European Association of
Geosynthetic product Manufacturers

COMPARATIVE LCA OF GEOSYNTHETICS versus CONVENTIONAL CONSTRUCTION MATERIALS
CASE 2: FOUNDATION STABILISATION

Ian Fraser – Tensar International (on behalf of EAGM)
Andreas Elsing – Huesker Synthetic (on behalf of EAGM)

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)

Road Foundation Construction

CHARACTERISATION OF ALTERNATIVES

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)

Road class III with the same finished surface in all cases.

- Foundation assumed life ≥30 years (weak soil)
- Binder course assumed life ≥ 30 years
- Asphalt surface layer assumed life ≥ 15 years

CHARACTERISATION OF ALTERNATIVES

Three basic foundation cases were investigated:

- Case 2A - conventional road with a non frost sensitive gravel/sand layer
- Case 2B - as 2A stabilised with a geogrid
- Case 2C – as 2A stabilised with lime/cement/hydraulic binder

Further refinements of the alternatives were modelled (see full paper)

Indicators investigated:

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

CHARACTERISATION OF ALTERNATIVES

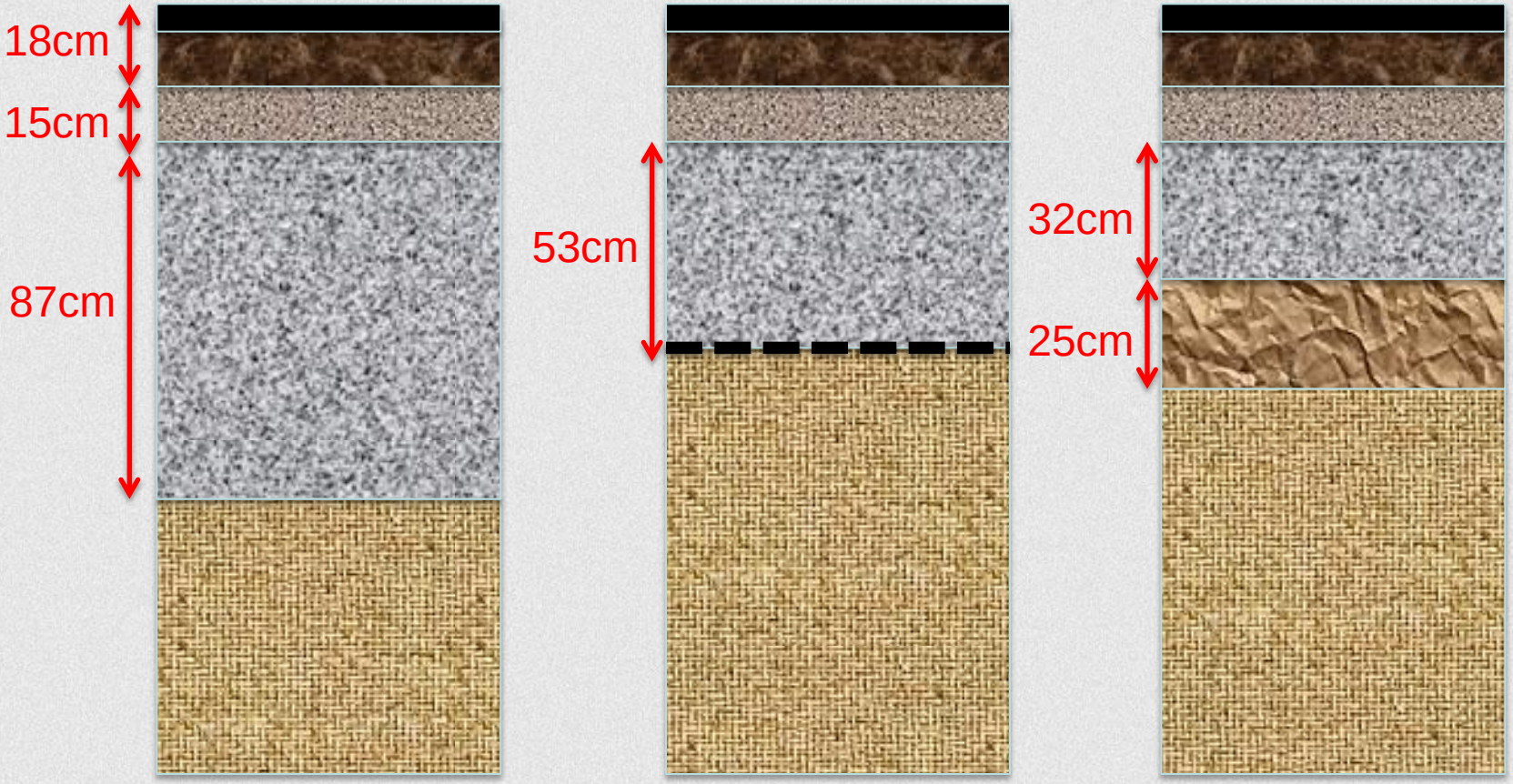
Three basic foundation cases were investigated:

