdb** have to be used as outlines of the national EBM contributions. ELF IB Regional is containing the agreed common international boundaries EuroBoundaryMap/EuroRegionalMap. The boundaries EBM/ERM were aligned in 2012 by discussions between the EBM project management and the concerning NMCAs. Please refer to the following documents for detailed information:

- D2.7-1_ELF_IB_DataSpecification_v1.1.pdf
- ELF_IB_Regional_Status.xls

If you detect any inconsistencies or new issues concerning the state boundaries, please get back to BKG.

3.2 inspireId and lifecycle information

EBM contains the following core INSPIRE attributes:

- **inspireId** – (external identifier of the spatial object)
- **beginLifespanVersion** – (date at which this version of the spatial object was inserted or changed in the spatial data set)

These attributes are added to all feature classes, but not for related tables. The attributes are purely technical, designed for tracking of objects in a database.

NMCAs are asked to provide this information, if maintained in the national data source. This concerns first basically feature class EBM_A. BKG will populate all missing attributes, especially for derived feature types.

The inspireId consist of a namespace and a localId, concatenated by a colon. The namespace is always: _**EG.EBM**. If the localId is not populated by NMCAs, it will be concatenated by an abbreviation of the feature class name, the SHN code and a sequential number (if needed).

Examples:

- Object in feature class EBM_A with inspireId populated by NMCA:
  inspireId = _EG.EBM:DEBKGDL20000BRJA
- Object in feature class AdministrativeUnit_1 with inspireId populated by BKG:
  inspireId = _EG.EBM:AU1.DE000000000000.2

3.3 Specific attributes in table EBM_NAM

3.3.1 Attribute ROA

This attribute identifies the residence of authority of an administrative unit. This attribute has been integrated in EBM v7.0. Based on the update of ERM theme Population (POP), a number of missing residence of authority for specific countries could be populated. For all countries, where this information was not provided by NMCAs, at least the national capital has been attributed.

Please review this and provide missing information, if possible.

3.3.2 Attribute PPL

This attribute contains the population figure of an administrative unit. This attribute has been integrated in EBM v8.0. For a number of countries it was possible to calculate missing data from information available from Eurostat. Please try to **update this attribute with actual information** referring to the reference data of EBM v11.0 (1.1.2016). If the reference date of the population figures is different, please indicate this in the metadata (lineage file).

If your data source is not containing this information, please contact your National Statistical Institute. All European countries were asked to carry out the Census 2011. That's why there should be available information, at least for 2011.

3.3.3 Attribute ARA

This attribute contains the area size of an administrative unit in km², rounded to a value with two decimal places.

Please check if there are "official" values for area size of your administrative units. If not, we will use calculated values. In some cases we have to clarify if the area size shall include or exclude the shape of larger water bodies. By default, area size will be calculated excluding coastal waters but including inland water bodies.

3.3.4 Attribute effectiveDate

This attribute informs about the official entry into force date of the administrative unit (timestamp). It contains all administrative changes after 1.1.2010, at least.

Please check if your data source is containing this type of information. If not, please populate this attribute for all administrative changes in EBM v11.0, but only for "real" administrative changes (update type A and B).

See also section 3.5.

3.4 Maritime zones

3.4.1 Importance

It becomes more and more important to publish the national maritime zones appropriate. EBM is already containing the territorial sea for a number of coastal countries. But the user requirements are going beyond this: EBM should contain territorial sea for all concerned countries and also additional features like contiguous zone and exclusive economic zone.

There is an amendment of the INSPIRE Data Product Specification Administrative Units, which asks the Member States to provide maritime zones. BKG will analyse the impact of these changes for future updates of EBM.

There is a very interesting project 'Marine Regions' managed by the Flanders Marine Institute (see www.marineregions.org). This project provides an online standard list of geo-referenced marine place names, areas and maritime boundaries. This includes especially a database of all maritime boundaries of the exclusive economic zones.

For the time being, EBM will stay with the current solution. NMCAs are asked to provide only the territorial sea. But please keep in mind that the EBM data model might be extended in the future to meet new user requirements.

3.4.2 Definition

The definition of the territorial sea and additional features is strictly following the United Nations Convention on the Law of the Sea (UNCLOS), see:

http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm.

Territorial sea

- The sovereignty of a coastal state extends, beyond its land territory and internal waters, to an adjacent belt of sea, described as the territorial sea.

Limits of the territorial sea

- Every state has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles, measured from baselines.
- Where the coasts of two states are opposite or adjacent to each other, neither of the two states is entitled, failing agreement between them to the contrary, to extend its territorial sea beyond the median line every point of which is equidistant from the nearest points on the baselines from which the breadth of the territorial seas of each of the two states is measured. The above provision does not apply, however, where it is necessary by reason of historic title or other special circumstances to delimit the territorial seas of the two states in a way which is at variance therewith.

