# Sustainable Engineering in a Global Scale

## The role of South Asia in the internationalization of higher education in Sweden, SASNET workshop, 28-29 November 2006


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# New forms in higher education: context, conditions and directions

# Solve the Most Important Problems First!

**Faeces**: 51 kg/person and yr (300-350 million tonnes/yr in the world)

**Urine:** 550 kg/person and yr

(3-4xE9 tonnes/yr i the world)

**Toilet Flushing: 40 l/p*d**

(15-30 $km^3$/yr in the world)


- **Drinking Water**
- **Food**
- **Energy**
- **Communication**

**95,000** households per day need to be provided with sanitation services (IVL, 2005)


## Social Welfare Systems

Scavengers at Landfill Site

# Some facts…(Word Fact Book, CIA)

| | Nepal  |  |
|---|---|---|
| Area, sq km | 140,800 | 449,964 |
| Elevation extremes | 70 m to 8,848 m | -2.4 m to 2,111 |
| Population | 24.7 mill | 8.9 mill |
| Median age | 19.7 years | 41.4 years |
| Life expectancy at birth | 59 years | 80 years |
| Infant mortality rate | 70.6 deaths/1,000 live births | 3.4 deaths/1,000 live births |
| Gross domestic product/capita | $1,400 | $26,000 |
| Pop. Below poverty line | 42 % | |
| Unemployment rate | 47 % | 4 % |

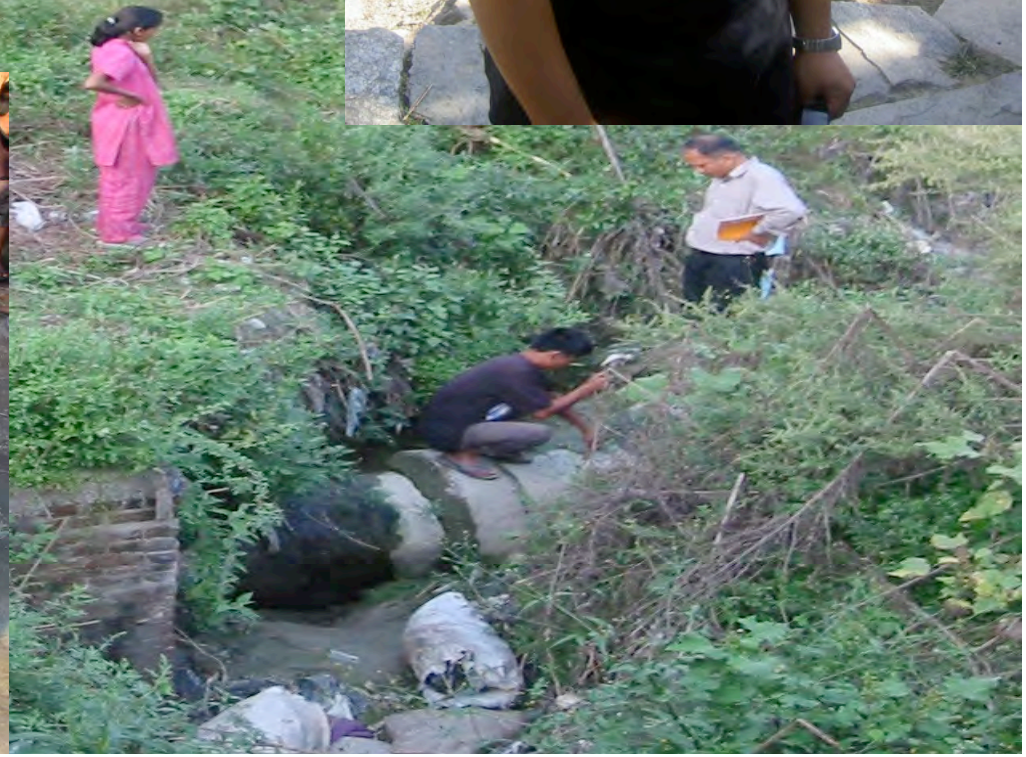
# Information and Communication



Learn from the locals and remember that you are just an adviser in the foreign country

