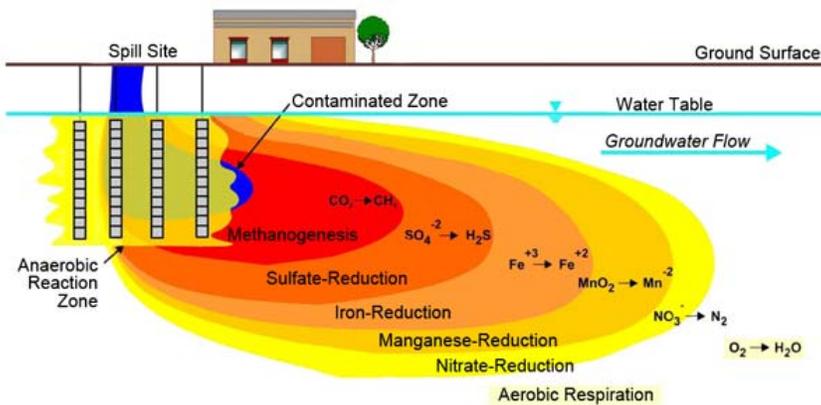
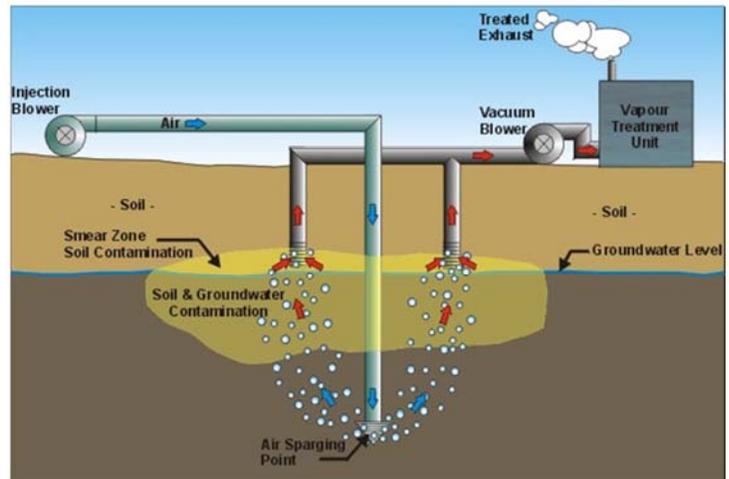
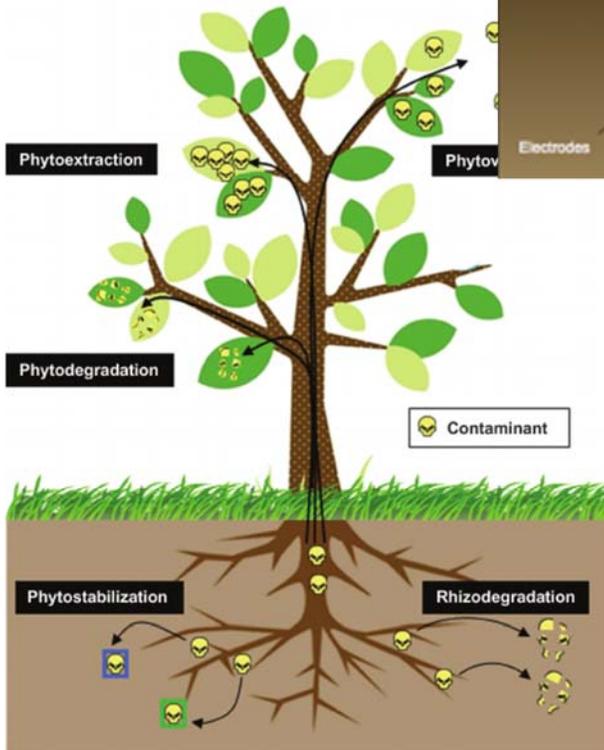
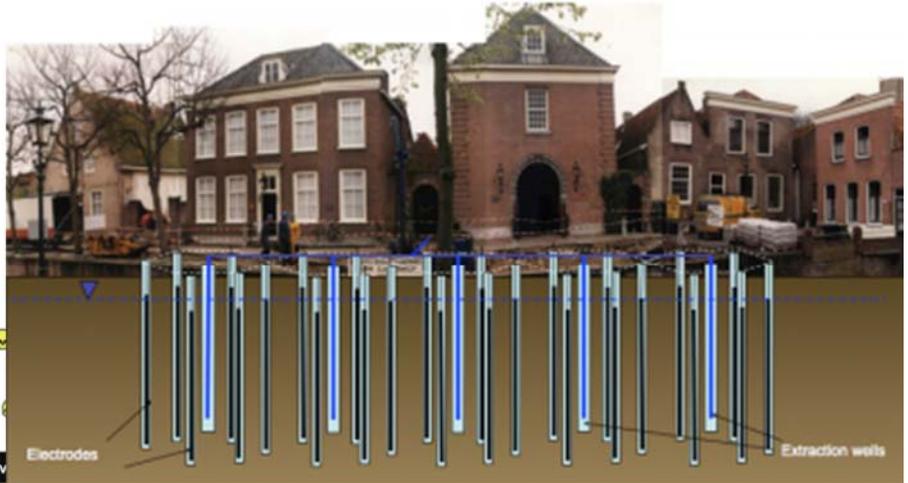
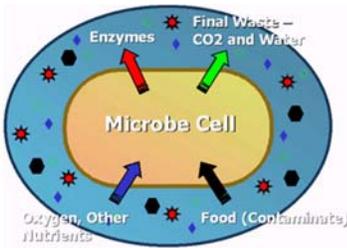


