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Geoethics in water management – Resources for higher education (GOAL Project framework)

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The recognition of the Human Right to Water and Sanitation by the United Nations General Assembly in 2010 marks a major symbolic and legal milestone. The United Nation's Sustainable Development Goals (UN SDGs) incorporate the different interests of society. In combination with limited resources conflicts of interests are inevitable. Competing interests of different stakeholders concerning water and land-use management are particularly big drivers of conflicts in this field. Also the personal daily behaviours of its individuals influences the water and energy consumption of whole society.

An essential baseline to achieve societal goals related with water might be the implementation of coherent environmental policies. Transnational implications of e.g. large water-infrastructure projects bring additional complexity to decision making processes. The Implications of climate change on water management add another layer of uncertainty.

Professionals with a higher education in geosciences are at the heart of humankind's attempts to deal with all of this issues. They are not only supposed to hold technical expertise, but also understand their responsibilities. A modern education of the students in geosciences therefor has to account for this challenges. Geoethics is capable of providing the theoretical background on this challenges.

The GOAL project (Geoethics Outcomes and Awareness Learning) aims in general at improving the concepts and practices of Geoethics and specifically to provide educational material (a syllabus and complementary educational resources) to be used in higher education. From the wide range of geoethical issues related to water management, two cases were chosen to introduce students to the concepts of Geoethics. The water supply system of Austria's capital Vienna serves as a starting point to deal with questions like utilization pressure on water and land. An historic dam that is now used for production of "green" electric energy via hydropower, sets the frame for the discussion about the impacts of hydropower on the riverine ecosystem.

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Geoethics in water management

Resources for higher education



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Declared Aims and goals of humanity (in water management)

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- Human right to Water and Sanitation 10th Anniversary (UN – General Assembly 2010)
- 5 years of Sustainable development goals (UN Sustainable Development Summit 2015)



SUSTAINABLE DEVELOPMENT GOALS



Realization of these goals

- The Sustainable Development Goals incorporate the different and contrasting interests of society
- Resources are limited

**conflicts of interests
are inevitable**

- Implications from climate change research add to complexity and uncertainty

The people working on this realization

Professionals with a higher education in geosciences:

- are at the heart of the processes to achieve these goals
(Engineers, scientists, consultants and advisers, ... people affected)
- will face dilemmas and issues during their (work)life
- should also get training on how to deal with them
- Geoethics provides a theoretical background on this challenges
- The GOAL-Project provides education material for students

Geoethics Outcomes and Awareness Learning

- Cofunded by the ERASMUS+ Programme
- Six partners from universities in Portugal, Austria, Israel, Italy, Lithuania and Spain
- developed a geoethics syllabus
- offers suggestions for 11 Educational Ressources
- E(hand)book

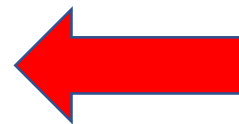
GOAL – Educational Resources





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- Introduction to Geoethics
- Geoethics and geological risks
- Geoethical aspects of georisks within field trips
- Geoethical values in a UNESCO Global Geopark
- Geoethical aspects of geoheritage within field trips
- Geoethical aspects of Georesources
- Aspects of georesources within field trips
- A geoethical conflict in fossil sites
- Geoethical aspects of hydropower plants
- Earth system nexus human interaction: a geoethical perspective
- Geoethical aspects of water supply