# Work together on all levels


No person is so unimportant to not care about



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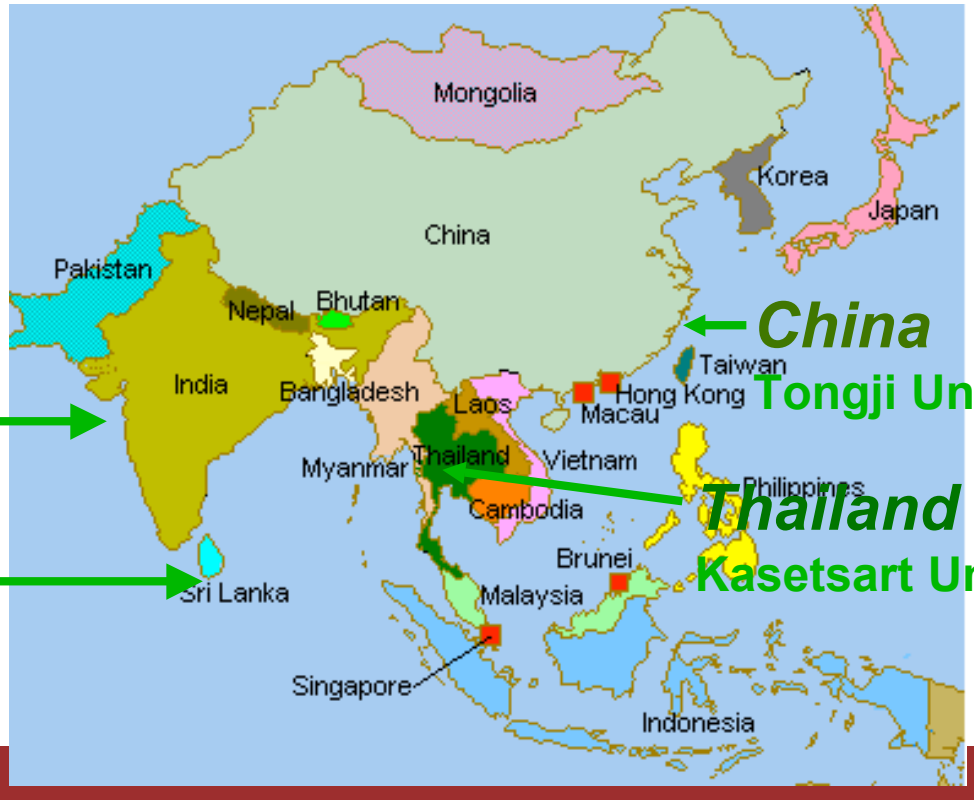
# Sida-SAREC: Asian Regional Research Programme in Environmental Technology

