



r.green.hydro



## Short description

The model has been developed in GRASS GIS software by EURAC (ESP group) and it is a multi-disciplinary tool that, starting from water availability and elevation data, provides information on hydro potential. Existing plants, different uses of water, mandatory provisions (i.e. the environmental flow, parks, etc...) and technical constrains reduce the number of exploitable rivers. Finally, it is possible to perform an economic analysis. Outputs of the software are several maps depending on the different scenarios used as input.

Mandatory data input:

- Raster file with discharge values along the rivers,
- Raster file with environmental flow,
- Digital terrain model,
- Shape file with existing intakes, reservoirs and hydro plant (ID, capacity, kind of turbines),
- Areas where hydro plants are forbidden.

Optional data input:

- Lakes, streets, weirs, electricity grid, parks, area of particular interest,
- Geologic and soil map, cadastre map,
- Duration curves, maximum distance between intake and restitution, minimum distance between restitution and the following dam, increasing of environmental flow.

Output data:

- Theoretical and technical potential along rivers,
- Different shape files of potential depending on recommendations (i.e. exclusion of some areas, different length of the conduit, increasing of environmental flow, etc...),

- Estimation of the cost for new plants,
- CO<sub>2</sub> emission map and data.

### **Renewable energy type(s)**

Hydro-power

### **Main objective(s)**

In the last decades, the importance of renewable energy is increasing in order to mitigate carbon dioxide emissions and to reduce the fossil fuel dependence of European Member States (Directive 2009/28/EC). In the Alpine region, the main renewable energy actually used is hydropower. On the other hand, one of the priorities of the Water Frame Directive (Directive 2000/60/EC) is the water protection. The software r.green.hydro considers legal, technical, economic and sustainable principles of both the directives in order to evaluate the residual potential of rivers under different scenarios.

### **Target group(s)**

Administrators, planners, designers

### **Operating site(s)**

Mis and Mae valley (Regione Veneto), Gesso and Vermenagna valleys (PNAM).

### **Experiences / best practise examples**

The model is mainly used in two pilot areas: the Mis and Mae valleys in the north east of Italy and the Gesso and Vermenagna valleys in the north west of Italy. Different scenarios are performed with several inputs provided by the questionnaires submitted to the local experts. Outputs of the module r.green.hydro are maps with energy production and relative costs. The maps are discussed in several meetings with stakeholders in order to plan the area through a participative approach. The module is also used by ARPA and Eaux Valldoitanes for the Regione Autonoma Valle d'Aosta, they are not partner of the project but they are interested in testing r.green model.

### **Data source**

Data were provided by local or regional administrators from pilot areas.

### **Responsible Partner(s)**

EURAC

### **Stakeholders involved (if applicable)**

Administrators, planners, local associations, citizens

### **Contact person(s)**

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