Homogeneous reach minimum length assessment tool (ML_tool) – User's guide
version 01 (20-01-2025)

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The tool is based on QGIS plugin framework. One needs to install the QGIS software. Please refer to https://qgis.org/ for basic operating instructions.

Prior to beginning the work with the plugin the user should prepare the Homogenous Reach (HR) layer that will be used to calculate the minimum length required for a river reach to be classified as a free-flowing river. Technically it is required that this GIS layer contains at least a name of each river stretch and names of homogenous reaches forming the stretches. It should be prepared in such a way that each HR is represented by exactly one spatial feature in a layer and has been given a unique name. Similarly, all the reaches belonging to one stretch are given the same name, and names of different stretches are unique.

1. Open an empty QGIS project
2. Add the RIVERSEGMENTS layer of your area of interest[1]
3. Add the riv_attr.csv file[2]
4. Install the „Minimum Length tool" plugin [3]
5. Click the plugin icon to open the dialog window
6. Indicate RIVERSEGMENTS, riv_attr.csv and the homogenous reach layers that will be used for calculations.
7. Run the plugin

While running, the tool will prepare the Functional Units layer, process the Homogenous Reaches layer and then perform the calculations of minimum length of a river reach required for a reach to be considered free-flowing.

The Functional Units layer will be based on CCM2 European dataset in agreement with the methodology described in Van De Bundt et al. 2024 (Step 3.4.2, Box 3, Figure 6).

Identification of rivers within the CCM2 database has been done with River Network Toolkit (RivTool v. 2.1.0.0). Functional unit ("FUnit_code") is an aggregate of three values: Strahler stream order (first digit), FCMacHT (second and third digit), River ID (remaining digits). In this way it gives a unique identifier while keeping information about important characteristics of the river functional unit.

Subsequently, Homogenous Reach layer (by default called STRETCH_REACH) will be processed and a new, unique ID for HR's and STRETCHES will be added, and the length of each HR will be calculated.

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[1] River and Catchment Database derived from the Catchment Characterization Model (CCM2.1). https://data.jrc.ec.europa.eu/dataset/fe1878e8-7541-4c66-8453-afdae7469221
[2] One can download it from here: https://doi.org/10.6084/m9.figshare.22730897.
[3] The plugin can be downloaded from https://github.com/kambe507a/MinimumLengthTool

The final layer is returned with calculated metrics:
“MIN_LEN” – indicates the required minimum length for a river reach to be called free-flowing
“IS_FFHR” – indicates whether the reach fulfils the condition of minimum length, provided there are no longitudinal barriers. Value 1 – true, 0 – false, -9 – value could not be calculated.

Although much effort has been made to make this tool operational, as of now the plugin should be treated as a prototype version, which might not be fully functional.

In some cases, the alignment of national river network with the CCM2 river network is not acceptable (usually in a low-relief landscape) and the result may be misleading. In such cases the user should have the possibility to examine those cases and interact with the process. This functionality, however, is not introduced yet.

Other known issues include lack of river course information in the original CCM2 dataset. This deficiency is being overcome by assigning the River_ID attribute with the use of RivTool. It is done by identifying river by maximising its length to source. Therefore, the tool may incorrectly identify the course of particular rivers.

References:

1. Van De Bund, W., Bartkova, T., Belka, K., Bussettini, M., Calleja, B., Christiansen, T., Goltara, A., Magdaleno, G., Mühlmann, H., Ofenböck, G., Parasiewicz, P., Peruzzi, C., Schmitt, K., Schultze, A., Reckendorfer, W. and Bastino, V., Criteria for identifying free-flowing river stretches for the EU Biodiversity Strategy for 2030, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/212220, JRC137919. https://publications.jrc.ec.europa.eu/repository/handle/JRC137919
2. RivTool v2.1.0.0. River Network Toolkit, http://rivtoolkit.com/