## NRIs

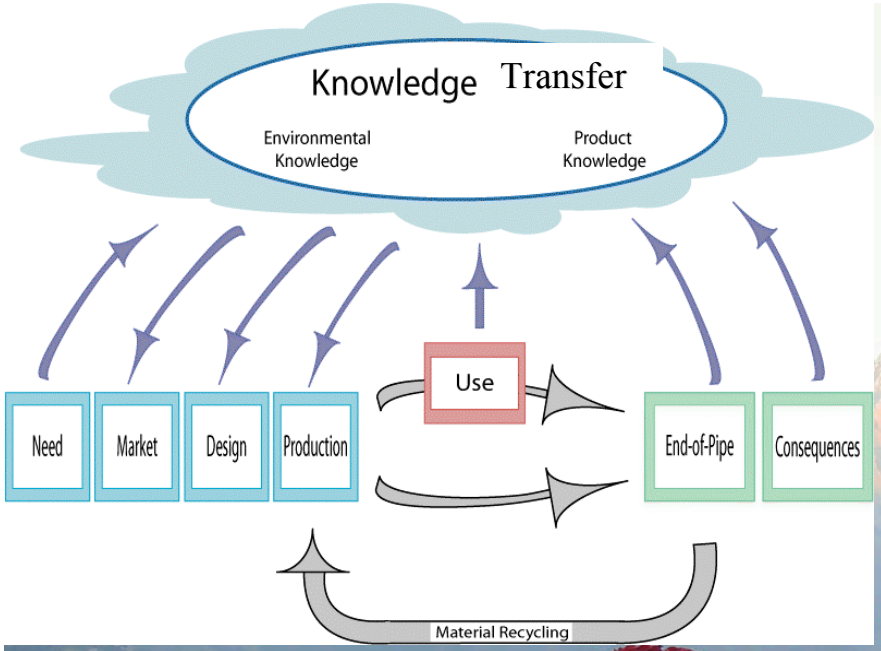


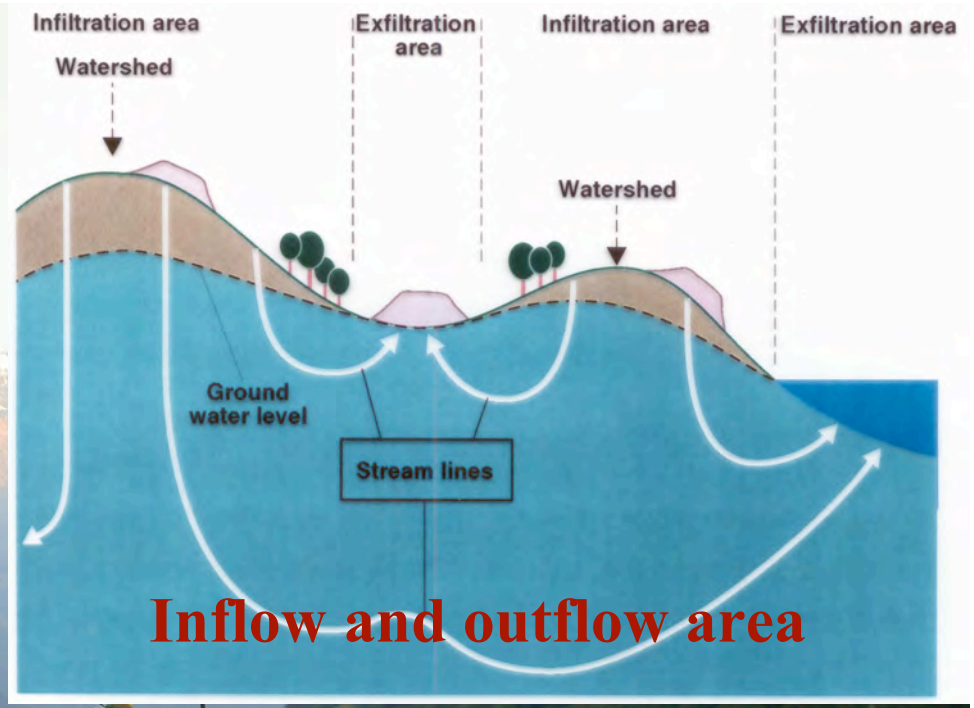

***India***
**Anna University**

***Sri Lanka***
**University of Peradeniya**

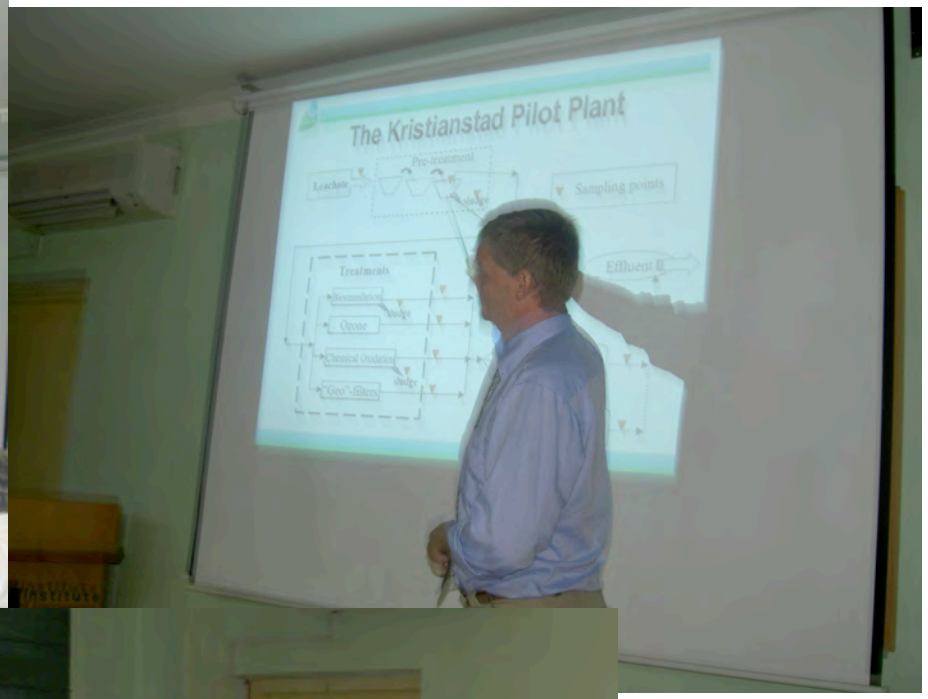
***China***
**Tongji University**

***Thailand***
**Kasetsart University**


Knowledge Transfer
Environmental Knowledge
Product Knowledge
Need
Market
Design
Production
Use
End-of-Pipe
Consequences
Material Recycling


Infiltration area
Watershed
Exfiltration area
Infiltration area
Watershed
Exfiltration area
Ground water level
Stream lines
Inflow and outflow area

