Welcome at the presentation of Master's Programme Environmental Sciences
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### Aims and Characteristics

Environmental Sciences programme is for students who want to take up the challenge of finding innovative approaches to improve the state of the environment and sustainable solutions to the threats it faces.

- **Enrolment:** International & diverse
- **Development of a critical attitude and analytical and problem-solving skills, and of gaining in-depth knowledge**
- **Interdisciplinary**
- **Four specialisations**
- **Thesis oriented**
- **Tailor-made**
- **Broad range of subjects**
The programme Environmental sciences focuses on four key issues on solving environmental problems namely Process, Causes, Solutions and Consequences including the coherence between the four specializations. (see the picture)
A: Environmental Quality
Investigates the physical, chemical and biological processes that influence the quality of the environment and the effects of pollutants on humans and ecosystems. For example in the case of climate change, Specialization A will investigate the climate change in the atmosphere and influence of climate on ecosystems in water and on land.

Thesis tracks included:
• Air Quality and Atmospheric Chemistry (MAQ)
• Aquatic Ecology and Water Quality Management (AEW)
• Soil Biology (SBL)
• Soil Chemistry and Chemical Soil Quality (SOC)
• Toxicology (TOX)

Coherence between the 4 specializations, for example, Climate change:
Specialization B - will investigate which instruments and interests have shaped the climate policy so far, and how desired changes can be made in the future. Specialization C - will investigate how renewable energy can be formed or how you can make CO2 (for example fuel methane). Specialization D - will investigate the natural and social processes involved in climate change and will develop tools and methods to apply in a strategic research.
Specialization B

Covers the contribution of the social sciences to environmental research. The focus is on the social, political, legal and economic aspects of environmental issues and the goal is to provide students with the skills for studying, formulating and designing innovative forms of national and international environmental governance. For example in the case of climate change, Specialization B - will investigate which instruments and interests have shaped the climate policy so far, and how desired changes can be made in the future.

Thesis tracks included:
- Environmental Policy (ENP)
- Environmental Economics and Natural Resources (ENR)

C: Environmental Technology

Concentrates on biological, chemical and physical processes for water reuse and the recovery of nutrients, minerals and energy. The aim is to fully understand these processes in order to design and optimize innovative technologies for renewable energy, closing nutrient cycles and solving environmental issues.

D: Human-Environmental Systems

Studies the natural and social processes involved in environmental issues. It aims to develop integrative tools and methodologies and to apply these in strategic research.

Coherence between the 4 specializations, for example, Climate change:

Specialization A - will investigate climate processes in the atmosphere and influence of climate on e.g. Ecosystems in water and on land. Specialization B - will investigate which instruments and interests have shaped the climate policy so far, and how desired changes can be made in the future. Specialization C - will investigate how renewable energy can be formed or how you can make CO2 (for example fuel methane). Specialization D - will investigate the natural and social processes involved in climate change and will develop tools and methods to apply in a strategic research.
Specialization C

Concentrates on biological, chemical and physical processes for water reuse and the recovery of nutrients, minerals and energy. The aim is to fully understand these processes in order to design and optimize innovative technologies for renewable energy, closing nutrient cycles and solving environmental issues. For example in the case of climate change, Specialization C will investigate how renewable energy can be formed or how you can make CO2 (for example fuel methane).

Thesis track included:
- Environmental Technology (ETE)
D: Human-Environmental Systems
Studies the natural and social processes involved in environmental issues. It aims to develop integrative tools and methodologies and to apply these in strategic research. For example, in the case of climate change, Specialization C will apply its tools by cycling specific compounds through the environment.

Thesis tracks included:
- Environmental Systems Analysis (ESA)
- Water Systems and Global Change (WSG)
The coherence between the four specializations

Environmental Quality (A)

Environmental Policy & Economics (B)

Environmental Technology (C)

Human - Environmental Systems (D)

Processes

Causes

Consequences

Solutions

The General view Coherence between the Four specializations
Thesis track: Air Quality and Atmospheric Chemistry (MAQ)

Air quality and Atmospheric Chemistry group investigates the behaviour of the atmosphere in which people live and breathe every day, as well as its composition of gases and aerosols. Such research is needed to understand daily weather patterns, but also to predict future climate, and to limit human exposure to harmful substances in the air. Diverse set of field measurements are employed, as well as a broad array of numerical modelling techniques.

Thesis themes:

- Global atmospheric composition & modeling
- Regional scale and urban scale air quality
- Satellite retrievals & interpretation
- Analysis of in-situ measurements of land-atmosphere interactions

For example, on (picture) measuring NO2 exposure across Netherlands.

