European Association of
Geosynthetic product Manufacturers

COMPARATIVE LCA OF GEOSYNTHETICS versus CONVENTIONAL CONSTRUCTION MATERIALS
CASE 4: SOIL RETAINING WALL

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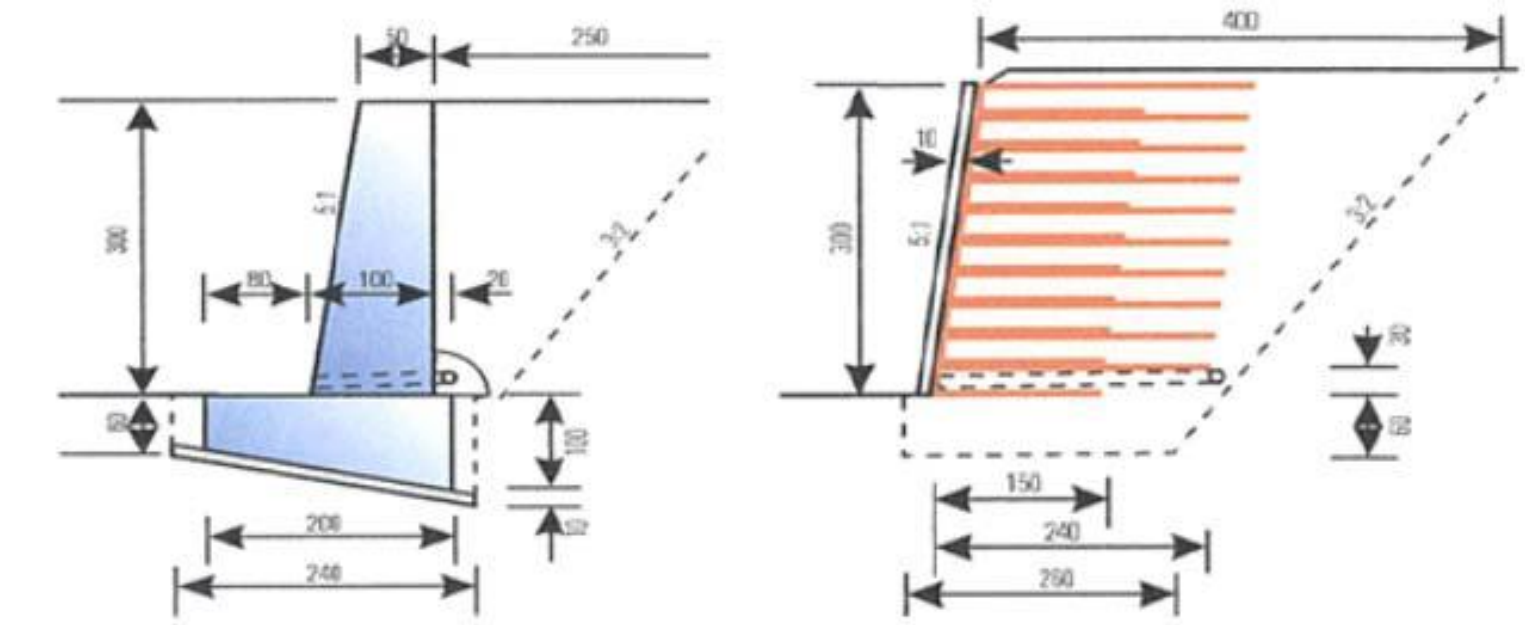
The E.A.G.M. commissioned ETH Zürich and ESU-services Ltd. to quantify the environmental performance of commonly applied construction materials. A comparison was undertaken between:

- conventional materials like concrete, cement, lime or gravel
- geosynthetic materials

A set of Comparative Life Cycle Assessment studies are carried out concentrating on various civil application cases, namely:

- filtration (case 1)
- foundation stabilised road (case 2)
- landfill construction (case 3)
- ***slope retention retaining structures (case 4)***

CHARACTERISATION OF ALTERNATIVES



4A
Retaining concrete wall reinforced with steel (strength class B300)

4B
Soil wall reinforced with geosynthetics (LTDS 14 kN/m)

CHARACTERISATION OF ALTERNATIVES

Soil retaining wall

The 'average' of 3 types of different geosynthetics is modelled:

