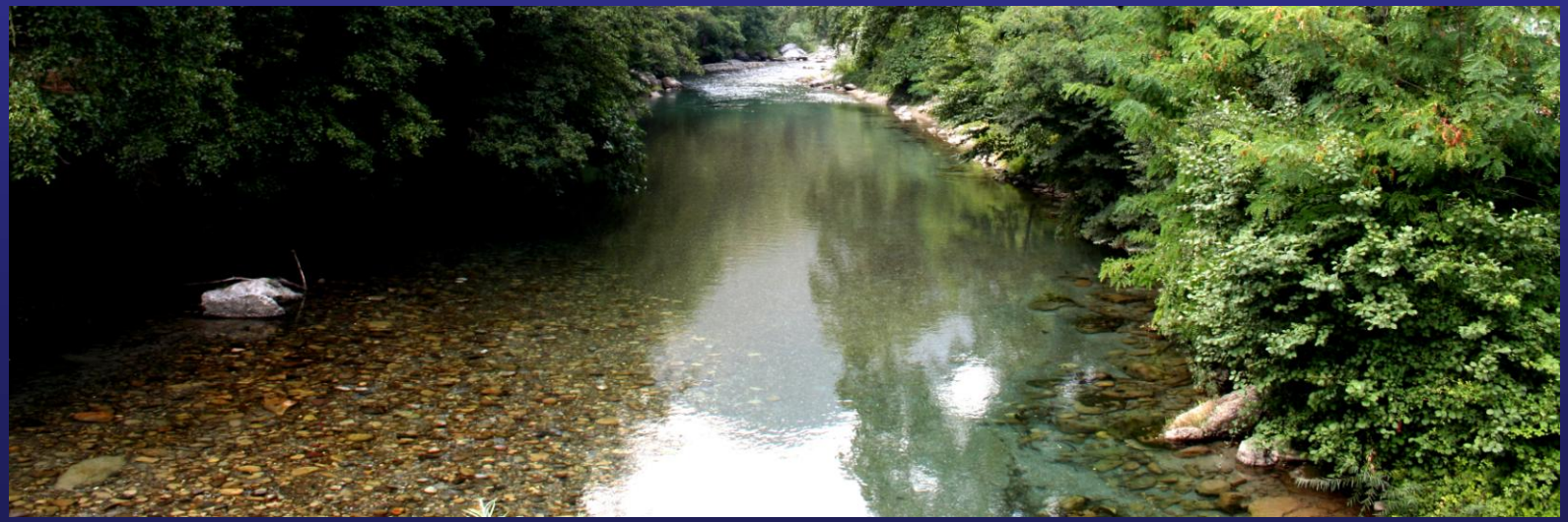
BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

WATER



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BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water (river, lakes and ground waters)

All the information for the characterization of this environmental component come from bibliographic data and from hydraulic and hydrogeologycal researches executed for project, and even less from field data collected during the field inspection.

Once characterized the area and defined every single river, water-course and water-bed we can provide to identify more sensible areas (flood areas, high permeability areas, karst areas) and more significative impacts whether during construction or during operation.

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water

Here we have a list of some of the potential impacts for the water environmental component during construction:

- **Change in the streamflow;**
- **Direct interference with water-courses;**
- **Change in water quality;**
- **Change in percolation;**
- **Direct interference with water-bed;**
- **Change in piezometric level of the water-bed;**
- **Change in water quality of the water-bed.**

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water

Here we have a list of some of the potential impacts for the water environmental component during operation:

- **Change in piezometric level of the water-bed;**
- **Change in the streamflow;**
- **Change in water quality of the water-bed.**

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water

- **Change in the streamflow**

These effects can be due to the felling of plants, changing in plants cover of the ground, changing in permeability of the ground, and changing of the slope

- **Direct interference with water-course**

We can have a direct interference with a water-course when, during construction, for example, we build a ford in the water-course

