European River Catchments Version 1.01

December 2006
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Contents

1 Introduction

The purpose of the European River Catchments (ERC) is to provide a homogeneous European catchments dataset at scale 1:1 million that can be used together with the digital topographic data of EuroGlobalMap (EGM).

The European River Catchments were created using as main input the River and Catchment Database for Europe (source: Joint Research Centre) version 2.0, extracting watersheds order 5 (CCM2 wso5). The coastline of the European River Catchments was extracted from the EuroGlobalMap water lines dataset version 1.1 (source: Eurogeographics[1]). Manual editing, based on different national and international information sources, was needed to obtain data consistency with EuroGlobalMap.

Version 1.01 was finished and published in December 2006.

2 Methodology

2.1 Creation of the European River Catchments

The European River Catchments (ERC) dataset was created having as basis three different layers. Primarily, the ERC dataset is composed of the CCM2 wso5 layer (aggregation level 5). In areas not covered by CCM2 wso5, the CCM2 river basins layer was used. The dataset was completed by adding an EGM adjusted coastline and thereby creating coastal catchments areas. This coastline was chosen because it fits with the EGM rivers. The EGM coastline used was defined by a line composed of the EGM attributes: “sea”, “foreshore” and “river” extracted from the EGM layer “water areas”. The coastline was adjusted manually following strict criteria. Catchments areas seawards from the EGM coastline were removed.

In order to ease and speed up the manual editing process the ERC layer was generalized. The line simplification point-removing algorithm (Douglas and Peucker, 1973)[2], within a simplification tolerance of 75 m, was used. In addition it soothes the square appearance of the original CCM2 catchments borders, as they were originally based in a 100m elevation model.

The ERC dataset was now ready to be matched to the EuroGlobalMap river network by manual editing.

2.2 The underlying river network (EuroGlobalMap)

The EuroGlobalMap (EGM) waterline layer contains three kinds of inland waterlines: rivers, canals and ditches. The ERC dataset was, preferentially, adjusted to rivers. Canals and ditches were only

[1] http://www.eurogeographics.org/eng/00_home.asp

[2] Douglas, David H. and Thomas K. Peucker, "Algorithms for the Reduction of the Number of Points Required to Represent a Digitized Line or Its Caricature," Canadian Cartographer, 10, No. 2 (December 1973).

taken into account when these were necessary for the river connectivity and when they made sense as an obvious water line for the catchment concerned.

The EGM waterline layer is complemented by a layer of artificial lines. The purpose of this layer is to provide connectivity for rivers that are interrupted by a lake or reservoir. It also marks the centre of a wide river or maintains the connectivity of a river to the sea through transitional water areas. These lines were taken into account on the same priority level as rivers while editing the ERC layer inland. At the coastal areas the lines were used only as a support and not considered as having a river status.

2.3 Manual editing procedures

The manual editing was done using topology (cluster tolerance of 1 meter) and the following procedures:

1) Help layers: When fitting the ERC borders to the EGM rivers network the following help layers were in mind: a) EGM lakes and reservoirs, when in connection with an EGM river; b) CCM2 river network; c) national catchments borders (when available); d) elevation (Gtopo30 elevation model) and e) the slope of the area (calculated from Gtopo30). The helping layers were prioritized in the mentioned order. Image2000 was sometimes used to check the actual location of the river or water area. Especially, it was used as support in coastal catchments.
2) Digitizing method: The ERC borders were replaced by reshaping or modifying the border or by following the national catchment border. The digitizing was in general done with an appropriate distance between vertices (app. 500 m).
3) Junctions: Relevant catchment border junctions near water line junctions were moved and snapped to the respective water line junction.
4) Water areas inland: When a catchment border crossed a lake or reservoir (water area) the border was moved so it wouldn't intersect the water area. When the lake or reservoir contained a water line junction, the catchments borders were placed inside the lake or reservoir matching the junction. When it was not possible to do so, the involved catchments were merged following the procedure described in number 7). The corrections were done only for lakes and reservoirs that were in connection with an EGM river. Other lakes or reservoirs were ignored.
5) Catchments with no river: When a catchment did not contain any EGM river and did not have any connection to the sea, the catchment was merged with the neighbouring catchment that contained the appropriate EGM river. The appropriate catchment was found using the CCM2 river network and the elevation model Gtopo30. In one case, an inland catchment with no river was preserved since it was visibly not connected to any river.
6) Coastal catchments with no river: Coastal catchments that did not include an EGM river were only changed in the following post-edit processing.
7) River catchments: In some cases neighbouring catchments both containing the same river were merged. These cases appeared, mostly, in coastal catchments. When inland, it was checked if the merge operation would not conflict with the CCM2 level 6 catchment borders. Exceptions to this rule were made and catchments were preserved and not merged even though the EGM river network suggested it. In these cases the EGM river network contained possible mistakes (cases with erroneous water line classification, illogical river connectivity and disconnections in the river network).
8) Big lowland catchments: In few cases, in extremely big flat areas covered only by canals (NL and BE), the CCM2 catchment borders were corrected with high regards on national borders. The catchment borders were only adjusted to the EGM canals when these agreed with the national catchment borders. Some catchments borders in South Eastern Hungary were not changed because of lack of any EGM river or help layers to validate whether the borders were correct or not.