ESSET yr 3; Specialisation EC
Soil remediation



1 Introduction

Soil pollution is a global problem. In year 1 and 2 of the programme you already dealt with soil pollution and soil investigation, in the minor environmental consultancy you learn about soil remediation and related subjects in the course Advanced Soil Remediation.

Soil is also becoming a point of interest for the bio based economy. Without a healthy soil, the basic products for the bio based economy cannot be grown. This requires a somewhat different look at the soil than the soil just being pollutant-free.

The following subjects will be discussed in this course:

- Physical, chemical and biological aspects of pollutants in the soil
- Remediation techniques
- Risk assessment
- Soil activities
- Soil in the bio based economy

2 Learning goals

The following goals have to be achieved at the end of this course:

- You can explain how different types of pollutants are distributed over the different phases of the soil (dissolution, evaporation, adsorption, precipitation, speciation) which laws govern this behaviour and how this depends on the pollutant characteristics and the soil characteristics. You can also calculate some of the distribution aspects
- You can explain which transport processes are involved in pollutant transport and how they apply to different parts of the soil and different types of pollutants
- You can predict which soil oxidants or reductants are active in the soil depending on the soil redox potential, you also know which products are formed in these reactions
- You can explain the difference between metabolic and co-metabolic biological degradation
- You can explain the phenomenon of redox zoning in the groundwater
- You can explain which oxidative and reductive breakdown processes occur with regards to pollutants and in which conditions which pollutants can be broken down.
- You can describe the chemical degradation processes that occur naturally in the soil
- For the most common in-situ remediation techniques (extraction, oxidation reduction, biological breakdown and isolation) and you can describe their working principle, in which conditions and for which pollutants you can apply them and what their advantages and drawbacks are
- You understand how persons can be exposed to soil pollutants (exposure routes) and how soil characteristics and pollutant characteristics favour certain exposure routes
- You can use the CLEO software to model the exposure to soil pollutants

3 Organisation

3.1 Educational activities

In this course we have six lectures, a computer practical, a written exam and a re-sit. An overview of the scheduled activities:

Table 1: overview educational activities adv soil rem

Activity	When	Subject
Lecture 1		<ul style="list-style-type: none"> Recap soil science and pollution Physical chemical aspects of soil pollution
Lecture 2		Physical-chemical aspects of soil pollution
Lecture 3		Biological aspects of soil pollution
Lecture 4		Remediation techniques
Lecture 5		Remediation techniques
Lecture 6		Guest Lecture (compulsory attendance)
Lecture 7		Workshop Risk Assessment (compulsory attendance)
Exam	Week 9	
Exam inspection	Week 10	
Excursion	Week 10	Compulsory attendance
Resit	Quarter 4	

Attendance at the lectures is not compulsory, except for the guest lecture and the workshop risk assessment in week 7. In week 10 on Wednesday we have an excursion for which attendance is compulsory.

3.2 Assignments

The lectures come with homework assignments which will be posted on blackboard. The homework assignments are quizzes, and they are just for you to process the subject matter. After you did the assignment you get immediate feedback on the answers. It is not compulsory to make them, they do NOT earn you a bonus score.

Next to the homework assignments there is a course assignment which will be provided in week 5. It will be graded between 1 and 10, and it will make up 10% of your final grade. This assignment is NOT compulsory, if you fail to hand it in it will be graded with a 0.

4 Sources

This course is based on the book "In situ soil remediation and groundwater remediation: theory and practice" by Thomas Keijzer et al (ISBN 90-76098-07-7). This book is not easy to come by unfortunately. There are several copies of this book available in Xplora (if they're not stolen...). There is also a theory document available on blackboard.

For those of you that need to brush up their basic soil science I can recommend "Essential soil science" by M.R. Ashman and G. Puri (ISBN 0-632-04885-9). The powerpoint of the course Soil science is also available on blackboard.

All other necessary source materials will be published on blackboard.