



IM SO GLO

INTERNATIONAL MASTER OF SCIENCE
IN SOILS AND GLOBAL CHANGE

EAGER TO ANSWER QUESTIONS LIKE...

- How to prevent and remediate soil degradation
- How do climate and land use affect soil performance
- How do soils and ecosystems affect climate
- What happens with ecosystems when several factors (e.g. drought and warmth) change
- Can thresholds and tipping points be identified

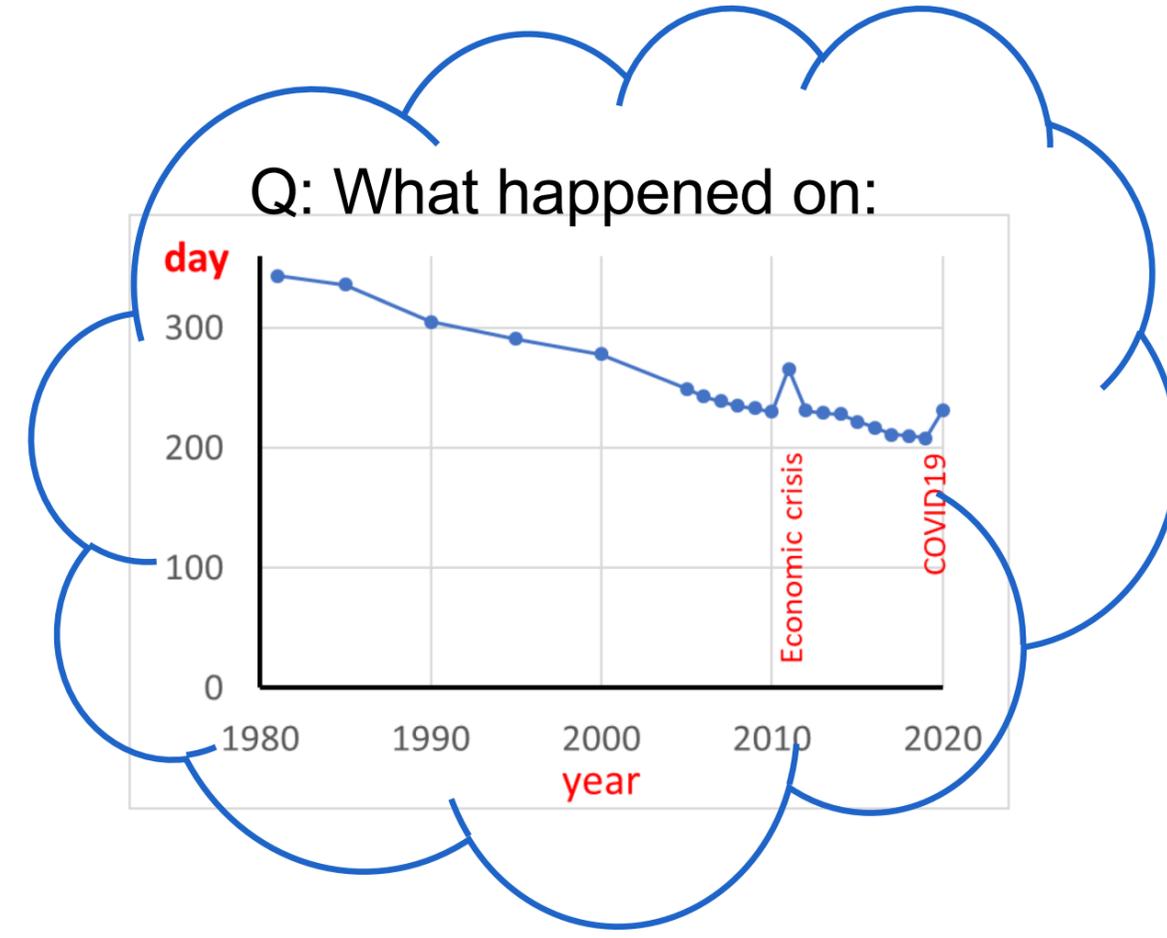
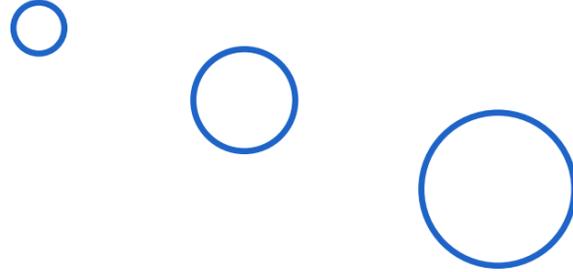
...then stay tuned !



