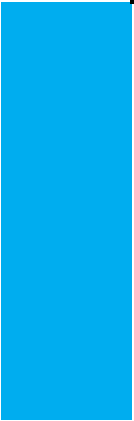


# Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



## Graduation Plan: All tracks

The graduation plan consists of at least the following data/segments:

<b>Personal information</b>	
Name	<b>Eric Geboers</b>
Student number	1516892
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<b>Studio</b>	
Name / Theme	<b>Architectural Engineering</b>
Teachers	Tjalling Homans & Martijn Stellingwerff
Argumentation of choice of the studio	I enjoy the freedom of topic you get with this studio. I also believe choosing a subject related to engineering is a very relevant choice when you look at the field of architecture today. It seems that there is a need for a designer who is able to bring several disciplines together, and less for the single 'genius' who is able to design buildings by himself. The complexity of buildings is ever increasing and I would like to understand as much as possible of this complexity. I have also always liked to explore the relationship of architecture and nature, it's really a personal fascination and I feel that in this studio I get that opportunity.
<b>Graduation project</b>	
Title of the graduation project	Sinai Salt City
<b>Goal</b>	
Location:	South-western Sinai desert (Egypt)
The posed problem,	The accelerated population growth in the past two centuries due to humanities technological advances has resulted in a number of problems among which a decrease of available farm land, massive species extinction and desertification. This project aims to combat desertification and enrich existing desert ecosystems by introducing a salt water infrastructure used for growing crops, enriching the soil and ultimately making architecture with salt.
research questions and	TRQ: How to build with salt in the desert? DQ: How do we make architecture in the desert using local materials whilst having a positive impact on the surroundings?
design assignment in which these result.	The plan is to develop a saltwater infrastructure in the Sinai desert in which seawater is separated in fresh water and salt using the power of the sun. The fresh water will be used for growing crops using seawater greenhouses and to combat desertification by enriching the soil. The salt will be the main ingredient for a building material. With this building material a

	<p>'salt community' is created in which the inhabitants work in the greenhouses needed to grow the crops: a fully self-sustaining system. Of this community several typologies will be developed: the greenhouse itself, the factory in which the salt buildings are made, the greenhouses and living units for the inhabitants. A masterplan will also be created with several scenarios on how to develop this salt city.</p>

## Process

### Method description

The research is split up in three different parts. The first part concerns process engineering. How do we make this salt infrastructure, how do we grow crops in the desert, with what flows do we have to deal with? This will be researched via a case study of the Sahara Forest Project and the Seawater Greenhouse, along with interviews with experts at both the TU Delft and Wageningen University. The next two steps are about material and architecture. After separating salt water into fresh water and salt, how do we make a material based on salt with which we can make architecture? Thus the second part of the research is about finding a production method with which a strong salt-based material can be made. This will be done via a combination of literature study and a series of DIY experiments.

The final step is to test the now newly created salt-based material. A range of experiments will be conducted to test the material on its tensile and compressive strength and density to formulate a strategy on how to design and build with this salt material.

### Literature and general practical preference

Precedents:

Sahara Forest Project

Seawater Greenhouse by Charlie Paton

Saltygloo (3D printed salt pavilion) by Emerging Objects

Literature:

Ashby, M. (2007). *Materials: engineering, science, processing & design*. Butterworth-Heinemann, Oxford

Benyus, J. (1997). *Biomimicry: innovation inspired by nature*. HarperCollins Publishers, New York.

Hawker, R. (2008). *Traditional Architecture in the Arabian Gulf: Building on Desert Tides*. WIT Press, Southampton

Nijssse, R. (2013). *Dictaat Draagconstructies 1*. TU Delft, faculteit bouwkunde, Delft.

Nijssse, R. (2013). *Dictaat Draagconstructies 2*. TU Delft, faculteit bouwkunde, Delft.

Pawlyn, M. (2011). *Biomimicry in Architecture*. RIBA Publishing, London.

Van Mourik, P & Van Dam, J. (1996). *Materiaalkunde voor Ontwerpers en Constructeurs*. Delft University Press, Delft

## Reflection

### Relevance

The relevance in this project is in mapping the 'flows' surrounding the creation of architecture, e.g. examining the full material cycles, the energy needs and transport routes and minimizing the impact on nature. It is an attempt in creating a bio-material that can be completely produced on site with

local materials – something that could potentially have significant impact.

## **Time planning**

See next page.

# Planning

## Road to P1

Week	40	41	42	43	44	45
Action	Literature study	Literature study	AE Café preparation Case study 3D print research	Prepare P1 Finish case study Start Material study	P1 Presentation	Reflection Choose direction for material, design, research
Goal/Product				Case study booklet		Assess next steps, adjust plan

## Road to P2

Week	46	47	48	49	50	51	2	3	4	5
Action	Research material options Set up interviews	Prepare interviews Material study	Interviews Literature study	Complete scheme		Start on preliminary design	Work on preliminary design	Prepare for P2 presentation	P2 Presentation	Reflection
Goal/Product							Hand in Research Methods paper	Presentation drawings		Assess next steps, adjust plan

## Road to P3

Week	6	7	8	9	10	11	12	13	14	15
Action	Vacation	Climate study current typologies Contact SFP people	Develop typologies	Develop typologies Contact relevant people	Re-assess masterplan Develop scenarios including typologies	Develop typologies, set scenes in MP	Develop routing,	Develop typologies including masterplan	P3 preparation	P3 Presentation
Goal/Product		Location analysis	Schemes & relations		Salt City 2.0			Salt City 3.0	Set scenes, develop typologies to 3.0-4.0	

Road to P4

Week	15	16	17	18	19	20	21	22	23
Action	Reflection	Continue development typologies	Continue development typologies	Develop integration typologies with each other & with masterplan	Finalise masterplan, seek outside assistance	Set final scenes, develop what to present	Develop presentation	P4 Presentation	Reflection Assess work remaining
Goal/Product	Assess final steps to P4			Typologies 4.0		Salt city 4.0 Typologies 5.0	Hand in Research Methods paper		Final design steps, reach salt city 5.0, typologies 5.0-6.0, develop furniture, tiling, etc.

Road to P5

Week	24	25	26	27
Action	Send models to 3D printer	Build model Make renderings Develop presentation	Build model Make renderings Develop presentation	P5 Presentation
Goal/Product				