Beyond Engineering: Building with Nature 2x

Syllabus

Prof. dr. Jill Slinger

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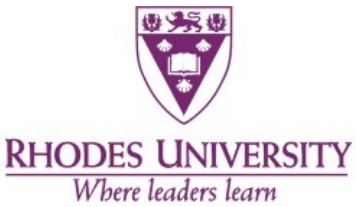
NWO


S.P.
AFRICA
SUSTAINABLE PORTS IN AFRICA


UNIVERSITY
OF GHANA


RHODES UNIVERSITY
Where leaders learn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EcoShape
building with nature


Deltares
Enabling Delta Life


Witteveen+Bos


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INTERNATIONAL


TU Delft

Collaborative Scope

The development of the Massive Open Online Course (MOOC) **Beyond Engineering: Building with Nature 2x** represents a collaborative endeavour by the Delft University of Technology in the Netherlands, the University of Ghana in Ghana, Rhodes University and CSIR in South Africa with contributors from the Ecoshape Foundation, Wetlands International and other organisations. Specialists from Deltares and Witteveen + Bos have contributed materials as well as their time and expertise. In particular, we have drawn upon materials of the project 'Integrated and Sustainable Port Development in Ghana within an African Context' (W 07.69.206), funded under the Urbanising Deltas of the World 2 Programme of the Dutch Science Foundation (NWO), to develop these educational components for the Design for Inclusive and Adaptive Delta Management (DIADeM) project (W 07.6919.306), funded under the Urbanising Deltas of the World 3 Programme.

This Building with Nature education endeavour rests firmly upon the seminal work of Dr. ir. Ronald Waterman, who has kindly granted the Delft University of Technology the right to use the registered trademark Building with Nature® and the Building with Nature© in this MOOC and other teaching courses.

In the world of scientific education and capacity development, there can be no perfect, final product. Accordingly, Delft University of Technology chooses, together with her collaborative partners, to view the MOOC Beyond Engineering: Building with Nature 2x as it now stands as the first step in an ongoing collaboration to review and improve the education material related to the wider Building with Nature concept.

Developed by:

Prof. dr. Jill H Slinger
Associate Professor
Policy Analysis & Hydraulic Engineering
Delft University of Technology
The Netherlands

Visiting Professor
Water Research Institute
Rhodes University
South Africa

Welcome

Thank you for joining us, and welcome to the MOOC **Beyond Engineering: Building with Nature 2x**. We have worked enthusiastically to develop an accessible course, that addresses the challenge of taking the social context into account in integrated design without becoming too difficult. We hope you will find it interesting and will participate enthusiastically.

We aim to create an open, worldwide community of participants who are interested in exploring the interface between society, hydraulic engineering and ecology. The MOOC Beyond Engineering: Building with Nature 2x represents a further step in such an endeavour. It follows upon the MOOC Engineering: Building with Nature 1x with its focus on integrated design – designing from engineering AND ecological principles. This MOOC provides you with valuable insights on how to design from social principles by taking the social context into account in your ecosystem-based design of hydraulic infrastructure. We encourage you to share your experiences and knowledge within the community, so that we can learn from each other and pioneer socially-inclusive, ecosystem-based design in Building with Nature theory and practice around the world.

Thank you for joining us. We hope you will enjoy the MOOC!

On behalf of the course team,
Jill Slinger

Syllabus Content

The syllabus content comprises two sections: Sections A and B.

- Section A describes the learning goals, necessary prior knowledge, course materials, and rules of the game.
- Section B gives a course outline and describes the assignments and grading. The course is divided into 5 topics and is envisaged to cover 5 weeks, with an additional initial week to acquire or revise necessary background knowledge. A recommended route through the course topics is depicted in terms of required activities. Note that the workload per topic can vary according to the disciplinary background of the participant.

SECTION A

A.1 Learning objectives

Building with Nature is a comprehensive engineering approach that seeks to enhance the use of natural ecological processes to achieve efficient and sustainable hydraulic infrastructural designs. It strives for a flexible integration of land in water and water in land using interactions and materials present in nature (Waterman 2008). Through the course **Beyond Engineering: Building with Nature 2x**, you will become familiar with this ecosystem-based design concept and **learn Social Design Principles for building coalitions to develop more effective and sustainable hydraulic infrastructure**.