- Why (the bigger picture)
- What (the study programme)
- Who (the partner Universities)

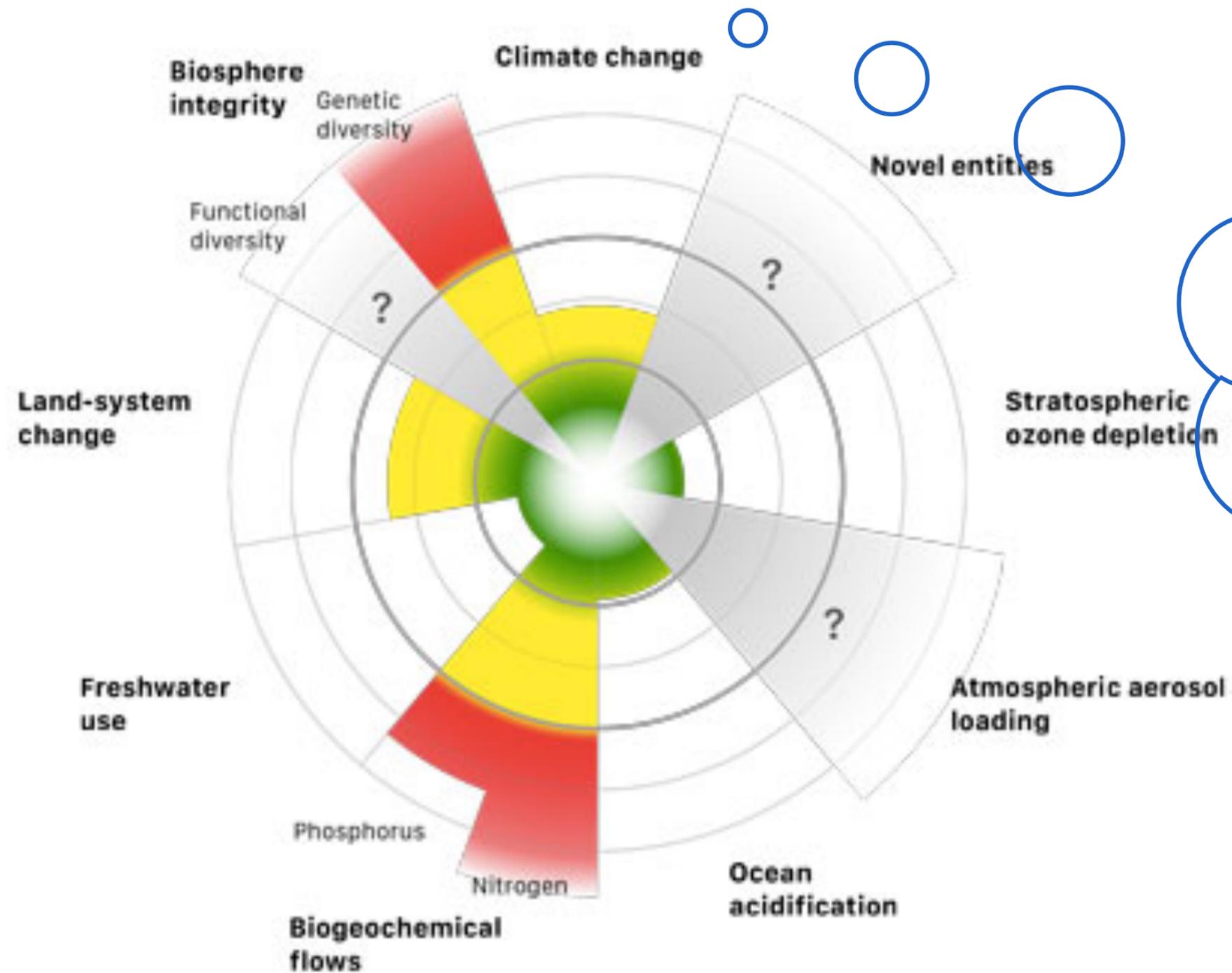
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THE BIGGER PICTURE