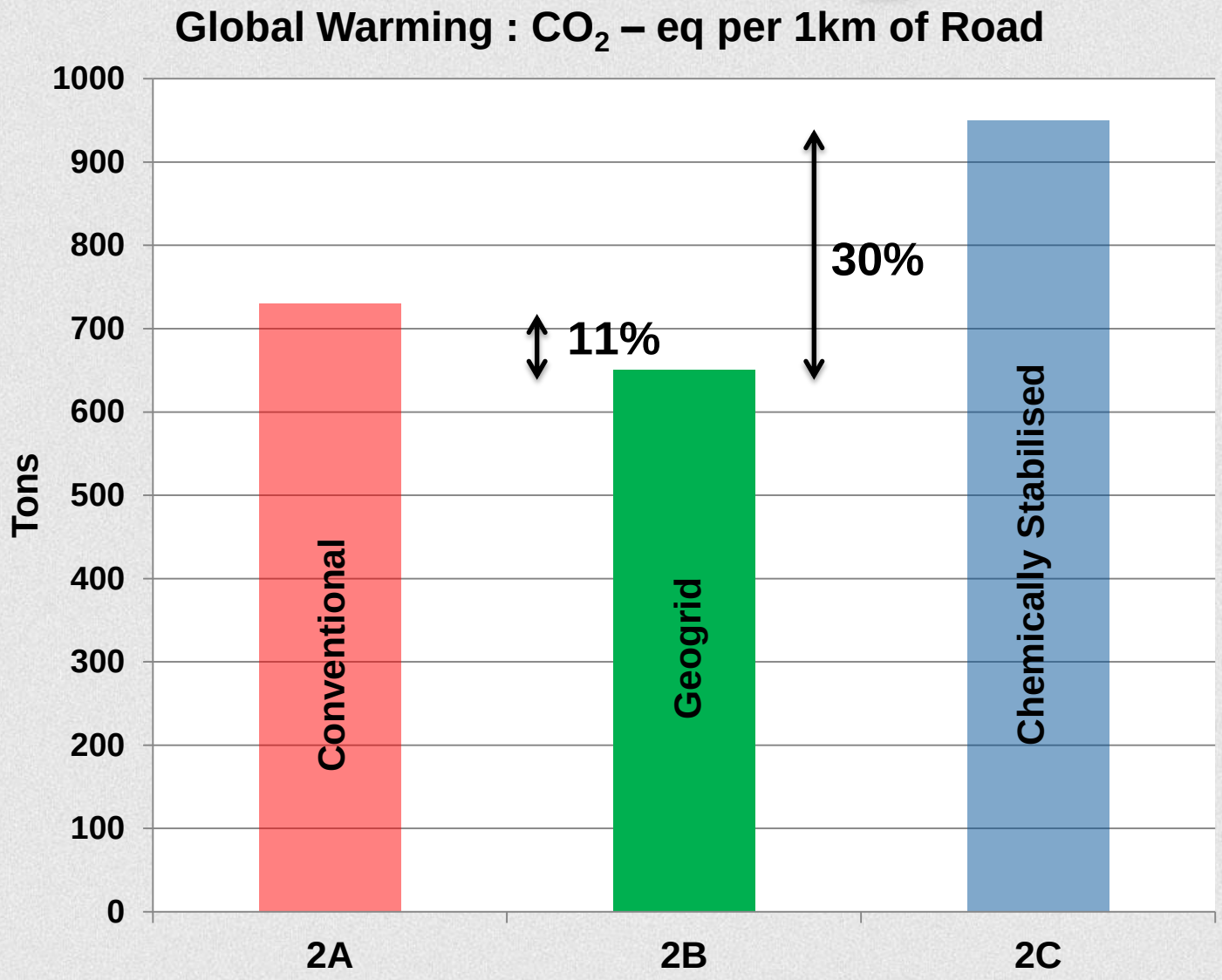
- Case 2A - conventional road with a non frost sensitive gravel/sand layer
- Case 2B - as 2A stabilised with a geogrid
- Case 2C – as 2A stabilised with lime/cement/hydraulic binder

Further refinements of the alternatives were modelled (see full paper)

Indicators investigated:

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


18cm
15cm
87cm
53cm
32cm
25cm
Case 2A
Case 2B
Case 2C
Asphalt Layers
Base
Sub-base
Sub-grade
Chemically stabilised
Geogrid


Global Warming : CO_2 – eq per 1km of Road
Tons
1000
900
800
700
600
500
400
300
200
100
0
11%
30%
Conventional
Geogrid
Chemically Stabilised
2A
2B
2C

THIS STUDY SHOWS

The use of geosynthetics leads to:

- **lower environmental impacts concerning all indicators investigated compared to a conventional road**
- **lower climate change impacts compared to lime or cement stabilisation**
- **~11% (or 800 tons) saving in CO_2 per 10km of road ≈ 3,200,000 km in a car (80 trips around the world)**
- **Vs lime/cement stabilisation save 30% ≈ 12,000,000 km**

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