The course builds on the MOOC Engineering: Building with Nature 1x, which explored the use of natural materials and ecological processes in achieving effective and sustainable hydraulic infrastructure designs, distilling Engineering and Ecological Design Principles. In this course, the missing element of Social Design Principles are developed and taught.

So, this course is about understanding why stakeholder-inclusive, ecosystem-based designs are needed in moving beyond standard hydraulic engineering. Emphasis is placed on delta, coastal and port environments. For example, the Dutch experience in learning to listen to stakeholders in the design and realisation of the extension to the Port of Rotterdam in the Rhine-Meuse Delta runs as a thread through the course. The course also draws on a number of international examples:

- Tema, the nearest port city to the Volta Delta in Ghana,
- Crocodile River and Tsitsa in South Africa,
- Great Brak estuary in South Africa,
- Sierra Leone, and
- Semarang in Indonesia.

We do not cover whether hydraulic infrastructure *should* be built or not, nor will we deal with assessing the impact of infrastructure on the natural or social environment. Instead, we will focus on social inclusion in the design of ecosystem friendly hydraulic infrastructure.

Specifically, participants in the course Beyond Engineering: Building with Nature 2x will learn to:

1. Identify relevant stakeholders for the design and implementation of nature-friendly hydraulic infrastructure.
2. Analyse the power and interests of these stakeholders, including their interdependence in terms of resources.
3. Apply basic game-theory principles in combination with the stakeholder analysis to determine potential coalitions in a Building with Nature project case.
4. Use Social Design Principles to evaluate the suitability of coalitions in the design and implementation of a particular Building with Nature project case.

The structure of the course is oriented to first addressing why the social context needs to be taken into account in topic 1, then identifying and mapping stakeholders in topic 2, learning the

fundamentals of cooperative game theory in topic 3, understanding the use of social design principles in topic 4 and finally analysing the suitability of coalitions in the design and implementation of a particular Building with Nature project case in topic 5.

A.2 Prior Knowledge

The course is intended to be accessible to many disciplines, for example engineers, ecologists, and planners. Because we are teaching social principles in an integrated design approach, the material is conceptually challenging, but the level of disciplinary knowledge required to complete the assignments is not high. This choice is motivated by the desire on the part of the course development team that as many people as possible are able to complete the course – gaining an understanding of how to take the social context into account in ecosystem-based engineering design. The difficulty of the assignments and the grade allocation are designed to support this aim. All with an interest in ecosystem-based engineering and an affinity for coastal and water systems and the people who live in these environments are welcome!

Experience in engineering design, ecological consultancy and planning is an advantage. Completion of the MOOC Engineering: Building with Nature 1x is strongly advised, but not required for enrolment. For the participants who have not completed the MOOC Engineering: Building with Nature 1x, a selection of the most important video lectures have been included in an additional Topic 0. Necessary Background Knowledge. Participants must realize that this will require extra study hours (8 - 16 extra hours).

A.3 Course materials

The course materials consist in: short video lectures, texts on the EdX platform, short case descriptions, readings, assignments, and contributions on the world map and the discussion forum. There are also links to supplementary material. The list(s) of supplementary material (websites, additional readings, supplementary knowledge clips) is compiled for those participants who would like to explore beyond what is required for this course and its assignments.

A.4 Rules of the game

The participants in this MOOC have different backgrounds, different views on the value of knowledge sources (e.g. disciplinary knowledge versus the lived experience of local residents), value nature differently and are at different stages in their career. We ask you to show respect for each other and to avoid value judgements in your feedback to one other. We do not strive for a particular viewpoint in this course, but seek to work respectfully and professionally with people holding a diversity of viewpoints on social inclusion, hydraulic engineering and nature. This acceptance of multiple views lies at the heart of collaborating in multidisciplinary projects and working successfully in a transdisciplinary fashion. We ask you to be analytical and helpful, especially when participating in the discussion forum. We all can learn from each other, and we look forward to many interesting discussions and learning moments.