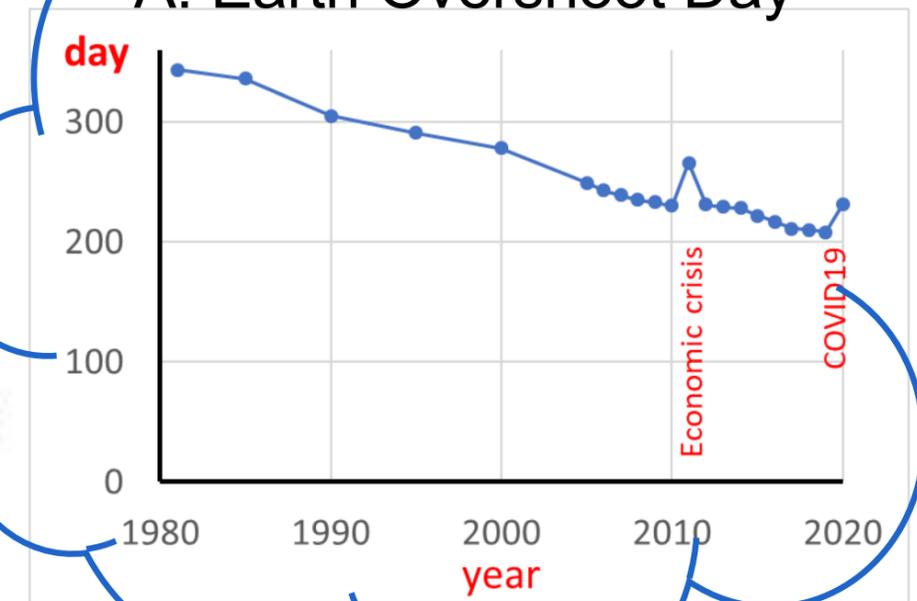


THE BIGGER PICTURE

– Some Planetary Boundaries are being exceeded...



A: Earth Overshoot Day



■ Beyond zone of uncertainty (high risk)
■ In zone of uncertainty (increasing risk)
■ Below boundary (safe)
■ Boundary not yet quantified

THE BIGGER PICTURE

- Some Planetary Boundaries are being exceeded...
 - thus some ecosystems function less and less well...
 - part of these ecosystem services are soil functions...
 - that are being threatened...
 - which can be evaluated via observable soil properties and a range of techniques...
 - and remediated using soil knowledge...
 - thus contributing to ecosystem recovery...

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 - (so that we do not have to colonize Mars)



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SOIL FUNCTIONS & SOIL THREATS

- (6) major soil *functions*: anthropocentric !
- List compiled by EU
- Processes that damage or exhaust the soil and thus decrease performance = (9) *threats*

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 - that are *being threatened*...
 - which can be evaluated via observable soil properties and a range of techniques...
 - and *remediated using soil knowledge*...
- thus contributing to ecosystem recovery...

