WP4.4

Cordevole MCA alternatives description

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Summary

SHORT DESCRIPTION
This document contains the description of the MCA application to a little torrent included in the Cordevole river basin pilot case study area. A mini-hydro power plant has already been installed on this stream, named Rio Cordon, but a different plant configuration to improve energy production, and the possibility of a second HP plant installation are considered.

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Introduction

The Cordevole river basin is almost completely included in the upper part of the Belluno Province. The territory is mainly mountainous, and an important hydroelectric exploitation of the water resource began in the early 1900 with the construction of large dams and the creation of big reservoirs along the Cordevole main reach. The recent HP industry development ha touched the minor tributaries, with the increasing construction of small and mini HP plants.
Regarding the Cordevole pilot case study, the MCA will be applied to one of this mini HP plants, installed on a little torrent named Rio Cordon.

Existing structures on Rio Cordon

The torrent Rio Cordon is a tributary of the torrent Fiorentina, which is itself one of the main tributaries of river Cordevole. Its hydrographic basin is about 7 km^2. The altitude ranges from 2748 m a.s.l. and 1763 m a.s.l., with a medium value of 2200 m a.s.l..

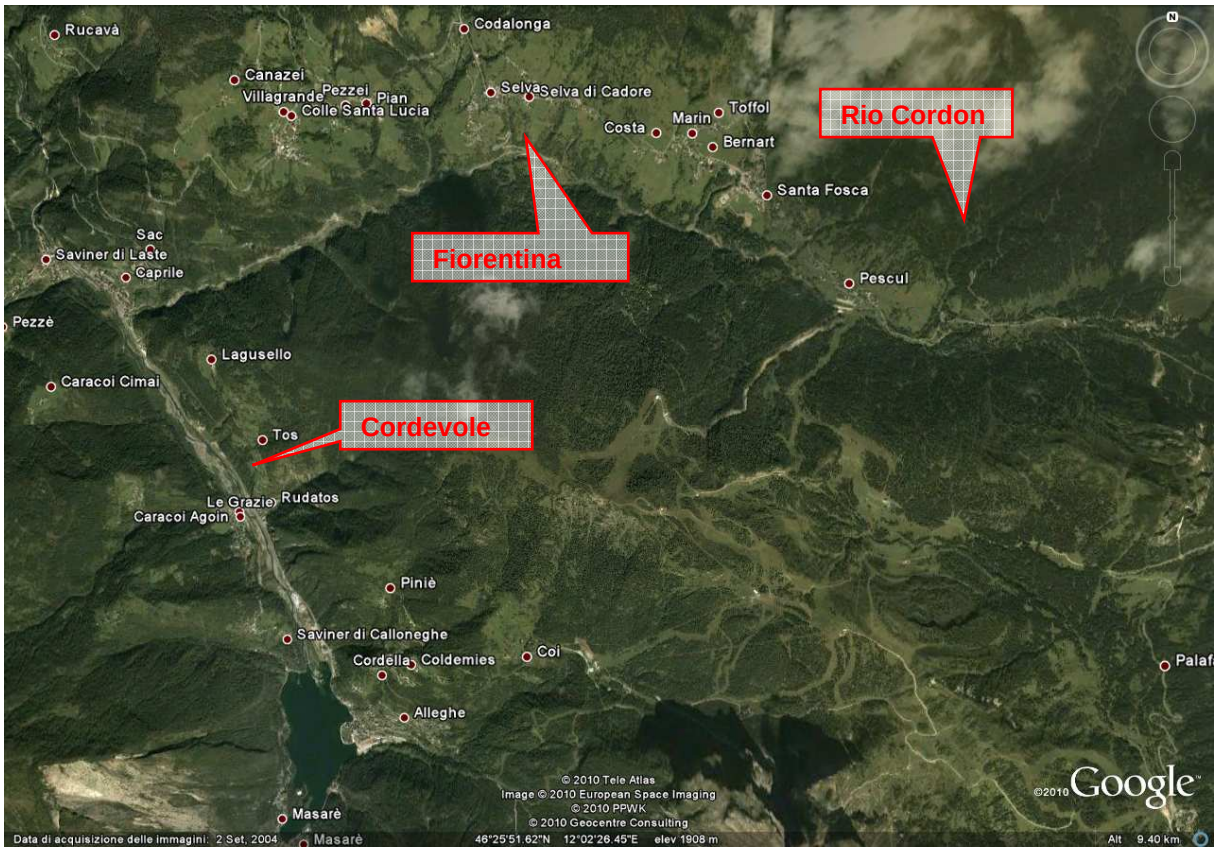

Figure 1: Overview of Rio Cordon connection with torrent Fiorentina and river Cordon

On the Rio Cordon there is a mini-hydro power plant, installed and managed by Consorzio BIM GSP S.p.A., which is a subsidiary company created by 67 Municipalities of the Belluno Province. This HP plant is placed at the altitude of 1638.70 m a.s.l., while the power plant is placed at the altitude of 1468.00 m a.s.l.. The difference in height at disposal for energy production is therefore 170.70 m. The maximum discharge that can be withdrawn is 0.195 m^3/s, the medium is 0.115 m^3/s. Consequently, the maximum plant power is 238 kW, and the medium is 191 kW. The annual production potential is 1'150'000 kWh.
This mini-hydro power plant is not the only structure present on the Rio Cordon. A few hundreds meters upstream, in fact, there is a solid discharge measuring station managed by ARPAV. This station is represented by a big concrete structure in which the solid transport stops and can be quantified. Beside solid discharge, also water discharge and several physical-chemical parameters are monitored. This monitoring station is located at the altitude of 1763 m a.s.l.