9) Catchments at the coverage border: The EGM river coverage follows country borders closely. This entails that some rivers appear disconnected from the rest of the river network (at the borders of Albania, FYR Macedonia, Bosnia & Herzegovina, Ukraine, Belarus and Russia). In these cases the catchments borders were either, not changed or corrected according to CCM2 rivers and Image2000 as if the whole river existed in the EGM river network.

2.4 Geographic coverage

The ERC geographic coverage is limited by the coverage of the EGM river network. This coverage is equal to EU25 and EFTA countries as well as Croatia, Moldova and Faeroe Islands. The ERC coverage was found by excluding catchments that did not contain an EGM river or touched any EGM river in the countries not included in the EGM coverage. In very few cases (e.g. in Moldova) catchments with no EGM river, that obviously belonged to the same river basin as the adjacent EGM river catchment remained in the ERC dataset. Iceland is not included in the ERC dataset since it was not possible to fit EGM rivers to the CCM data presently available and since no national catchments borders were available (mid June 2006).

2.5 Post-edit processing

As a result of the combination of the several datasets, from which ERC was created, and as a result of the manual editing, the ERC dataset contained a lot of small coastal polygons that did not contain any EGM river. These were cleaned up using the CCM2 river layer as guidance. Some of the small coastal polygons contained a CCM2 river which was obviously connected to an EGM river. These polygons were merged to the relevant catchment that already contained an EGM river. Neighbouring coastal catchments that did not contain or were not connected to an EGM river were dissolved into one coastal catchment for each of the coastal areas where no EGM river existed.

The ERC dataset was checked for correct topology and contains now 8719 polygons. If islands that do not contain any EGM river are excluded, the ERC dataset consists of 5179 polygons.

European River Catchments version 1.01:

Count	8719
Average (km^2)	535
Standard error (km^2)	16
Sum (km^2)	4664026
Max (km^2)	35299
Min (km^2)	0.06

2.6 Attributes

1. River basin name attribute

Catchments with an EGM water line are assigned a river basin attribute showing to which river basin the catchment belongs to. The river basin name is either derived from the main drain or from the attribute with primary national language in ascii (column “NAMA1”) from the EGM feature class “waterlines”. Smaller catchments that did not contain an EGM river with a proper name are assigned the attribute that corresponds to the EGM river network. These attributes are “UNK”, “N_P” and “N_A” which, according to Eurogeographics, refer to “unknown”, “unpopulated” and “not applicable”, respectively. “Unpopulated” is used by EGM when attribute information exist but the EGM data producer did not provide this attribute information. “Not applicable” is used when the attribute values do not apply[3].

[3] http://www.eurogeographics.org/eng/documents/egmspec3-0se.pdf

The catchments that did not contain an EGM river at all are not assigned a river basin name attribute. Except one river basin (in Italy) that was assigned with the name of the lake that it referred to.

2. Basin code

The attribute "Basin code" provides the same classification as the river basin text attribute but as a numeric one, showing a unique code for each basin with a name. The catchments with no basin name are assigned basin code 1.

3. Ocean name attribute

All catchments in ERC are assigned an ocean name (see also Figure 1). The WSCDL0 attribute in the GISCO dataset "wseu10m" was used as a classification guideline[4].