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water

- **Change in water quality**

Oil spill during construction near or in the water-course (bridge), oil spill in a construction site with waterproof surface and drainage water equipment

- **Change in percolation**

Like for the change in the streamflow, these effects can be due to the felling of plants, changing in plants cover of the ground, changing in permeability of the ground, and changing of the slope

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water

- Direct interference with water-bed
- Change in piezometric level of the water-bed
- Change in water quality of the water-bed

Underground structures (like tunnel) can cause direct interference with water-bed and changing in piezometric level (raising with barrier effect and drawdown with drainage effect) particularly in alluvial plains and alluvial cones;

Excavation operations cause loss of lithologic cover over the water-bed with contemporary loss of the self depuration capability of the percolation;

The construction of underground structures (like tunnel) in karst unit with high permeability, determine new fractures system that will cause an increase of the permeability of the karst system and new drainage ways with changing (reduction) in the capacity of the water-bed to store up percolation.

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water – Critical areas

- **Alluvial cone**

Presence of superficial water-bed;

Presence of water-course with high flow;

High permeability

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water – Critical areas

- **Alluvial valley**

Presence of superficial water-bed;

Presence of water-course with variable flows;

High permeability;

Presence of flood areas

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

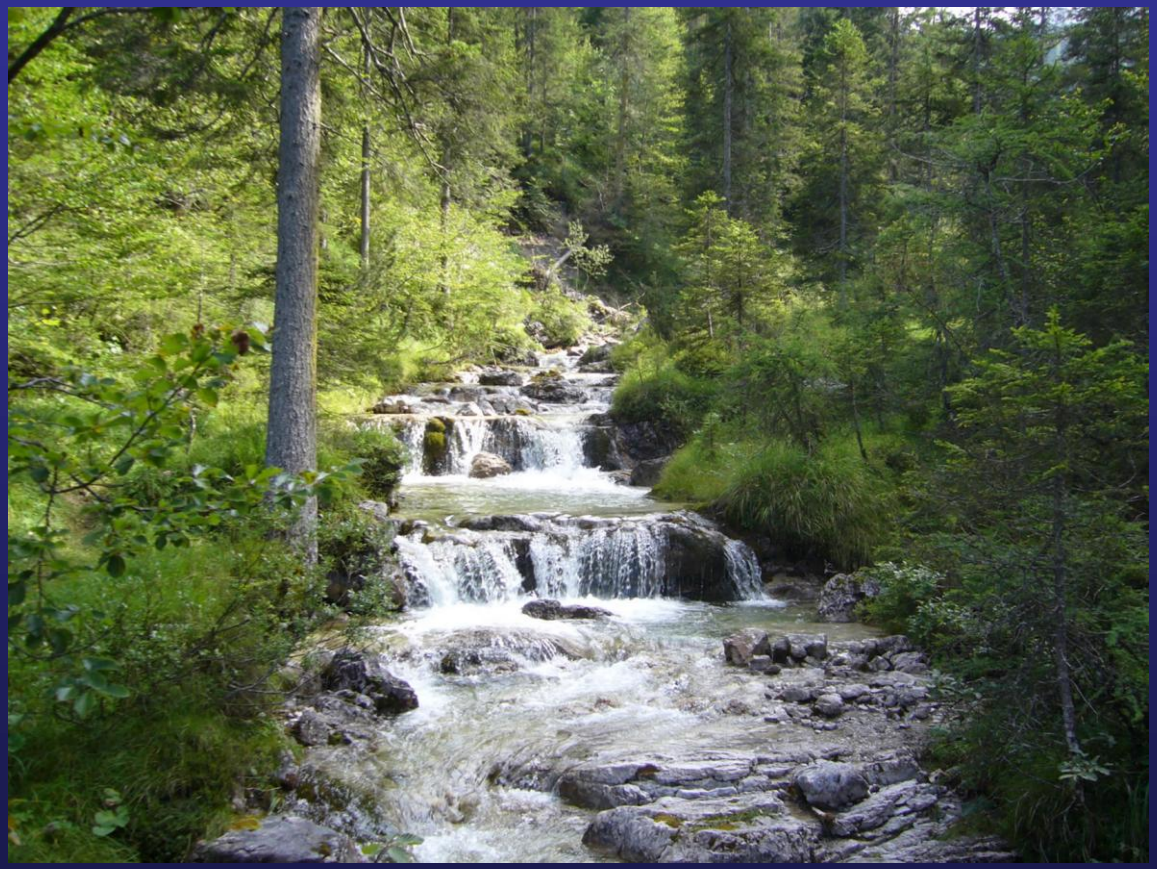
Water – Critical areas

- **River / water-course**

Changing in flow;

Changing in slope;

Changing in water quality



BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water – Mitigation measures

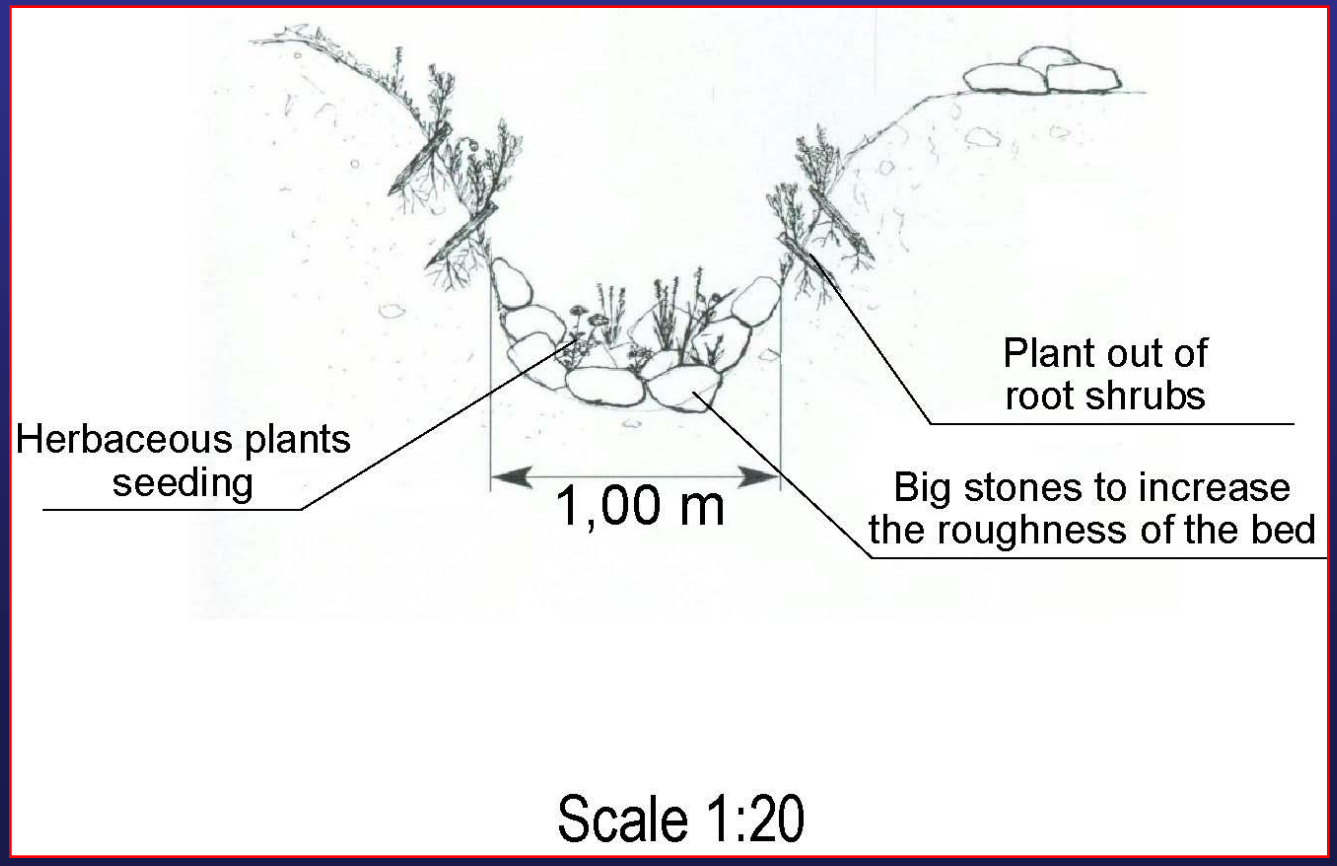
Here we have some examples of mitigation measures for environmental component "Water" and some examples of environmental restoration for water course:

- **green stones gutter;**
- **logs and stones dam;**
- **green bleachers.**

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water – Mitigation measures

- **green stones gutter**



APPLICATIONS:

For catchwater drains on the boundary of the construction site or in definitive configuration

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water – Mitigation measures

- **green stones gutter**

BENEFITS:

The benefits resulting from the application of this type of mitigation are represented by an immediate reduction of the erosive action of the water and by a pleasant environmental insertion of the hydraulic structures

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

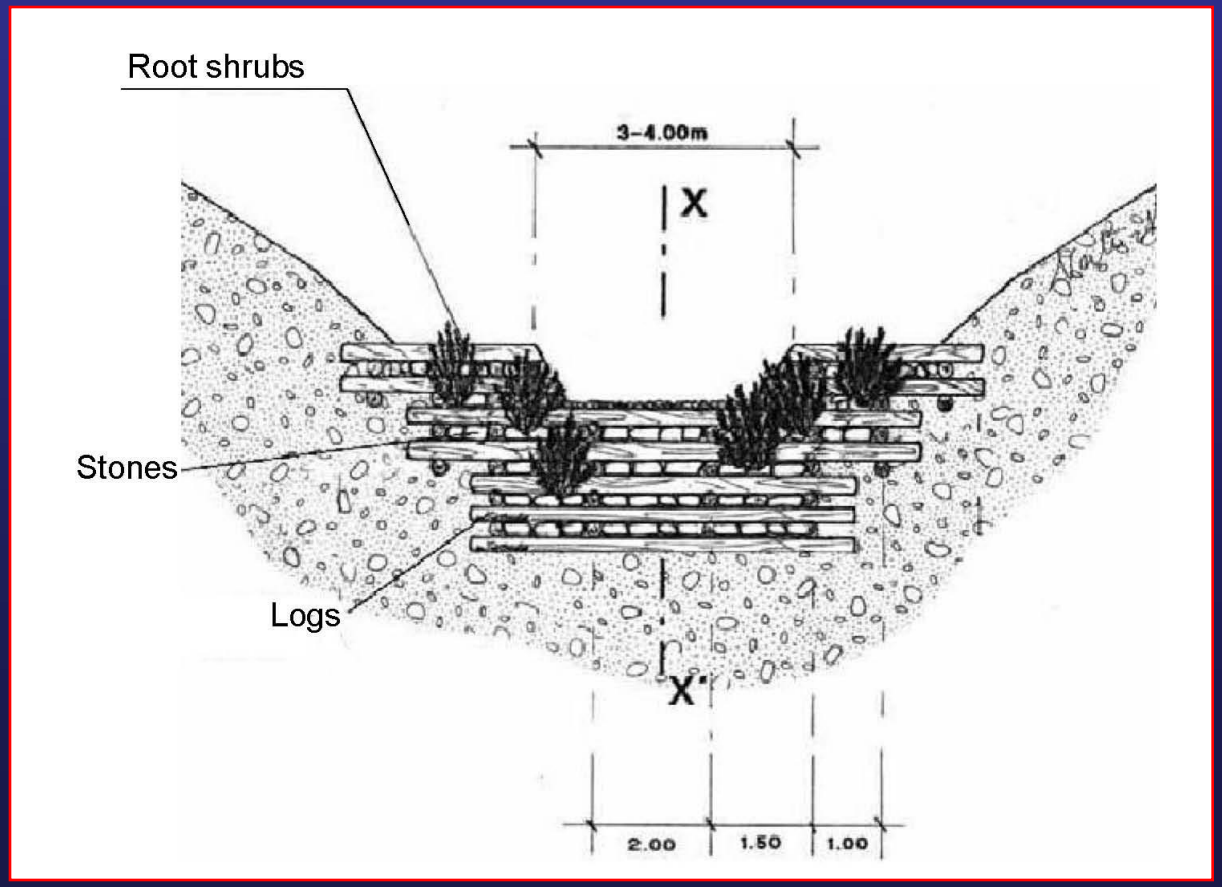
Water – Mitigation measures

- **green stones gutter**

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water – Mitigation measures

- **logs and stones dam**



APPLICATIONS:

Final settlement of water-course (mitigations and compensations)

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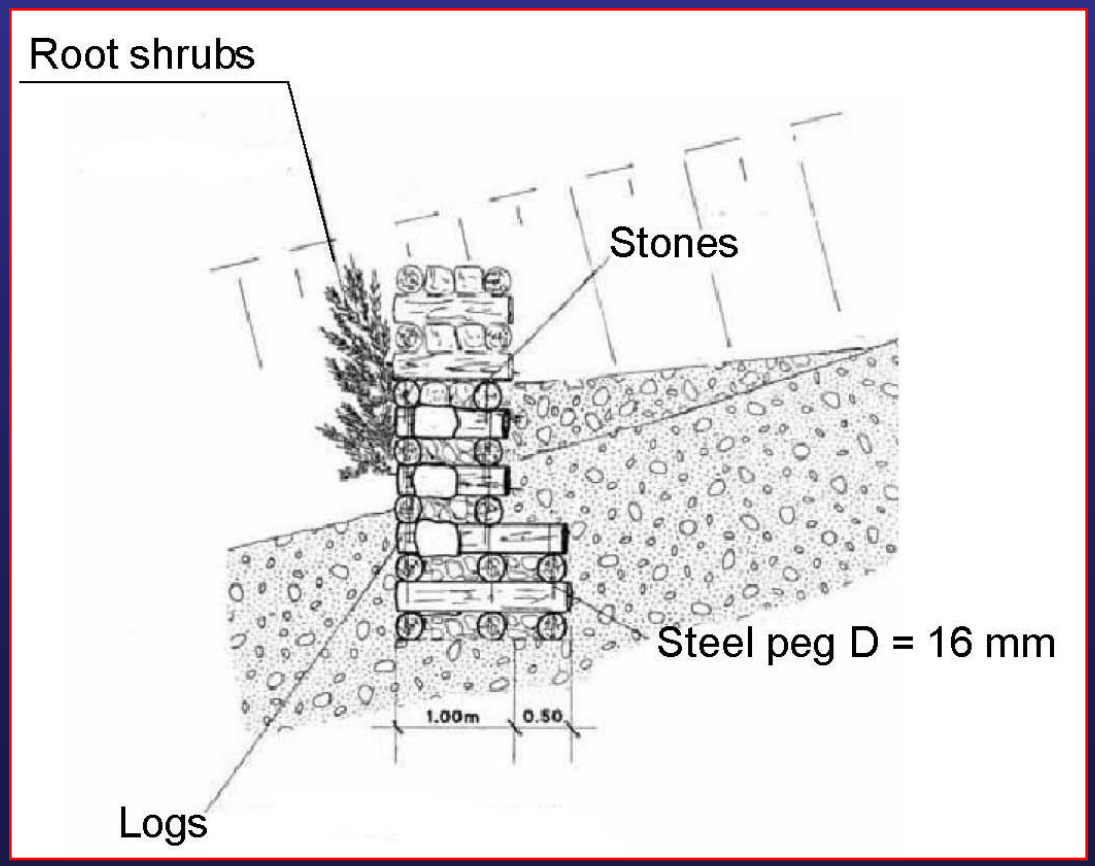
Water – Mitigation measures