For more information visit the chair group’s website mentioned on the picture.
Thesis track: Aquatic Ecology and Water Quality Management group (AEW)

Aquatic Ecology and Water Quality Management group studies freshwater as well as marine ecosystems, with regard to the ecology and water quality, often in relation to human interactions. AEW takes a systems approach linking physical, chemical, and biological processes across scales. For instance, freshwater ecology looks at the effects of invasive species, eutrophication problems, water quality assessments, etc. The water quality studies focus on the fate of chemicals, such as heavy metals, or pesticides and attention is paid to the risk assessment.

Thesis themes:
- Controlling eutrophication
- Aquatic vegetation and fauna
- Marine research
- Fate of contaminants
- Carbon and Nitrogen cycle
- Ecological risk assessment
- Modelling ecosystem patterns and tipping points

For example: Controlling eutrophication (picture). Eutrophication caused by nitrogen and phosphorous pollution flow into water, which reduces the oxygen in water. Topic: reduce inflow of polluted water or remove pollutants before inflow in river.

For more information visit the chair group's website mentioned on the picture.
Thesis track: Soil Biology (SBL)
The soil Biology group studies the role of soil organisms in element (carbon, nutrient) transformations in soils.

Thesis themes:
* Fertile soil
* Soil functional biodiversity
* Soil and Climate change
For example: Soil biodiversity (picture), Influence of soil contamination on the variety of life that exists within the soil, including bacteria, fungi, earthworms and termites.
For more information visit the chair group’s website mentioned on the picture.
Thesis track: Soil Chemistry and Chemical Soil Quality group (SOC)
Soil Chemistry and Chemical Soil Quality group studies chemical compounds in soil and their characteristics, particles, behavior and interactions.

Thesis themes:
* Environmental geochemistry
* Soil protection and pollution
* Soil sequestration

For example: Soil sequestration, the sequestration of carbon as a resource for the future
For more information visit the chair group’s website mentioned on the picture.

https://www.wur.nl/en/Research-Results/Chair-groups/Environmental-Sciences/Soil-Chemistry-and-Chemical-Soil-Quality.htm
Thesis track: Toxicology (TOX)

The Toxicology group studies the adverse effects of compounds on people, animals and the environment. You are trained to investigate, interpret, assess and communicate about those effects and the risk they pose. But also to monitor and predict the fate and impact of foreign substances to which humans and other organisms are exposed via the environment.

Thesis themes:

* Chemicals in Environment
* Mechanistic research
* Scientific underpinning or risk assessment of chemicals

For example: Chemicals in the environment (picture), residues of mining activities or effect of plastics on the shore for vegetation and animals
RIANNE VAN DEN MEIRACKER – Graduated
2019 – Environmental Toxicology (TOX)

BSc background: Environmental Sciences – Wageningen University

MSc thesis research: The immunomodulatory effect of cadmium on mouse T-lymphocytes (minor at AEW)

Internship at TAUW, Topic: Analysis of mixture toxicity for risk assessment of soil and groundwater

Currently: working at Deltares as Junior Advisor/Researcher Anthropogenic Substances

"During my thesis I researched the effect of cadmium, a wide-spread heavy metal which is naturally present in the environment in low concentrations. However, due to mining practices cadmium levels can be highly elevated locally. Via plants cadmium is taken up and can end up in vertebrates, such as mice. Mice serve as carrier of zoonoses, which are diseases which can spread via animals to humans. By impairing the immune system cadmium can increase susceptibility of mice to diseases, which can also increase the spread of diseases to humans. What I did specifically was study the effect of cadmium on mouse T-lymphocytes, which are cells that are involved in the adaptive immune response."
Thesis track Environmental policy group (ENP)
Environmental policy group contributes to sustainable development by developing the theoretical and empirical tools to analyse, evaluate and (help) design democratic processes of environmental reform from the local up to the global level.

Thesis themes:
* Sustainable food transformation
* Governing environmental mobilities
* Governing climate future
* Sustainable Urban infrastructures
* Marine Governance

For example: Marine governance (picture), marine is a challenging subject because boundaries in marine environment are vague: it’s not always clear who decides what in relation to reducing pollution at sea.
For more information visit the chair group’s website mentioned on the picture.
Specialization B: Environmental Policy and Economics
Environmental Economics and Natural Resources (ENR)

Thesis track The Environmental Economics and Natural Resources Group (ENR)
The Environmental Economics and Natural Resources Group aims to improve our understanding and management of national and international environmental problems, with an emphasis on natural resource management, environmental pollution, and climate change.

