Filtration of surface water by ecosystem types - Supply

General description

The Water Filtration Supply indicator represents the amount of nitrogen that is potentially filtered by ecosystems in a given municipality. This ecosystem service is calculated using the InVEST “Nutrient Delivery Ratio (NDR)” model, specifically focusing on nitrogen. A fixed value of nitrogen input is applied to all LULC classes in order to calculate the potential filtration capability as a percentage on the total input. The model uses a mass balance approach, which describes the movement of a mass of nutrients through space. Unlike more sophisticated nutrient models, the present approach does not represent the details of the nutrient cycle but rather represents the long-term, steady-state flow of nutrients through empirical relationships. A detailed description of the model can be found at: http://data.naturalcapitalproject.org/nightly-build/invest-users-guide/html/ndr.html

Input Data

- Land use map
- Biophysical table with data on specific coefficients regarding Land cover/land use (LULC) type, nutrients and water (listed in Table 1 of this document).
- Nutrient runoff proxy, a raster dataset with the yearly average amount of precipitation
- LAU2-NUTS2 boundaries

Calculation process

(1) Prepare Input data for InVEST NDR model

To run the model both raster and shapefile data are required. To avoid errors, it is advised to harmonize the data using the same projection, linear units, and cell size and then snapping the rasters to the DEM.

To obtain the results at the municipal level the Eurogeographics LAU2 Boundary Map was used instead of a watershed shapefile.

(2) Parameters required in the biophysical table

The biophysical table is a .csv table with information on LULC classes and specific nutrient and water coefficients used in the model. For the nitrogen load the standard value of 300 kg/ha was set for all land use classes. For the other coefficients the default values provided by InVEST have been used (See **Table 1**).

Table 1: default and recalculated parameters used in the Biophysical table

Parameter	**Field name**	**Used value**

Nutrient load for each land use	*load_n*	300 kg/ha
The maximum retention efficiency for each LULC class, varying between zero and 1	*eff_n*	Default
The distance after which it is assumed that a patch of LULC retains nutrient at its maximum capacity (in meters)	*crit_len_n*	Default
The proportion of dissolved nutrients over the total amount of nutrients, expressed as ratio between 0 and 1	*proportion_subsurface_n*	Default

(3) Set the other watershed parameters and Run InVEST NDR model

By running the NDR model, choosing the "**Calculate Nitrogen Retention**" option, the N load and N export per municipality are calculated. The model requires additional parameters that can be set before starting the calculation.