Baseline

- The normal baseline for measuring the breadth of the territorial sea is the low-water line along the coast as marked on large-scale charts officially recognized by the coastal state.
- In localities where the coastline is deeply indented and cut into, or if there is a fringe of islands along the coast in its immediate vicinity, the method of straight baselines joining appropriate points may be employed in drawing the baseline.
- If a river flows directly into the sea, the baseline shall be a straight line across the mouth of the river between points on the low-water line of its banks.

Internal waters

- Waters on the landward side of the baseline form part of the internal waters of the state.

Contiguous Zone

- Zone adjacent to the territorial sea.
- Every state has the right to establish the breadth of the contiguous zone up to a limit not exceeding 24 nautical miles, measured from baselines.

Exclusive Economic Zone (EEZ)

- Area beyond and adjacent to the territorial sea.
- The exclusive economic zone shall not extend beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured.

3.4.3   Implementation in EBM

All NMCAs of coastal states are asked to provide the administrative units including the territorial sea. This is not mandatory, but highly recommended.

In general, there seem to be three different cases for coastal states:

Option A: Territorial sea is split and administered by the administrative units on lowest level, which are linked to the coast. Those areas have been already included in earlier EBM versions, e.g. for Nordic countries. The attributes have to be populated in the following way:


- Territorial sea polygons:
  - SHN = same code like the neighbouring administrative unit,
  - TAA = 5 (coastal water),
- Land water boundary:
  - MOL = 2 (coastline without administrative meaning),
  - USE = 998 (not applicable),
  - BST = 998 (not applicable),
- Outer limit of the territorial sea:
  - MOL = 9 (boundary line on water),
  - USE = 1 (1st order),
  - BST = 1 (definite).

Legend:
- 1st, boundary on water
- 2nd, boundary on land
- 2nd, boundary on water
- not applicable, coastline
- Main area
- Coastal water

Option B: Territorial sea is one area directly administered by the national government. The attributes have to be populated in the following way:

- Territorial sea polygons:
  - SHN = 'XX000…000' (SHN code of the top level) or 'XX000…999' (fictitious SHN for a unit on lowest level)
  - TAA = 5 (coastal water),
- Land water boundary:
  - MOL = 1 (boundary line and coastline),
  - USE = 2 or 2-6 (depending on SHN),
  - BST = 1 (definite),
- Outer limit of the territorial sea:
  - MOL = 9 (boundary line on water),
  - USE = 1 (1st order),
  - BST = 1 (definite).

Option C: NMCA does not have the territorial sea in the national EBM contribution. In that case, at least the land water boundary has to be attributed in the following way:
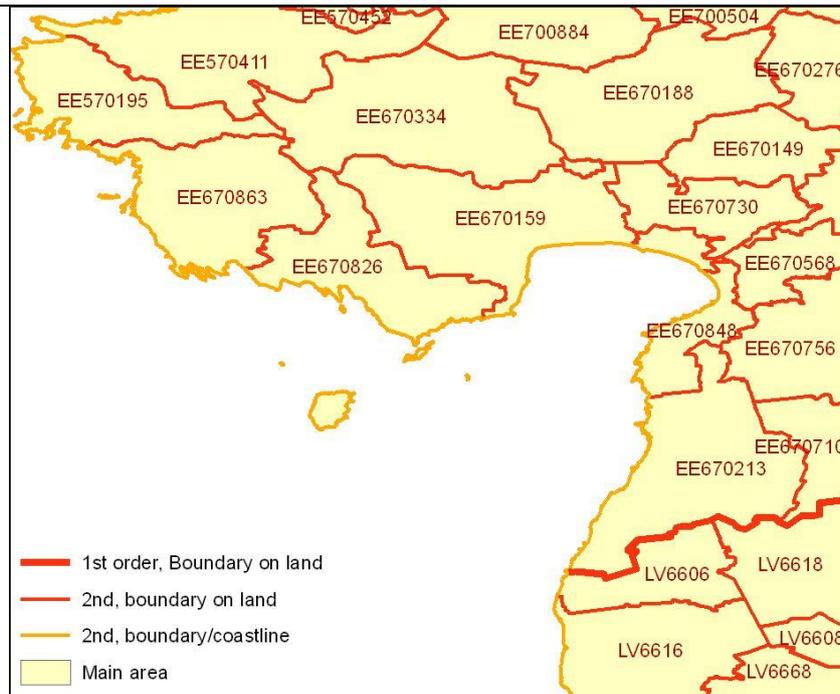
- MOL = 1 (boundary line and coastline),
- USE = 2 (2nd order),
- BST = 1 (definite).