4. Area attribute

This attribute is the calculated area in square kilometres rounded to 2 digits.

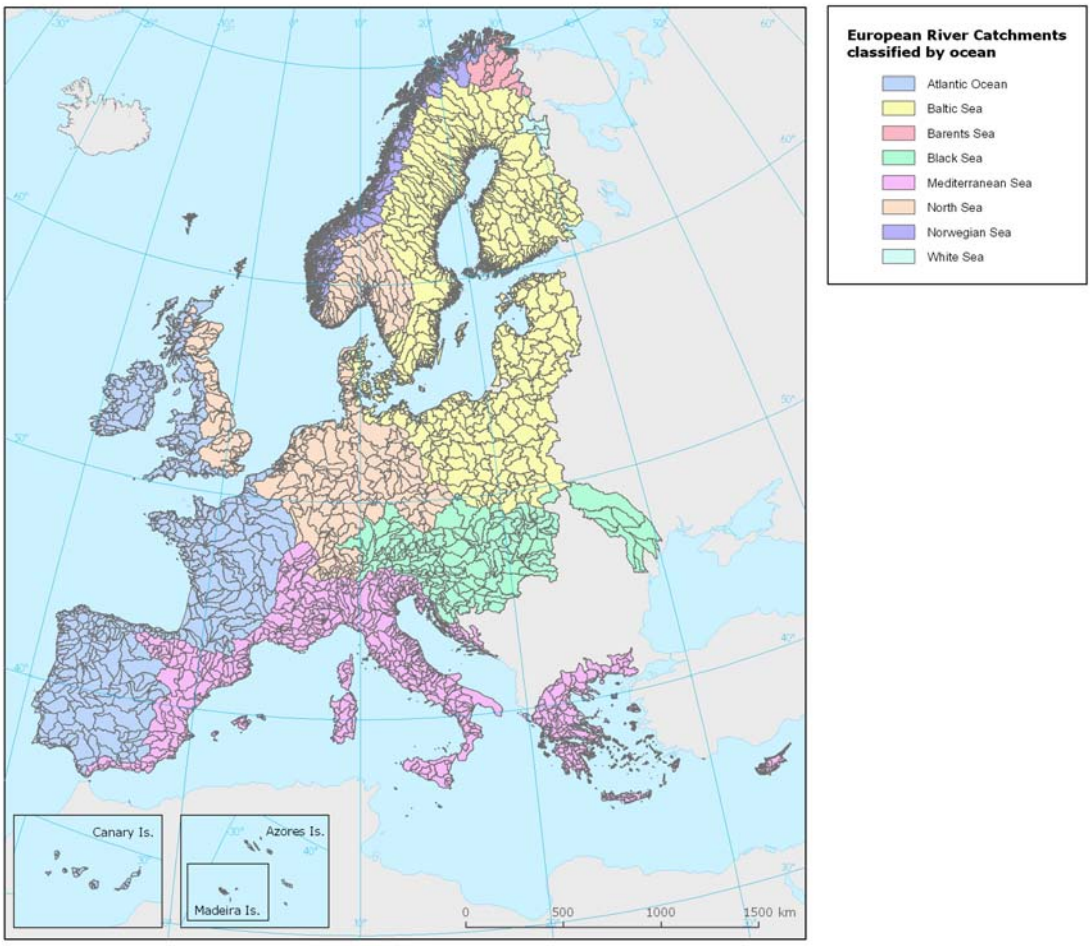

Figure 1 Illustration of European River Catchments classified with the ocean name.

[4] http://eusoils.jrc.it/gisco_dbm/hy/ws/dbm/hyws_dd.htm

2.7 Distribution of areas in ERC version 1.01

Area range (km^2)	Number of catchments
0-200	6383
200-400	513
400-600	294
600-800	200
800-1000	172
0-1000	**7562**
1000-2000	466
2000-3000	239
3000-4000	138
4000-5000	99
5000-6000	61
6000-7000	47
7000-8000	33
8000-9000	10
9000-10000	13
10000-11000	23
11000-12000	5
12000-13000	9
13000-14000	5
14000-15000	2
15000-16000	3
17000-18000	1
18000-19000	0
19000-20000	0
20000-21000	1 (in Germany)
21000-22000	1 (in east border of Poland)
35000-36000	1 (in Moldova)
Grand Total	8719