Figure 2: BIM HP plant intake. The water abstraction work is made of a grid placed on the top of the check dam.

Figure 3: BIM HP plant intake: detail of the grid on the top of the check dam.

Figure 4: ARPAV's solid discharge measuring station (upstream part)

Figure 5: ARPAV's solid discharge measuring station (downstream part)

Alternatives description

The MCA will be applied to different hypothesis of energy production improvement on the upper reach of Rio Cordon. Starting from the consideration that the ARPAV's monitoring station represents a remarkable discontinuity of torrent longitudinal development, one can consider the exploitation of this structure for energy production. Three hypothesis about the use of this existent barrage have been considered, and are described on the following.
Four Alternatives will be considered:

1. ALTERNATIVE 0: Current BIM HP plant configuration

2. ALTERNATIVE 1: Dismantling of the existent HP plant intake and construction of a new one immediately downstream the ARPAV's measuring station, in order to exploit an increased difference on height (124.3 m + 170.7 m = 295 m). The withdrawn discharge should however be consequently reduced. This alternative is named "new HP plant", and it is based on the idea that in the upper zones of the mountainous basins, withdrawing a smaller discharge with an increased difference in height will bring more or less the same energy production, but the environment will be less damaged, since lateral water contributions from hills and mountains slopes are significant.

3. ALTERNATIVE 2: Keeping the existing HP plant, but building a new HP plant with the intake immediately downstream the ARPAV's measuring station, and the release just upstream the existent power plant. This alternative is named "two in line HP plants", and considers an improvement on energy production, with the employment of a new torrent reach which currently is not concerned by water withdrawal. However this reach is included between two artificial structures which represent remarkable stream discontinuities for biological communities. The basic idea is the possibility of gaining energy production without worsening the current situation which is already noticeably influenced by the presence of the existing structures.

4. ALTERNATIVE 3: Keeping the existing HP plant and building a new HP plant with the intake immediately downstream the ARPAV's measuring station, and the release at the same height of the existent power plant. This alternative is named "two parallel HP plants", and is similar to Alternative 2 for what concerns the environmental aspects. It may be sensibly different from the economic point of view, and this aspect also will be analyzed inside the MCA application.