For the time being, EBM will not include the baselines, which can vary from the coastlines. An explicit depiction of the territorial sea with EBM is not possible. This means, all included territorial sea areas have to be attributed as coastal water, but not all coastal water areas must be territorial sea.

If NMCAs intend to include territorial sea in their data contribution, this has to be described in the metadata (lineage file). The description should include information about:

- Breadth of the territorial sea (nautical miles),
- Baseline (identical with coastline or not),
- National legislation.

3.5   Documentation of administrative changes

In case of update type A and B, the table *XX_Changes_EBM_v11.xls* has to be populated. This information is helpful for data users to understand the administrative changes.

In some cases it might be difficult to distinguish between "real" administrative changes and "only" improvements of the data. For example, if a boundary between two administrative units has changed significantly, you should analyse if this was caused by a real change of areas between both units, or if this has changed only because it was not displayed appropriate in the previous version. Please refer also to the examples for update type B and C listed in section 2.2.

Don't forget to populate attribute *effectiveDate* in table *EBM_NAM* accordingly, see section 3.3.4.

4 Consistency EBM – ERM

4.1 Consistent administrative layer

The aim for EBM and ERM is to streamline the production workflow by creating the update of the administrative layer only once. This means to use the same geometry for both products. But it has to be analysed country by country how far this is achievable.

Consistent administrative layer in EBM and ERM means:

- Same reference date → next update: 1.1.2016
- Same international boundaries → already solved
- Same attributive data (tables) → already solved
- Same coastlines → achievable?
- Same national boundaries → achievable?

Please analyse for your country if it's possible to use the same data for EBM and ERM. It might be difficult to decide if it's possible to use the same geometry of the national boundaries. Please keep in mind the requirements of EBM and ERM, which might be conflictive. On the on hand, EBM is asking for data with positional accuracy of 50 m suitable for scale 1:100 000. On the other hand, ERM requires the topological conformance with all other ERM themes.
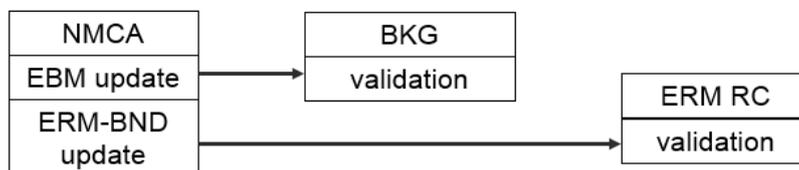
The preferred workflow is the following:
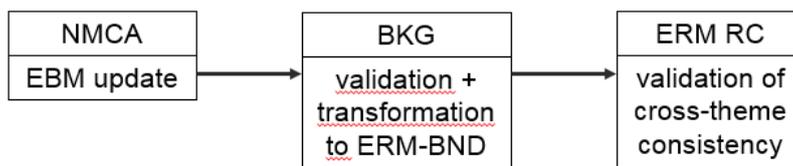
If it's not possible to get common coastlines this year, the following intermediate workflow might be applied:
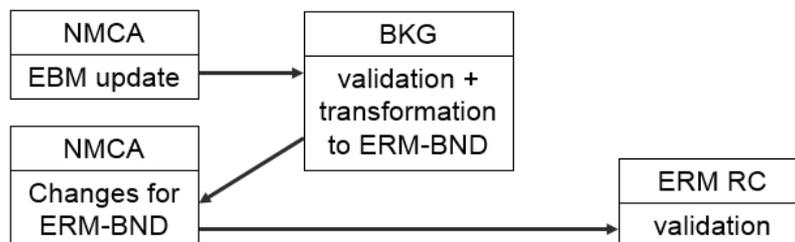
If it's completely not possible to use the same geometry for EBM and ERM, the following workflow has to be applied:

## 4.2   Consistency EBM – ERM theme POP

EBM contains the feature class *ResidenceOfAuthority.* This feature identifies the administrative centres (administrative seats) of administrative units. *ResidenceOfAuthority* is a subset of the ERM feature class *BuiltupP*. The data models of both features are slightly different, but the attribute values have to be identical. This concerns the attributes NAMN and USE of *ResidenceOfAuthority* and *BuiltupP*.

Furthermore, there's often a correlation between the name of administrative units and residence of authorities. Especially for countries with rather small units on lowest administrative level, the name of a commune and the name of the settlement, where the administrative seat is located, are identical.

There's a correlation between the population figures of administrative units and the settlements in feature class *BuiltupP*. Some administrative units contain only one settlement in ERM. For these settlements, the population figures can be compared between EBM and ERM.

Finally, the built-up areas in ERM feature class *BuiltupA* should be, by default, properly located inside administrative units. Built-up areas should not intersect administrative boundaries. Of course, there might be national specifics, where this general rule is not applicable.