- extruded stretched grids
- laid (welded) grids
- woven / knitted grids

(Data collected from EAGM members 2010)

surface

Bridge abutment reinforced concrete

EXAMPLES/PICTURES OF THE ALTERNATIVES

Retaining wall reinforced with concrete

Soil wall reinforced with geosynthetics

EXAMPLES/PICTURES OF THE ALTERNATIVES

Green facing

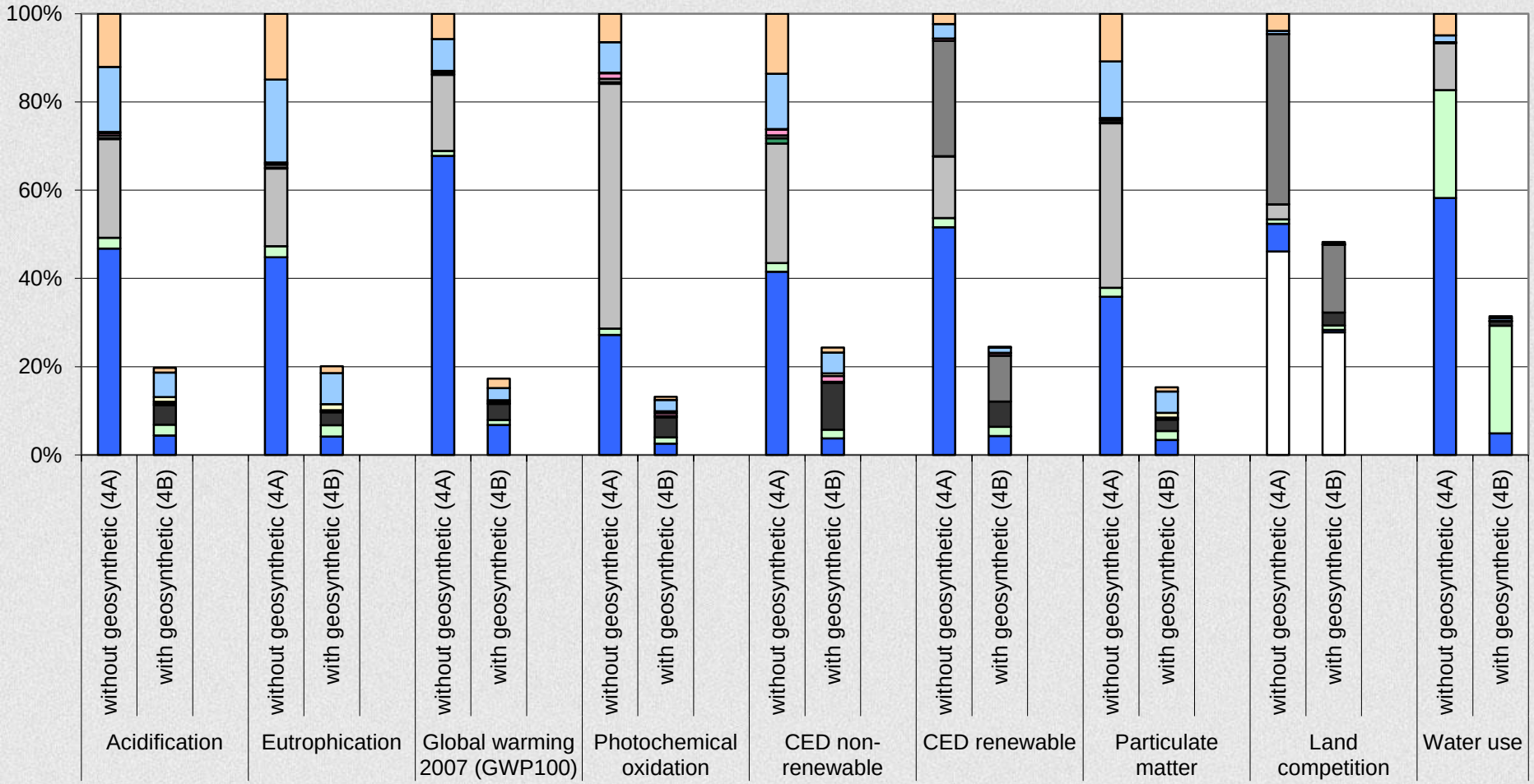
Life cycle impact Infrastructure element

Selected key figures referring to the construction of reinforced concrete wall (4A) and geosynthetic reinforced soil structure (4B)

	Unit	4A Concrete	4B Geosynthetics
Concrete, sole plate and foundation	m^3/m	1.60	-
Lean mix concrete	m^3/m	0.24	-
Structural concrete	m^3/m	2.10	0.31
Reinforcing Steel	kg/m	153	-
Geosynthetic	m^2/m	-	39.2
Diesel in building machine	MJ/m	11.6	53.9
Transport, lorry	tkm/m	701	265
Transport, freight, rail	tkm/m	33.2	6.9
NMVOC emissions (bitumen)	g/m	20	-

Indicators investigated: Acidification, Eutrophication, Global Warming, Photochemical oxidation, CED non-renewable, CED renewable, Particulate matter, Land competition & Water use

Environmental impact graph



THIS STUDY SHOWS

The use of geosynthetics leads to:

- **lower impact in all categories**
- **~ 75% reduction of Non renewable cumulative energy demand (CED)**
- **~ 85% reduction of cumulative greenhouse gas emissions**
- **Every 3 linear meters soil retaining wall (3 meter high) saves 30,000 MJ eq, which is equivalent to the energy consumption of one household per year!**

The whole study including the results of the critical reviews is available on:
http://www.eagm.eu/