- **logs and stones dam (section x-x')**



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Water – Mitigation measures

- **logs and stones dam**

BENEFIT:

Substitutive works of concrete little dam;
They are works that can be built whit logs and stones recovering on site

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

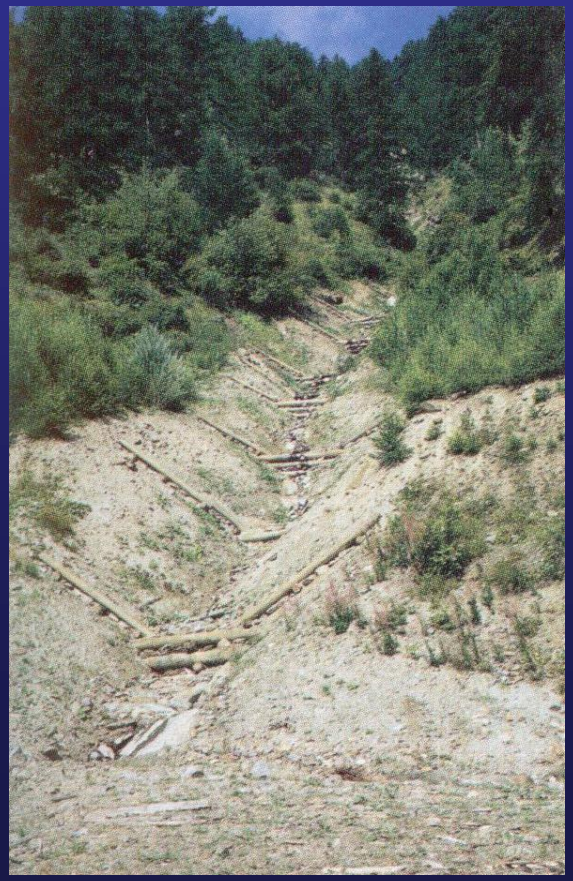
Water – Mitigation measures

- **logs and stones dam**

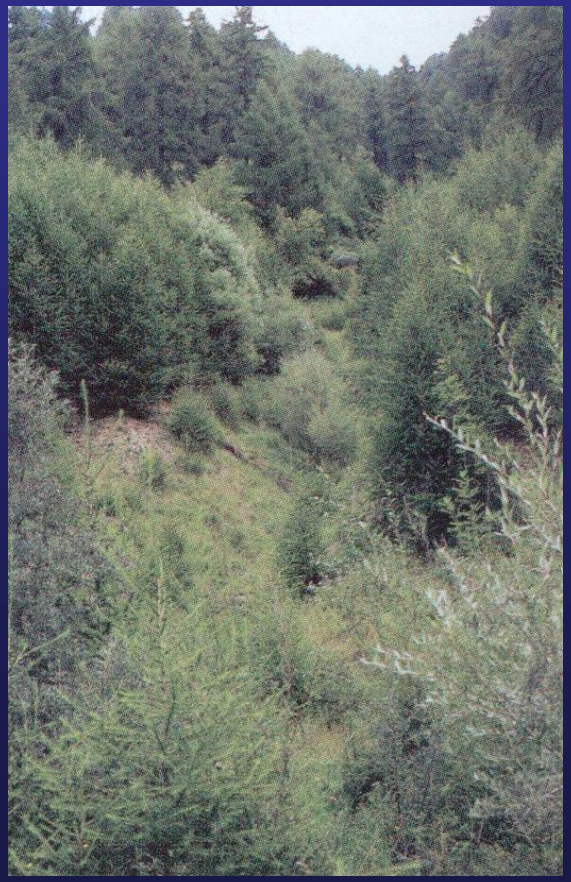
BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water – Mitigation measures