All relations are visualised in the following picture.
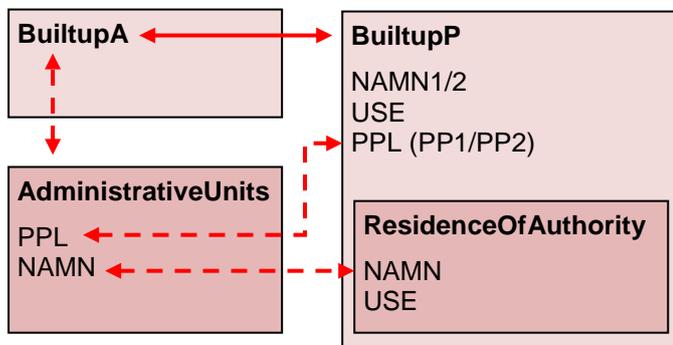
5   Generalisation

5.1   Introduction

A number of NMCAs don't maintain national topographic reference data in medium scale. Especially administrative boundaries are often based on cadastre data. Generalisation is needed to derive the national contributions for EBM.

There are no general rules for generalisation for the EuroGeographics products. But the EBM project management has experiences how to generalise large scale source data to medium scale. The following best practice example uses standard ArcGIS functionality. There might be comparable tools in other GIS platforms.

5.2   Line generalisation

The standard ArcGIS tool *'Simplify Line'* is suitable for line generalisation. It offers two different simplification algorithms: *'Point Remove'* and *'Bend Simplify'*. The first one simply reduces the number of vertices, the second one smoothes the lines. The best results can be achieved by combining both algorithms:

1) *'Point Remove'* with simplification tolerance *'10 Meters'* and
2) *'Bend Simplify'* with simplification tolerance *'100 Meters'*
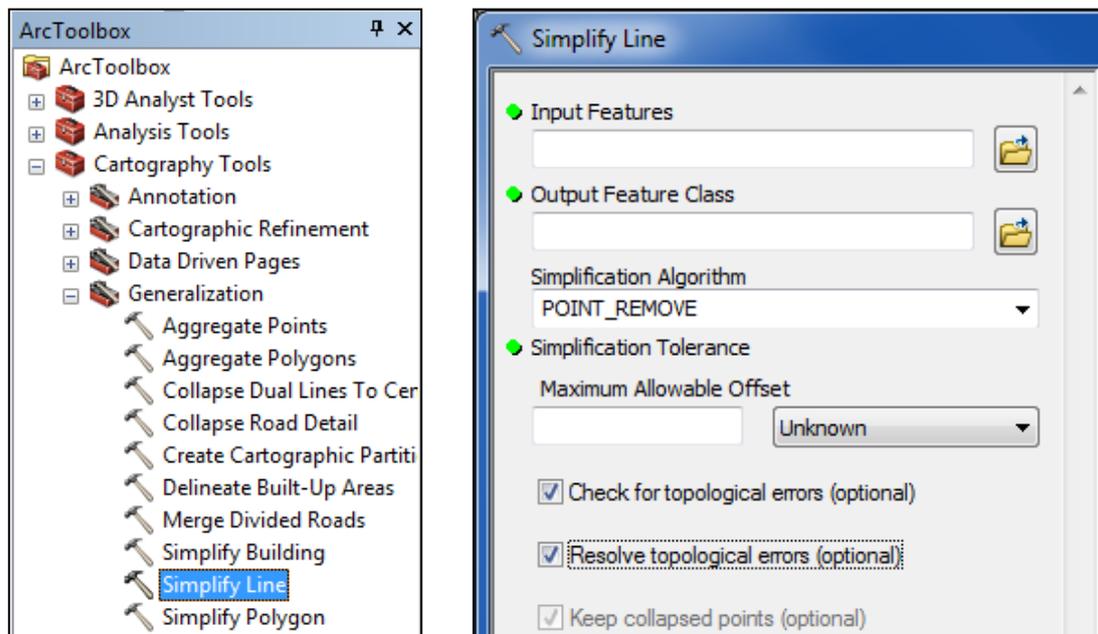
These parameters are appropriate in most cases for medium scale (EBM/ERM). Alternatively, the following parameters might be used:

a) *'Point Remove'* with *'5 Meters'* + *'Bend Simplify'* with *'50 Meters'*
b) *'Point Remove'* with *'20 Meters'* + *'Bend Simplify'* with *'200 Meters'*

In case of very detailed source data, the generalisation may result topological errors. The ArcGIS tool tries to resolve them, but an evaluation of the generalised data is needed. There will remain some issues which cannot be solved automatically, e.g. narrow corridors or cutbacks/needles. Please generalise them interactively.