Soil function	Description
Biomass production	Production of food, fodder, fiber, energy crops
Environmental protection	Filtering, buffering and conversion of matter
Genetic reservoir	Habitat and gene pool for organisms representing soil biodiversity
Physical basis	Support for (infra-)structure and activities (recreation)
Source of raw material	Mineral material, peat, water
Geogenetic and cultural heritage	Protection and hiding of paleontological and archaeological remains

Soil threat
Erosion
Loss of organic matter
Pollution
Salinization
Compaction
Loss of biodiversity
Sealing
Landslides
Flooding

ECOSYSTEM SERVICES

- Some Planetary Boundaries are being exceeded...
- thus **some ecosystems function less and less well...**
- part of these **ecosystem services** are soil functions...
- that are being threatened...
- which can be evaluated via observable soil properties and a range of techniques...
- and remediated using soil knowledge...
- thus contributing to **ecosystem recovery...**

- “the benefits people obtain from ecosystems”
- Broader than (but including) **soil functions**

Millennium Ecosystem Assessment report 2005

Underlined:
studied by
soil scientists

Green:
Eqv. to
soil functions

Supporting ESS

- Nutrient cycling
- Primary production
- Soil formation
- Habitat provision
- Pollination

Provisioning ESS

- Food
- Raw materials
- Genetic resources
- Water
- Biogenic minerals
- Medicines
- Energy

Cultural ESS

- Recreational
- Science, education
- Therapeutic
- Heritage preservation

Regulating ESS

- Carbon sequestration
- Predation
- Waste decomposition, Purification
- Pest/disease control

ALL THIS AND MORE
IN IMSOGLO...

WHAT (are admission conditions)

– For BSc (180 ECTS) in pure or applied sciences with ≥ 40 ECTS in Natural Sciences + proven English proficiency

– 4 Intakes:

(current project)

Scholarships	2019-2020	2020-2021	2021-2022	2022-2023
EU-countries	3	4	17	
Other countries	18	22	30	
+ self-funded students				

A scholarship covers: tuition fee, monthly allowance, travel allowance

The tuition fee covers: insurance, class participation, excursions

WHAT (will you learn)

- Programme Learning outcomes
 - In a few words:
 - *IMSOGLO graduates have the knowledge and skills to characterize soils and understand soil evolution in an ecosystem context under global change (because they understand the underlying processes and interactions).*
 - Detailed programme learning outcomes
- Two Specializations:
 - Soil Biogeochemistry & Global Change
 - Physical Land Resources & Global Change

WHAT (will you learn)

– Programme Learning outcomes

– Two Specializations:

– Soil Biogeochemistry
& Global Change

– Focus:



– [Extra learning outcomes & info](#)

– Physical Land Resources
& Global Change

– Focus:



– [Extra learning outcomes & info](#)

		BGC		Fluxes and cycles of		
				water	C	Plant nutrients
		Focus	N			P
Scale	Local	shaded	shaded	shaded	shaded	shaded
	Regional	shaded	shaded	shaded	shaded	shaded
	(Trans-)national	shaded	shaded	shaded		
Resilience Degradation Remediation	Management		shaded	shaded	shaded	shaded
	Process understanding		shaded	shaded	shaded	
	Experimentation		shaded	shaded	shaded	

		PLR		Fluxes and cycles of		
				water	C	Plant nutrients
		Focus	N			P
Scale	Local	shaded	shaded	shaded	shaded	
	Regional	shaded	shaded	shaded	shaded	
	(Trans-)national	shaded	shaded	shaded		
Resilience Degradation Remediation	Management	shaded	shaded	shaded	shaded	
	Process understanding	shaded	shaded	shaded	shaded	
	Experimentation	shaded	shaded	shaded		

WHAT (about mobility)

- 2 Specializations:
 - Soil Biogeochemistry & Global Change (pathway A or B)
 - Physical Land Resources & Global Change (C or D)
- Pathways within specialization depend on thesis location

Program schedule		semester	mobility pathway			
			A	B	C	D
UGent		1	UGent	UGent	UGent	UGent
BoKu		2	BoKu	BoKu	UGent	UGent
summer activity						
UGOE	UA	3	UGOE	UGOE	UA	UA
thesis		4	UGOE	BoKu	UGent	UA