# International Transfer of Knowledge



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काठमाडौं विश्वविद्यालय
KATHMANDU UNIVERSITY
Lab. studies

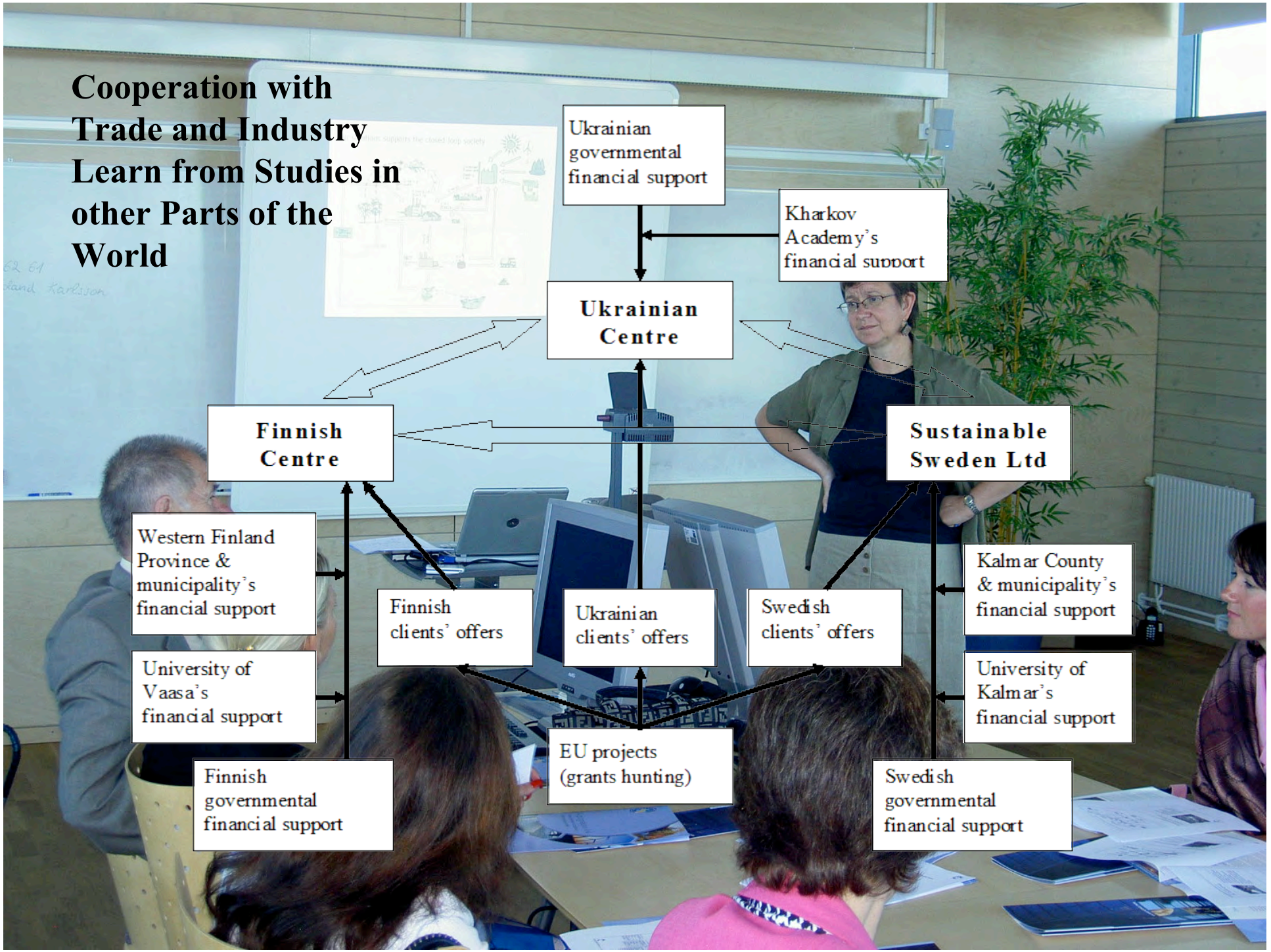
Oily sludge/soils

Phytoremediation- Biodiesel Production?

Transfer of knowledge

# Mix Nationalities and Transfer Scientific Knowledge and Culture

# Cooperation with Trade and Industry Learn from Studies in other Parts of the World



# MFS abroad

HÖGSKOLAN KALMAR UNIVERSITY

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# How to work

- Exchange of students, MSc and BSc, PhD, Post-doc, teachers
- Joint scientific papers
- Tests of Swedish technologies in tropical climate and reverse
- Contacts for Swedish companies
- Cooperation agreements, teaching and research
- Research applications in cooperation
- Cooperation with local Trade and Industy

# WANTED!

- A sustainable world!
- International Environmental Engineers in Eco-cyclic Systems

Bachelor of Science/environmental engineer university degree

Kalmar University, Sweden

# International Environmental Engineer in Eco-cyclic Systems

Our world is spinning around.

