European Association of
Geosynthetic product Manufacturers

COMPARATIVE LCA OF GEOSYNTHETICS versus CONVENTIONAL CONSTRUCTION MATERIALS
CASE 1: FILTER FUNCTION

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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)

Filter system below a road

Drainage trench construction

CHARACTERISATION OF ALTERNATIVES

Filtration system with geosynthetic compared with granular filter.

The “average” of 3 types of different PP geotextiles is modelled:

- Continuous filaments nonwoven
- Staple fibre nonwoven
- Woven

(Data collected from EAGM Members 2010)

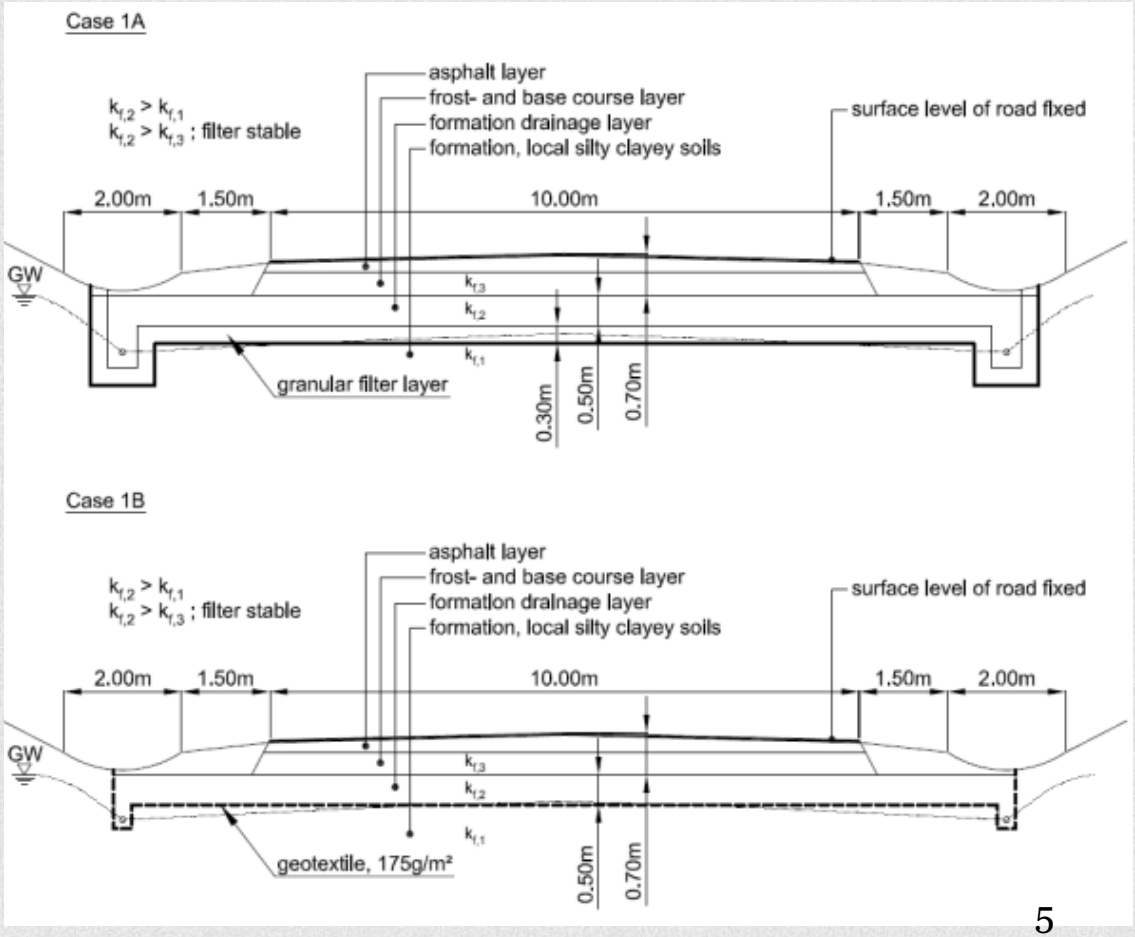
CHARACTERISATION OF ALTERNATIVES

Filter system below a road:

- Case 1A - granular filter layer - 300 mm gravel
- Case 1B - geotextile filter – 175 g/m²

Hydraulic permeability : (k-value) ≥ 0.1 mm/s

Estimated lifetime ≥ 30 years



CHARACTERISATION OF ALTERNATIVES

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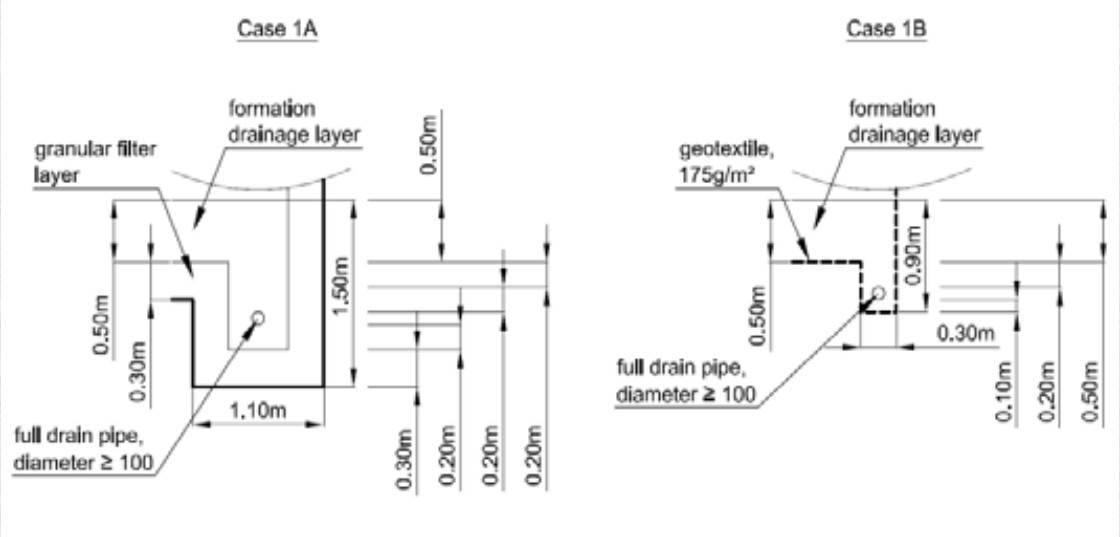

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CHARACTERISATION OF ALTERNATIVES