  <p>GOAL Educational Resource</p>	
AUTHORS	Günter Langergraber (BOKU, Austria), Sebastian Handl (BOKU, Austria), Susanne Schneider-Voll (BOKU, Austria) & Markus Fiebig (BOKU, Austria)
TITLE OF THE CASE	Geothermal aspects of hydropower plants
SHORT CASE DESCRIPTION	Hydropower is a renewable source of energy that is considered widely as "green" energy. However, hydropower (e.g. dams) has geothermal conflicts and also a small hydropower plant a
KEYWORDS	Geothermal aspects; Hy management.
PRIOR KNOWLEDGE	Basic ethics; Riverine ecosystem
AIM	Critically reflect and discuss sources in an ecosystem; dilemmas that arise when
OBJECTIVES	<ul style="list-style-type: none"> To analyse the ecosystems and the To understand the conservation. To know about the process. To become aware of hydropower. To evaluate the impact resource. To predict how the demands in less for
CASE	Hydropower is a renewable source for "green" energy to produce hydropower has
  <p>GOAL EDUCATIONAL RESOURCE</p>	
AUTHORS	Sebastian Handl (BOKU, Austria), Günter Langergraber (BOKU, Austria), Susanne Schneider-Voll (BOKU, Austria) & Markus Fiebig (BOKU, Austria)
TITLE OF THE CASE	Water: a geoethical perspective on one of humanities most valuable resource
SHORT CASE DESCRIPTION	The water supply for the Austrian capital Vienna is used as case-study and starting point to discuss geoethical implications on several aspects involved with the use of the renewable resource water. Geoethical conflicts and dilemmas are addressed that arise from the utilization pressure on the resources water and land use.
KEYWORDS	Geoethical aspects; Holistic thinking; Natural resources; Water management; Water supply.
PRIOR KNOWLEDGE	Basics of sanitary engineering; Water management; Water supply.
AIM	Promotion of geoethics values and principles related to the human interaction with the water cycle through the reflection about water as a major resource of life.
OBJECTIVES	<ul style="list-style-type: none"> To analyze geoethical issues and dilemmas connected with water supply on two different spatial scales (local and global). To understand the need to preserve natural systems and its dynamics when designing interventions on the environment. To defend the involvement of all stakeholders in the decision-making process. To contrast the objectives of different sectors with interest in water use. To support Geoethical values to preserve a functional environment as the fundamental basis for renewable resources as drinking water. To value public awareness of geoscientific work.

Geoethical aspects of hydropower plants

- Hydropower is widely considered green energy
- But numerous impacts on river ecosystem by the necessary infrastructure

Students will:

- Learn effects of hydropower plants on river ecosystems by studying of scientific papers (Flow Alteration, Hydropeaking, River connectivity Habitat fragmentation,...)
- Learn about geoethical values (ethical, social, cultural) and the principle of responsibility



Geoethical aspects of hydropower plants

Questions the students will work on:

1. Which are general impacts of dams on riverine ecosystems?
2. What are the stakeholders to be involved in the planning of a hydropower plant?
3. What geoethical conflicts and dilemmas are linked to hydropower plants?
4. Can all conflicts be solved to satisfy all stakeholders? How?
5. Which technical measures can be implemented at sites with hydropower plants in general and at the presented case in particular to improve the riverine ecosystem?
6. How to deal with the resulting dilemmas?
7. How to sustainably preserve water so future generations can benefit from this natural resource?



GOAL – Educational Resources

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Geoethical aspects of water supply

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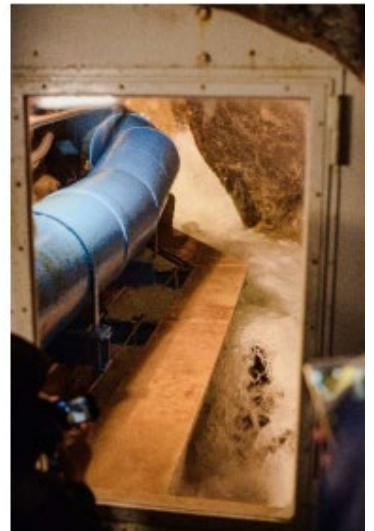
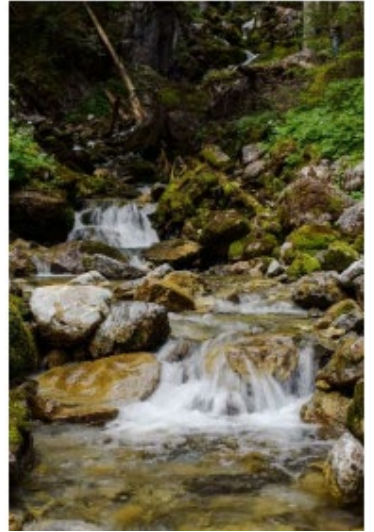