- **logs and stones dam**



Just done



After 10 years

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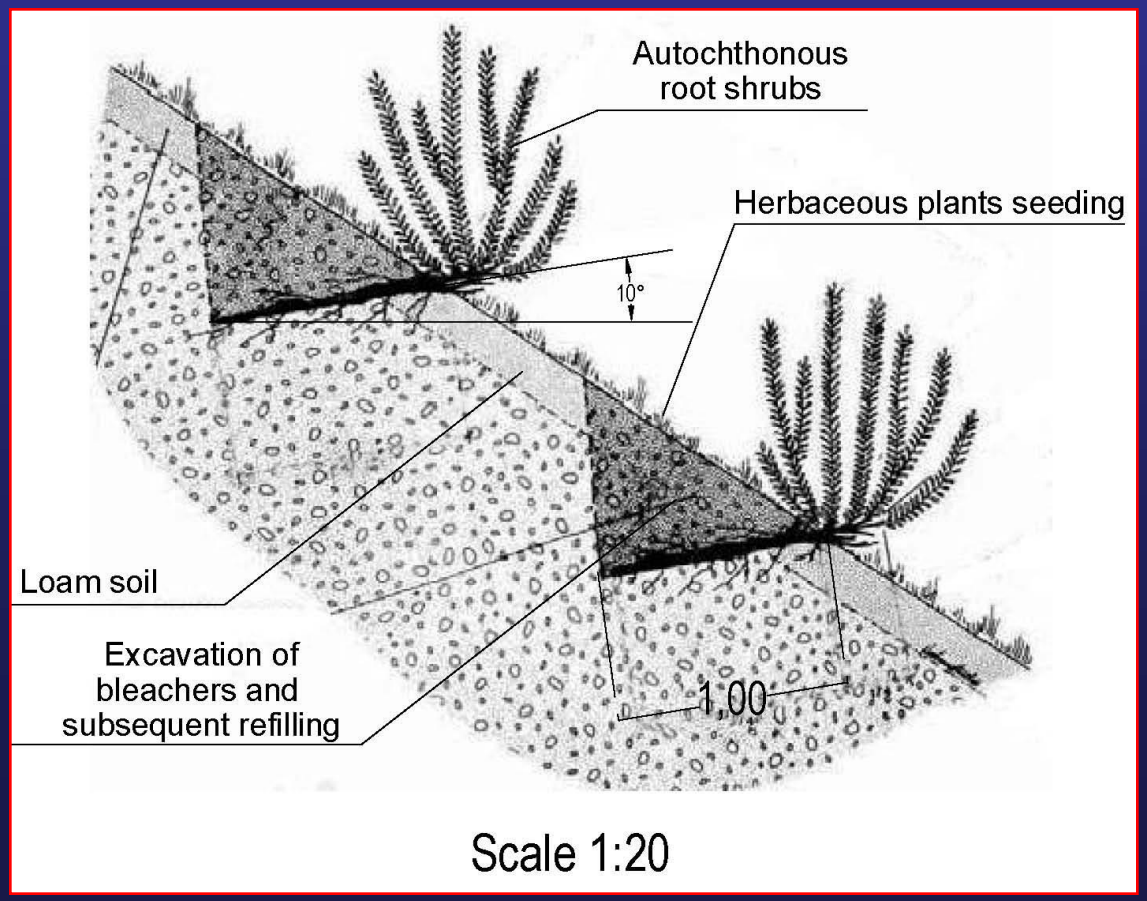
Water – Mitigation measures

- **green bleachers**



APPLICATIONS:

Restoring of bank side of water-courses interfered during the construction

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water – Mitigation measures

- **green bleachers**

BENEFITS:

Deep root with drainage effect;