WHAT (about being a community)

– You share:

Primer event
IMSOGLO
 “International Master
 In Soils and Global Change”

14-17 September 2020



– Primer event

– First semester

– Summer activity

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1	JOINT PRIMER EVENT (UGent) Field excursion, Instrumentation, Field examples of soil threats Presentations on the content of IMSOGLO	
	Module SOIL FUNDAMENTALS (Ghent University, 30 ECTS)	
2	Specialisation SOIL BIOGEOCHEMISTRY AND GLOBAL CHANGE Module SUSTAINABLE LAND MANAGEMENT (University of Natural Resources and Life Sciences, Vienna, 30 ECTS)	Specialisation PHYSICAL LAND RESOURCES AND GLOBAL CHANGE Module NATURAL RESOURCES MANAGEMENT FOR RESILIENCE TO GLOBAL CHANGE (Ghent University, 30 ECTS)
	JOINT SUMMER ACTIVITY Summer school (Austria) or Field Work (China) in alternating years	
3	Module BIOGEOCHEMICAL CONSEQUENCES OF GLOBAL CHANGE (University of Göttingen, 30 ECTS)	Module SOIL PHYSICAL CONSEQUENCES OF GLOBAL CHANGE (Aarhus University, 30 ECTS)
4	Master Thesis Vienna or Göttingen (30 ECTS)	Master Thesis Ghent or Aarhus (30 ECTS)

WHO (are the participating universities)

University	web	In brief	Students	..of which International	World rankings 2020	
					Shanghai	Times Higher Education
Ghent University		here	46000	13%	66	103
Aarhus Universitet		here	33000	15%	69	106
Universität für Bodenkultur Wien		here	12000	25%	301-400	-
Georg-August-Universität Göttingen		here	31000	14%	101-150	130

PROGRAMME LEARNING OUTCOMES

IMSOGLO graduates will

1. possess a broad knowledge at an advanced level in basic disciplines (soil physics, soil biogeochemistry, land information systems, meteorology and climatology);
2. understand the evolution of soil (agro-/forest/natural) ecosystems under natural conditions and human-impact, as well as its relation to global change;
3. have the ability to characterise soil physically, biologically and chemically, using advanced techniques to understand soil processes, to translate this to soil quality and to assess the influences by and on natural and anthropogenic factors;
4. possess the basic methods to conduct field work (soil survey, soil profile description, soil sampling), interpret analytical data, classify the soil, and manage and interpret existing geospatial (soil) data;
5. have the ability to plan and execute target orientated experiments or simulations independently and critically evaluate the collected data;
6. possess a holistic understanding of interactions and processes in the agro-ecosystem and natural ecosystems, using statistical tools and advanced (geospatial) information- and modelling techniques;
7. have the ability to act from a researchers' perspective: creativity, accuracy, critical reflection, curiosity, justification of choices based on scientific criteria;
8. have the ability for independent integration and extension of acquired knowledge to update concepts and innovate implementation possibilities, knowing the limits of own competences;
9. have the ability to participate in and lead interdisciplinary groups that contribute the development of sustainable environmental solutions at local, regional and global scale;
10. possess qualifications for employment in private and public-sector companies and organisations where high level expertise in soil management is required;
11. have the ability to communicate, orally and written, in words and in graphs, on the own discipline to experts and the general public.



BIOGEOCHEMISTRY

‘Soil biogeochemistry and global change’ graduates will additionally be able to

1. sample, measure and describe basic concepts of biogeochemistry, in particular element cycles and fluxes in (agro-) ecosystems;
2. recognise the impact of soil properties and processes on plant nutrition and health;
3. evaluate the role of trees in land use systems, with particular emphasis on agroforestry;
4. develop appropriate field designs and experimental procedures to address testable hypotheses;
5. design, apply and evaluate experiments using both stable and radioactive isotopes;
6. understand the role of soil microorganisms for soil properties and plant nutrition in relation to their activities in the environment.