Thesis themes:
* Economic of climate change
* Economic of natural resources
* Economic of pollution management

For example:
Economic of natural resources, (picture) How do we manage fish populations when our data are faulty?
Economic of climate change (picture) How can a city like Jakarta adapt to rising sea levels?
Economic pollution management(picture) What is the economic damage caused by plastic pollution?

For more information visit the chair group website mentioned on the picture.
LARA TENDERINI – Graduated 2019
Environmental Policy (ENP)

**BSc background:** Applied Biology and Environmental Science from the University of Cape Town in South Africa.

**MSc thesis research:** Invisible Energy Policy in the South African Mining Sector: A Social Practice Outlook on Water Use.

**Internship:** Jones & Wagener

**Currently:** Jones & Wagener – an engineering and environmental consulting firm in South Africa, as an environmental scientist.


"South Africa is the 5th largest coal producer in the world and the intensity of mining leads to high levels of environmental degradation. With a global mandate to reduce energy usage, I looked at the ways that energy is used indirectly on mines. Specifically, I looked at water processes on mines with a Social Practice Theory perspective. Practices of water use are guided by certain policies, and thus the way in which policy is shaped has huge potential to change the way we indirectly use/save energy. This is useful from a policy perspective, such as for the understanding of unintended policy consequences and for policy coherence"
Thesis track Environmental Technology group (ETE)

Environmental Technology group develops and evaluates innovative environmental technologies and concepts based on processes from nature, to recover and reuse essential components and maintain and create a viable environment.

Thesis themes:
* Re-usable water: Nutrients and Organic carbon, Desalination, Micro-pollutants & Pathogens
* Bio-recovery: Energy, Minerals and metals, Fuels and chemicals

For example: Phosphate recovery (picture) Phosphate can cause eutrophication which is not good for the environment. However, in other cases it can be a useful element. At the technology group one of the topics is to remove phosphate from wastewater and make it available to use for other purposes.
TOM VERHOEK – Graduated 2017
Environmental Technology (ETE)

BSc background: Environmental Sciences for Sustainable Energy and Technology (ESSET) at Avans Breda (University of applied sciences)

Thesis Research: Build his own reactor: Micropollutants Biological - Ozone - Biological

Internship at: Royal HaskoningDHV as a researcher, researching innovative sludge digestion (Ephyra®)

Currently: working as a Consultant Wastewater at Royal HaskoningDHV

"The effluent of wastewater still contains micropollutants like pharmaceuticals which are not removed by the normal wastewater treatment plant. I build a continuous reactor based on batch research from my PhD supervisor. There was found that using Ozone degraded pharmaceuticals well but it costs a lot of energy. It also caused toxic metabolites to be formed. In order to remove these metabolites we used a biological reactor to remove these from the wastewater influent. To reduce the amount of Ozone needed we pre-treated the effluent with a biological reactor to reduce parts which are biodegradable."
Thesis track: Environmental System Analysis group (ESA)

Environmental System Analysis group is a quantitative and multi-disciplinary research field that aims to analyse, interpret, simulate and communicate complex environmental problems from natural and social science perspectives. The general idea is that you learn tools and methods to apply in a field that you’re specialised in via (pre)education, e.g. you are an expert in Heavy metals in soil and you learn to analyse, interpret, simulate and/or communicate this environmental issue with the tools that you learn from the ESA courses.

Thesis themes:
- Environmental Change & Society
- Pollution and Nutrients
- Ecosystem Services and Biodiversity

For example Ecosystem services & Biodiversity (picture) a healthy eco system provides services for example provision of water, recreation, regulating temperature. These services could be validated in economic terms.

For more information visit the chair group website mentioned on the picture.
Thesis track: Water System and Global Change group (WSG)

Water System and Global Change group is a multidisciplinary research group which analyses and assess the impacts of climate change and population growth on water systems. The WSG group propose and test adaptation strategies with the use of simulation models, earth system observations, scenario analysis and field studies.

Thesis themes:
- Land water climate interaction
- Water pollution assessment
- Water-food-energy nexus
- Adaptive planning and design

For example: Land water climate integration and water pollution assessment (picture); we need to protect ourselves from flooding. And we also need to reduce water pollution. So there is a need for integration.