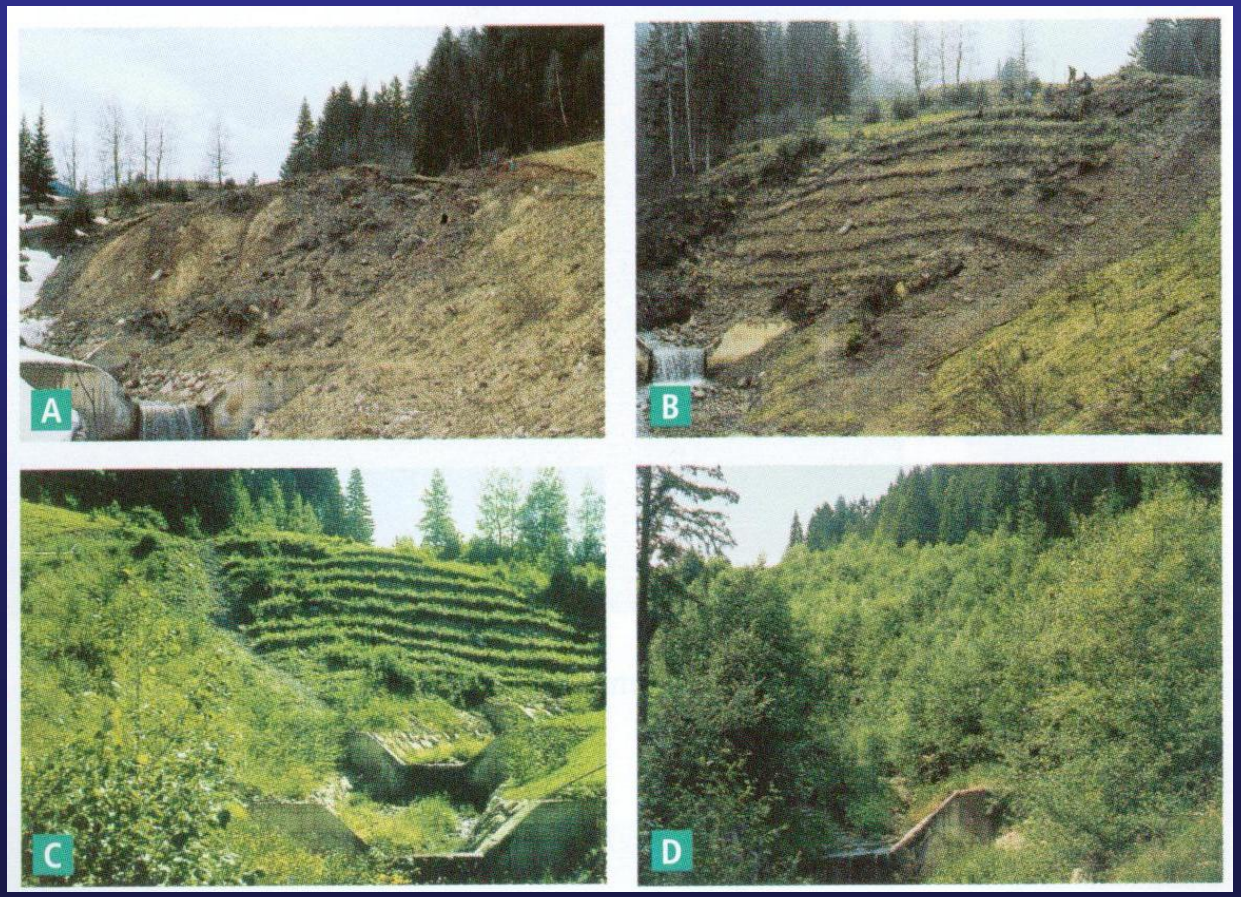
Reduction of the erosion and creeping;

Immediate consolidation of the ground by root shrubs

BIOLOGICAL AND PHYSIO-CHEMICAL IMPACTS

Water – Mitigation measures

- **green bleachers**



A) Begin conditions

B) Just done

C) After 6 months

D) After 9 years