Towards Road Sustainability

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1. Footprint
2. Limits to growth
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The sustainability problems start all here: … the ecological footprint!
Ecological footprint

A measure of human demand on the Earth’s ecosystems. It represents the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and render harmless the corresponding waste.
Average footprint of an European Citizen:

3 ha/inhabitant

Average footprint of a north-American citizen:

5 ha/inhabitant

Available in our world:

1,5 ha/inhabitant!
If we all had an **European** lifestyle: 2 Planets!

If we all had a **north-American** lifestyle: 3 Planets!

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2 Limits to growth
Are there any limits to our growth?

This question was first asked in 1972

The answer seems to be YES!
Exponential growth is a mathematical concept... ...not a physically feasible one!
1972 UN Stockholm Conference

1992 UN Rio’s Conference

Scope of environment concerns

Management of Environmental Resources

Environmental Safeguards

“Frontier” Economics

60’s 70’s 80’s 90’s Y2K

Sustainable Development

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3 Major problems
Major Global Environmental Problems:

Climate Change

Loss of Biodiversity

Roads and transport are very relevant for both!
Climate Change

- Transport is responsible for 23% of GHG emissions
- 75% of it comes from road vehicles
- 95% of transport energy comes from petroleum
- 1 ton of cement used in construction generates 1 ton of CO2

Loss of Biodiversity

- Habitat loss
- Fragmentation of ecosystems
- Landscape downgrading

... and other impacts

- Significant use of construction materials
- Soil sealing
- Air and water pollution, noise, etc.
Two dimensions of the environmental problems:

The infrastructure

Construction / Maintenance / Decommissioning

The operation

Traffic / Integration in a transport system

Both have significant impacts that require attention
US vehicle miles travelled

1984: 1.650 billion miles

2009: 3.050 billion miles

An increase of 184%!

(Source: US Federal Highway Administration 2009)
Construction Phase vs. Operation Phase

Impacts much beyond the construction phase!

(Source: Alan Pears, 2004 – Sustainability and Roads)

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World transport CO2 emissions by vehicle type

Using Roads: 75%

World Bank, 2008 – Safe, Clean and Affordable Transport for Development
CO2 Emissions

Different Contributions,
Different Responsibilities!

Energy Consumption vs. Urban Density

Land use matters... a lot!

Emissions sources

CHANGER enables calculation of emissions by reference to the different phases of a construction project. Its database covers a comprehensive range of construction processes and materials, including Impacts from:

- Pre-Construction
- Clearing, piling, cut transport, fill transport
- On-Site
  - use of electricity and fuel
- Materials
  - Construction materials, transport of materials
- Machinery
  - Excavators, pavers, rollers, etc.

Flexibility

The flexibility of the system corresponds to a wide variety of user needs - from pre-project phase estimations, right through to comprehensive end-project assessments. In each case, CHANGER automatically generates full or partial reports that can be exported to Excel, Word, PDF and HTML format.

Emissions results are expressed in metric tonnes of CO2 equivalent.

Further specifications are available on the dedicated website at

www.irfghg.org
4 Tools
Environmental Impact Assessment is THE tool for preventing unwanted impacts.

It is not a tool for REJECTING projects, but rather a tool for IMPROVING projects.

This is essential for moving towards sustainability!
Impact Assessment and Measures

- Identify Impacts
- Quantify Impacts
- Assess Impacts
- Propose Measures

- Reduce Impacts
- Mitigate Effects
- Compensate Damages

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Main Environmental factors

• Climate
• Geology and geomorphology
• Soils and land use
• Water resources
• Air quality
• Waste
• Noise
• Habitats and ecosystems
• Heritage
• Landscape
• Social and economic dimensions
• Protection regimes
• Risk analysis
Material Flow Analysis in all phases

Transport of Materials

Consumption:
- Energy
- Water
- Materials

Transport of Waste

Emissions:
- Solid waste
- Effluents
- Air pollution
- Noise

Planning & Design → Construction → Operation → Maintenance → Decommissioning

• Specify & Select

Reuse & Recycling

Landfill Deposition

Construction Materials & Equipments
An anticipatory approach at a very early stage of the project:

• Prevents many negative impacts;

• Provide more project options;

• Is better for the economy of the project.
The Environmental Impact Assessment (EIA) can (should) be done at a very early stage:
Portuguese procedure: two-phase assessment

- Promoter prepares the EIA at a preliminary design stage;
- Authorities establish an “Impact Declaration” with impact requisites for the final project design;
- Promoter prepares final project design and “Conformity Report” with the established requisites;
- Authorities evaluate the “Conformity Report” and may require further measures or studies, including during the construction phase.
Portuguese procedure: two-phase assessment

**Two-Stage Environmental Impact Assessment**

- **Promoter**
  - Preliminary Project Design

- **Authorities**
  - EIA Impact Declaration

- **Promoter**
  - Final Project Design & Conformity Report

- **Authorities**
  - Conformity Analysis & Further Measures

**Construction**

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Strategic Environmental Assessment (SEA) is as early as you can go:

- Relative to Plans or Programs, instead of project design;
- It is not a substitute of EIA but it facilitates it at a later stage;
- Required by EU Directives in most situations.
Final comments
Final Comment 1

Sustainability: Construction + Operation

Infrastructure vs. Transport Policy

Do not attempt to make policy by building infrastructure (fait accompli)!

Do not “write” the plans in concrete (or in asphalt)!
Final Comment 2

Infrastructure is instrumental to transport policy and not transport policy “after” infrastructure!

But…

… a lot of optimization can be achieved for the already built infrastructure!
Final Comment 3

Sustainability is global and holistic…

Life cycle analysis of the infrastructure and measures taken at all stages are essential!
Final Comment 4

The bar has to be put higher

More ambition,

more demanding targets,

better performance!
World Bank 2008
“Safe, Clean and Affordable Transport for Development”

- Safe Transport

- Clean Transport
  - Promote Mass Transit Transport projects (BRT and LRT)
  - More investments in Non-Motorized Transport
  - Usage of Climate Change Funds in Transport (clean buses for example)

- Affordable Transport

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Some steps forward:

**Infrastructure**
- Intelligent roads
- Optimize the flow of traffic
- Avoid congestion
- Concentrate on black spots

**Vehicles**
- Electric cars
- Other non-fossil fuels
- Improve efficiency

**Transport policies**
- Better public transportation
- Better intermodal connections
Sustainable Transport:

Make your Choice

Thank You!

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