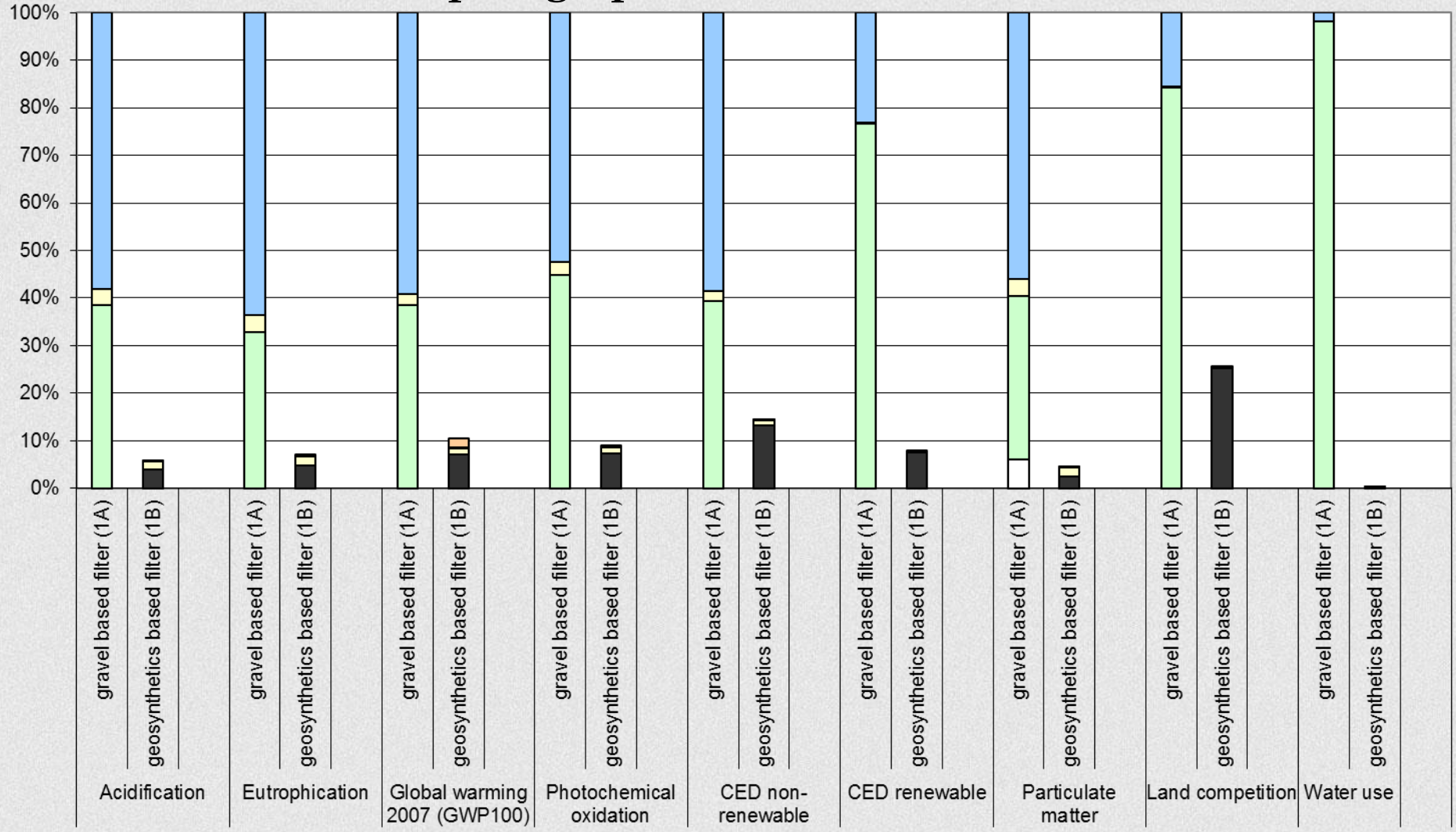
Key figures referring to the construction of 1m² of filter :

	Unit	Case 1A Total	Case 1B Total
Gravel	t/m²	.69	-
Geosynthetic layer	m²/m²	-	1
Diesel used in building machines	MJ/m²	2.04	1.04
Transport, lorry	tkm/m²	34.5	0.035
Transport, freight, rail	tkm/m²	-	0.07
Particulates, > 10 μm	g/m²	4.8	0
Particulates, > 2.5 μm & < 10 μm	g/m²	1.3	0

INDICATORS INVESTIGATED:

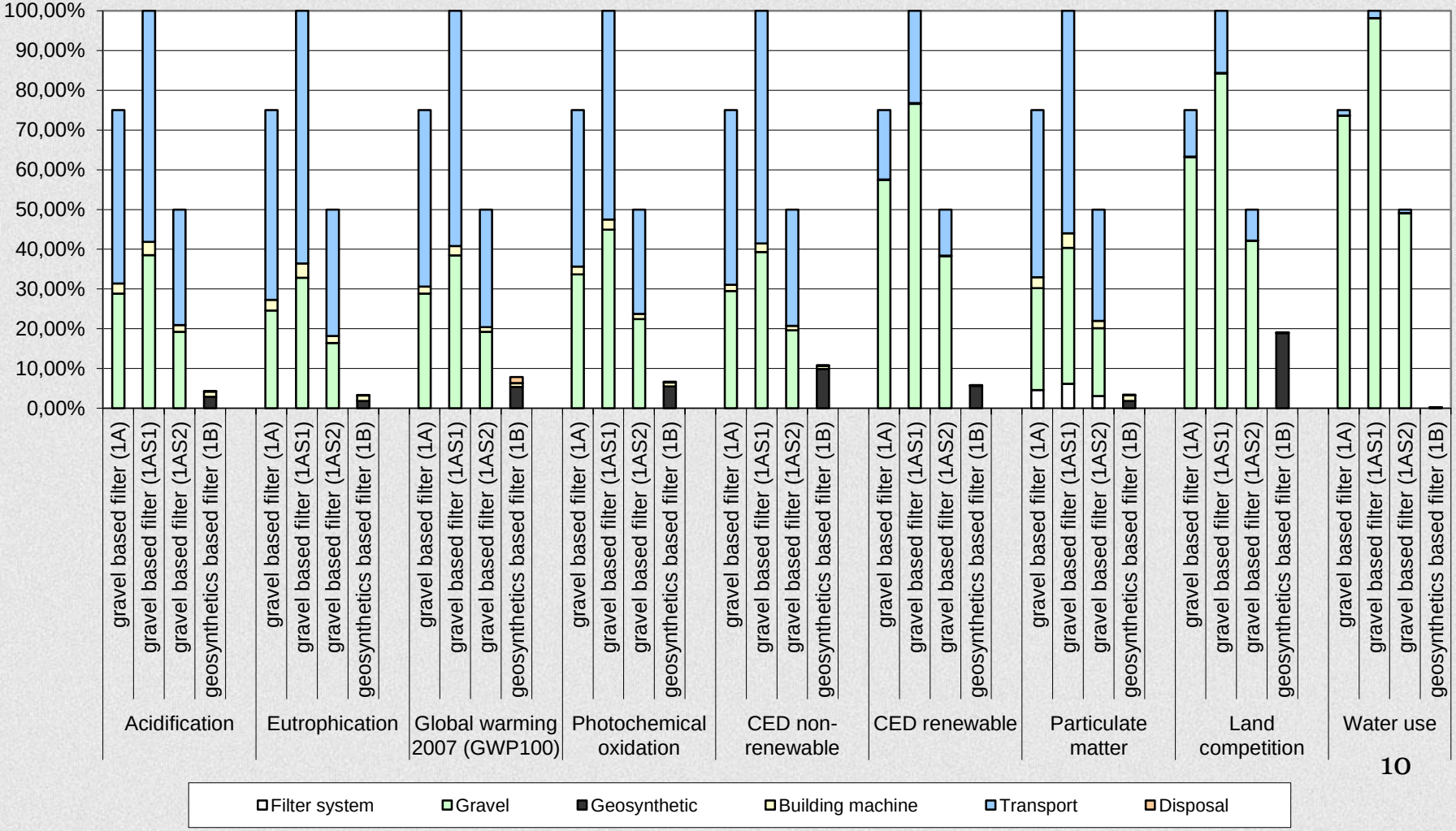
1. Cumulative Energy Demand [CED]
2. Climate Change [Global Warming Potential, GWP100]
3. Photochemical Ozone Formation [also known under “summer smog”],
4. Particulate Formation [PM, causes health problems as it reaches the upper part of the airways and lungs when inhaled]
5. Acidification [major acidifying substances are NOX, NH3, and SO2]
6. Eutrophication [nutrient enrichment of the aquatic environment]
7. Land competition
8. Water use

Environmental impact graph



Varying the thickness of the gravel layer +/- 10cm

Environmental performance of geotextile filter remains considerably better



THIS STUDY SHOWS

The use of geosynthetics leads to:

- **75% (min.) lower environmental impact for all indicators**
- **~ 85% lower non-renewable cumulative energy demand**
- **~ 90% lower cumulative greenhouse gas emissions**

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