Geoethical issues and dilemmas resulting from

- utilization pressure on water and land are addressed on a local scale
- daily personal behavior and consumption are addressed on a global scale

Students will:

- Learn about the importance of natural systems for water supply
- Learn about the concepts of virtual water and waterfootprint
- Learn about geoethical values (ethical, social, cultural) and the principle of responsibility



Geoethical aspects of water supply

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Questions the students will work on:

1. Which geoethical issues and dilemmas arise from different interests in land use?
2. How do changes in land use affect water resources?
3. How geoethical values can be met by the operation and management of the catchment area of the springs?
4. Which geoethical values are met by the Water Footprint Network?
5. Which Sustainable Development Goals have a strong impact on water supply management and may also pose a (partly) conflict of interests to SDG-6?
6. Which geoethical issues and dilemmas are related with the achievement of the different SDGs and their linkage?
7. How can Earth Scientists be involved in the process of achieving the SDGs related to water management?
8. Explain how geoethical values support geoscientists in their role in the process of achieving the SDGs.





All materials:

Geoethics syllabus

E(hand)book (Teaching Geoethics)

11 Educational Ressources

are (soon) freely available at

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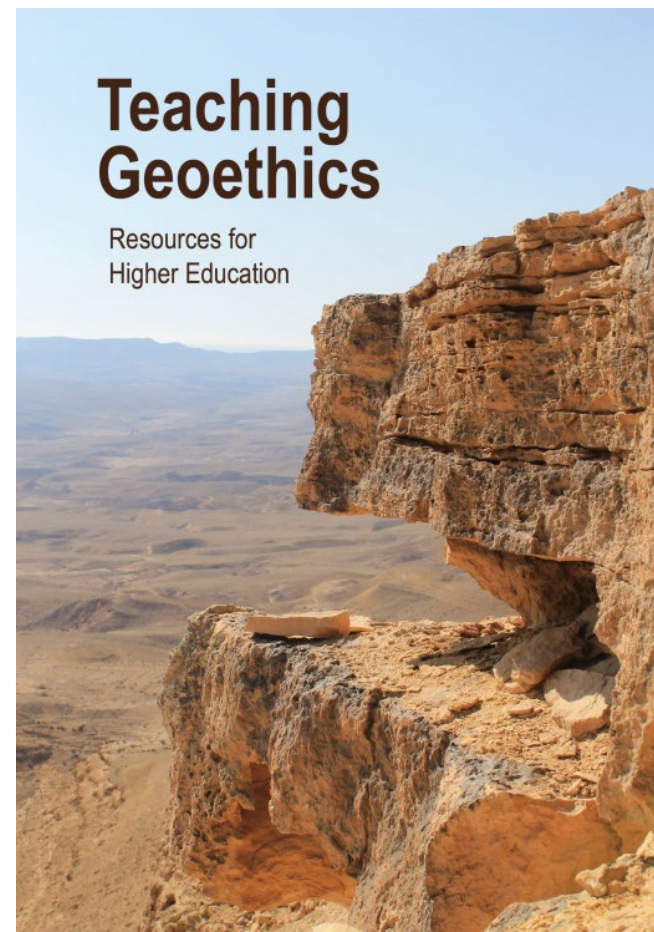
Vasconcelos C., Schneider-Voss, S. (Eds.):

Teaching Geoethics –
Resources for Higher Education.

Universidade do Porto, Portugal;
ISBN 978-989-746-254-22.

will be available soon from:

www.goal-erasmus.eu



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