SECTION B

B.1 Course Outline

The course structure is listed per topic below. The course begins with a Topic 0. Necessary Background Knowledge so that participants can learn, or remind themselves, of the Building with Nature concept and the Hydraulic Engineering Design Principles and the Ecological Design Principles. Thereafter, Topics 1 through 5 open one by one each week over the next 5 weeks. Participants are reminded that the workload per topic can vary according to their disciplinary knowledge and their prior experience.

Topic 1: Why Beyond Engineering?
This topic introduces the importance of social context to the Building with Nature concept. Short video lectures and diagnostic questions provide insights on when to include stakeholders in complex public decision making and Building with Nature design processes. An example from delta and port development serves as inspiration. Thereafter, participants apply diagnostic questions in determining strategies for stakeholder engagement on two cases in Assignment 1.1. Participants share opinions on the value of including different knowledge sources in ecosystem-based engineering design and adaptive delta management. A reading task forms Assignment 1.2.

Topic 2: Stakeholder Analysis and Mapping
Stakeholder analysis and the value of working with stakeholders are explained in a video lectures. Course participants then apply their learning to material on the Maasvlakte 2 stakeholders, identifying relevant stakeholders, mapping their power and interests, and analysing their interdependence (Assignment 2.1). Next, the issue of scale is addressed in a video lecture and a reading, which forms the basis of Assignment 2.2. There is ample room for discussion and knowledge exchange in the discussion forum.

Topic 3: Cooperative Game Theory
The fundamentals of Game Theory and Cooperative Game Theory Models are first explained in a video lecture. Next, the insights deriving from the application of cooperative Game Theory to the Great Brak estuary in South Africa are explained in a video lecture. The Self Sustaining River Systems Innovation Team is also used to illustrate coalition forming. Participants familiarize themselves with the concepts through a series of quiz questions (Assignment 3.1). A reading task on coalition forming in Building with Nature forms Assignment 3.2.

Topic 4: Social Design Principles
Renowned experts in transdisciplinary science and social impact assessment use illustrative cases from South Africa and Indonesia in their video lectures to explain the principles guiding their practice. A study from Sierra Leone provides the case on which Assignment 4.1 is based. Then drawing on experiences in Ghana, and normative principles for stakeholder-inclusive, ecosystem-friendly design deriving from the Sustainable Ports in Africa project, the Social Design Principles are distilled in a video lecture.

Topic 5: Towards Coalition Building
Course participants apply their new knowledge in evaluating the potential for coalition building in a Building with Nature approach to the case study of the Tema in Ghana (Assignment 5.1). They familiarize themselves with this case through extensive visual material and documentation.
In addition to the deep case material and associated assignment, course participants are challenged to move beyond engineering in their Building with Nature practice through two videos. There is an inspiring example of social engagement in the Tsitsa Catchment in South Africa and there is an exposition of how the present position of the environment as 'green handbrake' can change to that of partner in port development.

B.2 Assignments and Grading

There are eight assignments distributed over the different topics of the course, only four of which are graded. The table below details per assignment: the maximum grade allocation, the date on which the assignments are released and the final deadline for assignment submissions. Where no maximum grade is indicated, the assignments are ungraded. Dates are written as dd/mm/yyyy. The course uses a pass/fail structure. To pass the course you need to obtain at least 50% of the total amount of points that can be earned.

Assignments, Grading and Deadlines

Topic	Assignment	Max. Grade	Release Date	Final Deadline
1	1.1 Situation diagnosis	-	7/4/2020	5/5/2020
	1.2 Reading	20%	7/4/2020	5/5/2020
2	2.1 Stakeholder Identification and Mapping	-	14/4/2020	5/5/2020
	2.2 Reading	20%	14/4/2020	5/5/2020
3	3.1 Quiz: Cooperative Game Theory	-	21/4/2020	5/5/2020
	3.2 Reading	20%	21/4/2020	5/5/2020
4	4.1 Social Design Principles	-	28/4/2020	12/5/2020
5	5.1 Evaluating Coalition Building Potential	40%	28/4/2020	12/5/2020

Contact details:
Faculty of Technology, Policy & Management
Jaffalaan 5
2628 BX, Delft
The Netherlands
T 015-27 89801
E communication-tbm@tudelft.nl
I http://www.tbm.tudelft.nl/en/