Towards loss of natural resources?
Towards polluted air and water?
Towards gigantic mountains of waste?
Towards flooded cities?
Towards decreasing health?
Towards a dangerous climat?

It doesn´t have to be that way.

One of the key-solutions is recycling of materials and energy, in a global aspect, in every corner of the world.

You can be one of them that leads us.

Welcome to Kalmar University, Sweden!

Industrial Ecology

- Searches for strategies similar to those found in Nature
- Tries to understand industrial production and patterns of consumption through analysis of flows, cycles of materials and energy

Education open for students from all countries.

The student´s project work can be related to some environmental or eco-cycle engineering problem in his native country.

## Education plan

**General**

The education plan is effective from spring semester 2007 onwards.

The programme "International Environmental Engineering for Eco-cyclic Systems" leads to a Bachelor of Science degree. The degree encompasses 120 credits of which 10 credits consist of a project work.

**The goals of the education**

**The basic university education will give:**

- Ability to make autonomous and critical evaluations
- Ability to autonomously define, formulate and solve problems
- Preparedness to meet changes in daily work
- Ability to seek and evaluate knowledge on a scientific level within international environmental technology
- Ability to follow the knowledge build-up within international environmental technology
- Ability to exchange knowledge also with laymen without specialist knowledge within international environmental technology.

**To be awarded the Bachelor of Science degree, the student must have:**

- Acquired knowledge in mathematics and natural science to such an extent that is required to be able to understand and apply the basics within mathematics and natural science on the chosen field of technology
- Acquired knowledge and proficiency in handle products, processes and working environment with regard to humans' prerequisites and needs, and to societal goals as regards social conditions, resource economy, environment and economy.
- Acquired knowledge based prerequisites to, after some year's relevant working practice within his field, be able to participate in the development of, and be responsible for, the usage of known eco-cycle technology in original production, design, cleaning and recirculation.

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## design of the education

be seen in the table below

| Year 1 | | | |
|---|---|---|---|
| Course | | Subject | Level |
| Engineering science | 20 c | Mathematics 12c, Physics and chemistry 8 c | 1-20 c |
| Materials technology | 5 c | Materials technology | 1-20 c |
| Integrated waste management and recycling | 5 c | Environmental engineering | 1-20 c |
| Biology for eco-cycle engineers | 5 c | Environmental science//Biology | 1-20 c |
| General environmental chemistry | 5 c | Environmental science/Chemistry | 1-20 c |
| | | | |
| Year 2 | | | |
| Course | | Subject | Level |
| Applied organic chemistry | 5 c | Environmental science/Environmental engineering/Chemistry | 1-20 c |
| Measurement data treatment | 5 c | Matemathics 2 c, Measurement technology and computing 3 c | 1-20 c |
| Analythical chemistry | 5 c | Environmental science/Environmental engineering/Chemistry | 21-40 c |
| Hydrology | 5 c | Environmental engineering | 1-20 c |
| Air pollutions and discharge control | 5 c | Environmental engineering | 21-40 c |
| Environmental management | 5 c | Environmental engineering | 21-40 c |
| Environmental protection engineering I: Water | 10 c | Environmental engineering | 1-20 c |
| | | | |
| Year 3 | | | |
| Course | | Subject | Level |
| Environmental protection engineering II: Soil and air | 5 c | Environmental engineering | 1-20 c |
| Engineering methodology, project management and economy | 5 c | Technology/Economy and finance | 1-20 c |
| Industrial ecology and indicator analysis | 5 c | Environmental engineering | 21-40 c |
| Environmental societal engineering, sustainable production and industrial processes | 5 c | Environmental engineering | 21-40 c |
| Risk analysis, environmental strategy and environmental effects | 5 c | Environmental engineering | 41-60 c |
| Mass- and energy balance analysis in natural and industrial systems | 5 c | Environmental science/ Environmental engineering | 41-60 c |
| Project work (BSc-degree) | 10 c | Environmental engineering | 41-60 c |

After a completed education, the exams listed below can be awarded:
University Engineer in Environmental Engineering for Ecocyclic Systems
Bachelor of Science in Environmental Engineering for Ecocyclic Systems

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## How to Reach Sustainable Engineering in Developing Countries?