For more information visit the chair group website mentioned on the picture.
Linda van Garderen – Graduated 2017- Double Masters- MES (ESA) and MCL (MAQ)

BSc background: HBO Bachelor, Applied Environmental sciences (Milieukunde)
SENSE MSc Honours Program (currently - WIMEK Graduate Programme)

Thesis Research at ESA : “Seasonal nutrient export into the Japanese and Okhotsk seas”

Thesis Research at MAQ (Air quality and Atmospheric Chemistry) “Storms of the future: A modelling perspective on future storminess in the Netherlands” (at Royal Netherlands Meteorological Institute (KNMI))

Internships: “Identifying high impact weather over Europe”, Potsdam Institute for Climate Impact Research (PIK), Germany

Currently: PHD Student at Helmholtz Zentrum Geesthacht - Institute for Coastal Research (HZG), Germany. PhD Research: “Climate change attribution of extreme weather events”

Linda van Garderen - ESA and MAQ

ESA Thesis research: Seasonal nutrient export into the Japanese and Okhotsk seas:

“I wanted to see if the Global NEWS-2 model, which is a global river nutrient export model, was missing nutrient sources for the Japanese and Okhotsk sea region and find out if the yearly average output could be set to a seasonal average output increasing the model's accuracy. I have therefore seasonalized and updated the dissolved inorganic nitrogen part of the Global NEWS-2 model, specifically for this region.”

MAQ Thesis research: Storms of the future: a modelling perspective on storminess in the Netherlands:

“I used the highest resolution global earth-system model (EC-Earth) output available to find if the characteristics of storms that reach the Netherlands might change in the future. The model output shows less number of storms in the future, no change in wind direction or storm track position for those storms that reach the Netherlands. However, the future storms do contain significantly more precipitation before and during the event, which could lead to flooding.”
General programme structure – MES

2 Years of study (in total 120 ec)

- Year 1: Courses
  - Compulsory courses – depending on your preparatory training
  - Major courses – depending on your thesis subject
  - Elective (optional) courses

- Year 2: Internship and major thesis
  - Major thesis (36 ec)
  - Internship (24 ec) or second thesis if allowed (minor thesis of 24 ec)

1 ec equals 28 hours work load
Example course schedule  
Thesis track Environmental System Analysis

<table>
<thead>
<tr>
<th>FIRST YEAR</th>
<th>SECOND YEAR</th>
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<tbody>
<tr>
<td>Period 1</td>
<td>Thesis Environmental System Analysis</td>
</tr>
<tr>
<td>Sep/Oct</td>
<td>Internship</td>
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<tr>
<td>MO</td>
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<tr>
<td>Research Methods in Environmental Sciences</td>
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<tr>
<td>Free choice</td>
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<tr>
<td>AF</td>
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<tr>
<td>Principles of Environmental Sciences</td>
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<tr>
<td>Environmental Systems Analysis: Methods and Applications</td>
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<td>Period 2</td>
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<td>Nov/Dec</td>
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<td>Free choice</td>
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<td>Period 3</td>
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<td>Jan</td>
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<tr>
<td>Environmental Assessments for Pollution Management</td>
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<tr>
<td>Free choice</td>
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<td>Period 4</td>
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<tr>
<td>Feb</td>
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<tr>
<td></td>
<td>Integrated Ecosystem Assessment in Regional Management</td>
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<td>Period 5</td>
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<td>Mar/Apr</td>
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<tr>
<td></td>
<td>Environmental Quality and Governance</td>
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<td>Period 6</td>
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<td>May/Jun</td>
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<td></td>
<td>Academic Master Cluster (AMC)</td>
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</table>

This is an EXAMPLE of a study plan, the DEFAULT study plan as you can find on the website at MES - Thesis track Environmental System Analysis.

First Year:
The academic year consists of 6 periods:
Period 1 and 2 - lectures are offered in the Morning and afternoon
Period 3 lectures are the whole day
Period 5 lectures are in the Morning and Afternoon
Period 6 - Academic Master Cluster - these are projects offered the whole day.
Re-exams periods are in February and August
Second year:
Is Thesis and Internship (in no particular order)

Please note: If, because of very relevant pre-education, you don’t have to do Research Methods and or Principles of Environmental Sciences in period 1, you can choose a free choice course. Your study adviser decides on this. You have always a start meeting with your study adviser to discuss your (preliminary) study program, before starting the academic year.
Career-oriented profiles - MES

- An Entrepreneurship variant
  - MSc track
  - Climate-KIC
- A selective research variant
  - WIMEK graduate programme
  - WASS graduate programme
- Environmental education & Environmental communication and innovation
- A selective track Sustainable Development Diplomacy (ENP major only)


Career-oriented profiles for MES:
For those interested in following career-oriented profiles, that is possible. Some of these options can be part of your MSc programme, some other options have to be followed partly next to your MSc programme. Note that, you have to apply for these programmes.
For information on Career oriented profiles follow this link:
In case you have more questions you can contact your study adviser.
Employment Market MES graduates

As the Pie chart shows most of MES graduates are employed and or decide to study their PhD in Education & Research Institutions (32%). In Consultancy firms (21%), Trade & Industry (19%) and in Government (14%).
Origin of present Environmental students:
- In total 404 students are registered in April 2020. 133 students were enrolled in September 2019 and 57 students were enrolled in February 2020.
Why Wageningen?