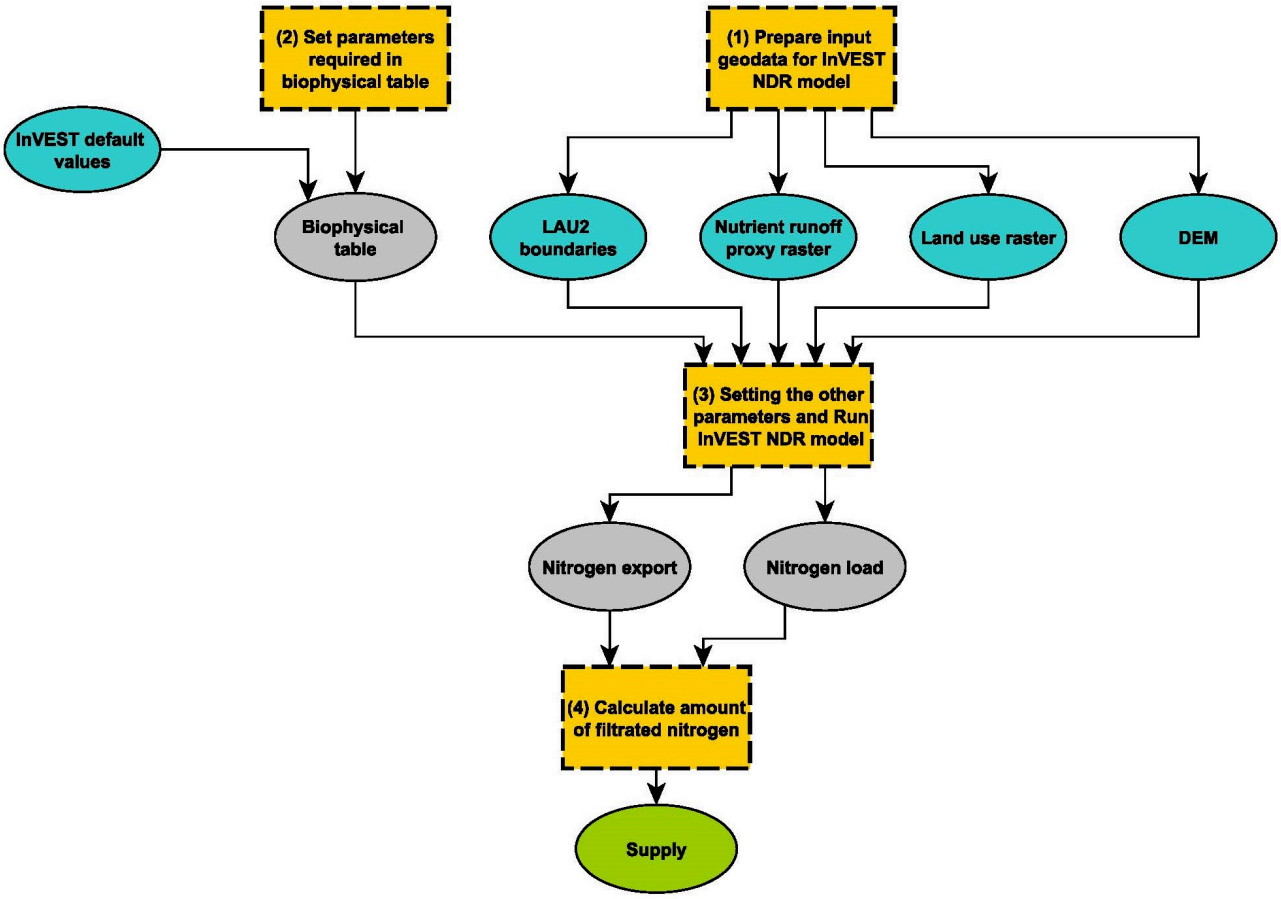
We used the following thresholds:

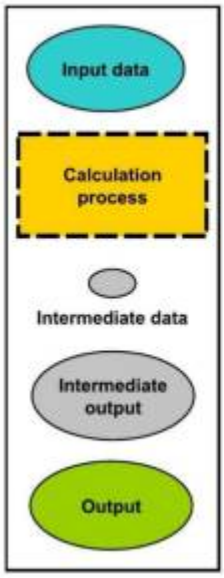
Table 2: Additional parameters required by the model

Parameter	**Threshold**
Subsurface Maximum Retention Efficiency	0.8
Subsurface Critical Length	150
Threshold Flow Accumulation	1000
Borselli k parameter	2

(4) Calculate the amount of filtered nutrients per municipality

The amount of nitrogen that is potentially filtered in a municipality can be calculated from the outputs of the Nutrient Delivery Ratio model by subtracting the nitrogen exported per municipality from the total nitrogen load in the same area. This value is then normalized on the area of the municipality in ha multiplied by 300kg in order to obtain the percentage of Nitrogen being potentially filtered per LAU2 polygon.





Input data→elements that hold a value or a reference to data stored on disk. It is usually a spatial explicit information coming from official sources.

Calculation process→ the actual operation performed on the data. The number preceding the item refers to the number in the model description.

Intermediate data→ for each calculation process intermediate data is generated. This data, however, is usually not significant itself, but is used as an input for the next calculation step.

Intermediate output→ is intermediate data that has a significance for the ES evaluation.

Output→ is the result of the calculation process. It is typically one of the ES indicators, either Supply, Demand or Flow.