Course program + course sheets [here](#)

Key words for this option:

- Microbiology
- Agroforestry
- Agro-ecology
- Lab experimentation

		BGC	Fluxes and cycles of				
			water	C	Plant nutrients		
Focus					N	P	other
Scale	Local						
	Regional						
	(Trans-)national						
Resilience Degradation Remediation	Management						
	Process understanding						
	Experimentation						



PHYSICAL LAND RESOURCES

‘Physical land resources and global change’ graduates will additionally be able to

1. describe and model the soil water cycle and its relation to soil degradation and soil management;
2. design soil water management strategies under a changing climate;
3. recognise soil threats and to identify promising ecosystem services for a field situation;
4. measure and model erosion risk, soil compaction and the other soil threats identified by the EU;
5. characterise the relation between the C-cycle and the climate at different scales;
6. apply land evaluation techniques to identify and choose between promising land management alternatives in a regional context.

Course program + course sheets [here](#)

Key words for this option:

- Prevention and remediation of soil degradation
- Land evaluation for ecosystem functioning
- Soil water & C cycles
- Modelling

		PLR	Fluxes and cycles of				
			water	C	Plant nutrients		other
					N	P	
Focus							
Scale	Local						
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Resilience Degradation Remediation	Management						
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Ghent University is a top 100 university, founded in 1817, and one of the major universities in Belgium with more than 46,000 students, with a foreign student population of about 13% (40% of PhD students) and 15,000 employees.

Our 11 faculties offer more than 200 courses and conduct in-depth research within a wide range of scientific domains.

Our credo is 'Dare to Think', challenging everyone to question conventional views and to dare to take a nuanced stand. We are a pluralistic university open to all, regardless of their ideological, political, cultural or social background.

Ghent University Global Campus is also the first European university in Songdo, South Korea.

IMSOGLO is an initiative by the faculty of Bioscience Engineering.

For IMSOGLO-matters, the general and UGent coordinator is Prof. dr. Peter Finke (imsoglo@ugent.be).

AARHUS UNIVERSITET

Aarhus University is a young, modern university established in 1928. It has grown to become a leading public research university with international reach covering the entire research spectrum. Around 15% of 33.000 students are international, representing over 106 nationalities. The university is consistently ranked as one of the world's top universities. It was ranked number 69 in the 2020 Shanghai ranking and among the world's 100 best universities in 17 out of 42 subjects in the 2018 QS World University Rankings by Subject. According to Universitas 21 Ranking 2017 Denmark ranks fourth best in the world in providing higher education. Denmark is widely cited as one of the world's most liveable places.

UNIVERSITÄT FÜR BODENKULTUR WIEN

Founded in 1872, the University of Natural Resources and Life Sciences, Vienna, known too by its acronym BOKU, comprises 15 departments and four service centres in and around Vienna. BOKU has about 12 000 students (25% international), about 700 scientists employed on a project basis, about 74 full professors and about 130 associate professors. BOKU is a unique Austrian research and teaching organisation with strong focus on soil and terrestrial ecosystems, biotechnology, resources and societal dynamics, water-atmosphere-environment, living space and landscape, renewable raw materials, food-nutrition-health and nano sciences.

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

The University of Göttingen is an internationally renowned research university. Founded in 1737 in the Age of Enlightenment, the University is committed to the values of social responsibility of science, democracy, tolerance and justice. It offers a comprehensive range of subjects across 13 faculties: in the natural sciences, humanities, social sciences and medicine. With over 31,000 students and offering up to 200 degree programmes, the University is one of the largest in Germany. Two Faculties are involved in IMSOGLO, i.e. the Faculty of Geosciences and Geography, and the Faculty of Agricultural Sciences (with the Department of Crop Sciences as the Lead).