- **Is the biggest European research institute** in the field of *Ecology / Environment*
- **Different programmes** with a **focus on various aspects** of environment
- A lot of (international) **research** in the area (also at the institutes like Alterra, Imarens)
- As a result **many optional courses** to choose from and **experts for supervision**
- **International** classroom
General admission requirements for MSc

- Admission is always the responsibility of the **Admission Board**

- Basic principle: the student has to be able to complete the MSc programme within **two years**

- Basic requirements for all MSc programmes of WUR:
  - Bachelor’s degree in a **relevant field**
  - GPA (Grade Point Average) of **at least 70%** of the scale maximum
  - Fluency in **English**, both written and spoken
  - Good **working knowledge** on **mathematics** and **statistics**
Admission to the programme

- Students with **BSc Environmental Sciences** (BES) in Wageningen
- Students with a bachelor’s degree in a **relevant field** of study (University or University of Applied Sciences)
- Students with at least a bachelor’s degree and relevant **work experience** (mid-career professionals)
More information

Wageningen University  [www.wageningenur.nl/en.htm]
Environmental Sciences [www.wageningenuniversity.eu/mes]
Study handbook [https://ssc.wur.nl/Handbook]
Suzanne: Student coach [studentcoachmes-mue@wur.nl]
Study for a day event- [studentcoachmes-mue@wur.nl]
Study Association Aktief Slip [https://www.aktiefslip.nl/]

WAGENINGEN UNIVERSITY & RESEARCH
Student Experience – Environmental Sciences

Tamina Reinecke
Why MSc Environmental Sciences?

- My background: BSc Tourism at Wageningen University & Research and Breda University Applied Sciences

Driven by the goal of making tourism more sustainable, the MSc Environmental Science was the perfect study for me. It combines social and natural sciences to bridge the gap between what is known and what is done.

- Freedom in program design

Due to the possibility of tailoring the program, I was able to follow various courses from other thesis tracks and studies and get a unique academic profile that meets my interests best.
Why Wageningen University?

- **Quality of Education**
  Lecturers are motivated and engaged, the study success of the students is in the center of attention, small groups and extensive feedback support the learning success.

- **International Classroom**
  The diversity of students in Wageningen is unique. The great amount of students from different countries and study backgrounds brings much insights way beyond the content of the course.

- **Study Support**
  Next to study guidance, the university also offers various support possibilities for students for a smooth academic - and career development. For example, academic writing or personal motivation assessment courses.
Environmental Economics Thesis Track

There is a variety of activities covered:
- Computer tutorials (e.g. GAMS)
- Calculations
- Group work
- Essays writing
- Policy Simulation
The highlight:
Academic Consultancy Training
https://ssc.wur.nl/Studiegids/Vak/YMC-60809

Consulting a company with a team of 5-7 students with different study backgrounds.

- Have fun!
- Get to know the work as a consultant
- Learn about team management & negotiating
There are various possibilities to upgrade your Masters at WUR if you want more.

I decided to apply for the EIT Climate KIC Master Label.

https://masterschool.climate-kic.org/

https://www.wur.nl/en/newsarticle/Climate-KIC-Master-Label-Programme-.htm
While in student associations you will mostly find Dutch bachelor students, there is great amount of interest groups and sports associations in which everyone finds their perfect fit.

I am currently a member of ESN Wageningen and Ballistic Squash Association.
You can chat with us for any questions or any clarification you require to make your choice for Environmental sciences.

Chat is only during the Master Open Day 30th April 2020

Tamina Reinecke
MSc student

Amanda Fransisco da Silva
MSc student

Suzane Tuju
Study adviser

Puck Stamps
Study adviser
What else can you do at this open day?

- Chat with study advisers and students
- Check our FAQ’s about application, housing, scholarships, visa, costs, introduction days, Wageningen, student for a day, corona and more
- Take a virtual tour with one or more of our students who will show you their life
- Watch videos with tips for choosing a study programme, about student life and study experiences
Thanks for your attention and wishing you success on choosing your Master programme